



**MONASH** University

**What are the current supports in place for EAL students studying VCE**

**biology?**

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A thesis submitted for the degree of *Doctor of Philosophy* at

Monash University in 2022

*Faculty of Education*

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## Abstract

With a population of approximately 25.6 million people in Australia, one in four Australians are currently born overseas and 20% of Australians speak a language other than English at home, (Australian Bureau of Statistics, 2022). This is reflected in the education system where 25% of students in primary and secondary schools in Australia learn English as an additional language or dialect (Australian Curriculum Assessment and Reporting Authority (ACARA), 2022). In Victorian schools, 27% of the student population are from Language Backgrounds other than English (LBOTE) and 13% were English as an Additional Language (EAL) learners. A significant number of students complete Victorian Certificate of Education (VCE) subjects and VCE biology is one of the most language dependant non-English subjects. Whilst there has been research examining methods that can be used to support LBOTE students, there is limited research that has studied how to support LBOTE students in content subjects such as science. Therefore, the aim of this study was to identify and explore what current supports are available for EAL students studying VCE biology.

In investigating how biology is taught and what support is needed, EAL students, teachers and policy documents were included in this study. I employed a multi-method approach using various methodologies, such as autoethnography, policy review and case study, to explore this topic. A thesis by publication method was used with a publication for each methodology that addressed a specific sub-research question. Four teachers from two schools with a high percentage of LBOTE students were interviewed, in addition to an analysis of my own experiences as a student and further inclusion of policy documents investigating a socio-political lens linked to the exploration of the research question. A combination of relevant theoretical frameworks, cultural capital (Bourdieu, 1986), ecological systems theory

(Bronfenbrenner, 1976), funds of knowledge (Moll et al., 1992) and the initiation, response, follow-up model (Wells, 1993), were used to analyse and present the data.

Key findings identified highlighted the importance of parental involvement, the need for and use of resources and tools, as well as creating a sense of belonging and achievement amongst the students. Within those themes, areas that needed to be further developed in schools and supported were the benefits of communication (with other education staff and parents), professional development opportunities and necessary planning time for teachers. This study's findings contribute to the body of knowledge for supporting EAL biology students, whilst highlighting and addressing possible challenges in the field for current and future teachers, students, and policymakers.

## Publications during enrolment

Fernando, P., Gindidis, M., & Cooper, R. (2021). Mapping a Language(s) Journey in Science; From Learning Biology to Teaching Biology: An Autoethnography. *The Qualitative Report*, 26(8), 2682–2710. <https://doi.org/10.46743/2160-3715/2021.4629>

## Thesis including published works declaration

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

This thesis includes one original article published in peer reviewed journals and two papers submitted for review with reputable peer reviewed journals. The core theme of the thesis is supporting EAL student in biology. The ideas, development and writing up of all the papers in the thesis were the principal responsibility of myself, the PhD candidate, working within the faculty of Education under the supervision of Dr Rebecca Cooper and Dr Maria Gindidis.

(The inclusion of co-authors reflects the fact that the work came from active collaboration between researchers and acknowledges input into team-based research.)

In the case of (*chapter 5, 6, & 7*) my contribution to the work involved the following:

Thesis Chapter	Publication Title	Status <i>(published, in press, accepted or returned for revision, submitted)</i>	Nature and % of student contribution	Co-author name(s) Nature and % of Co-author's contribution*	Co-author(s), Monash student Y/N*
Chapter 5	Mapping a Language(s) Journey in Science; From Learning Biology to Teaching Biology: An Autoethnography	Published	<i>Concept, collecting and analysing data and writing first draft 60%</i>	1) <i>Dr Rebecca Cooper, input into manuscript 10%</i> 2) <i>Dr Maria Gindidis, input into manuscript 20 %</i>	No  No
Chapter 6	Great divide; Exploring the chasm between Victorian EAL policies in schools and teacher practices using Bronfenbrenner's ecological lens.	Submitted Under Review	<i>Concept, collecting and analysing data and writing first draft 60%</i>	1) <i>Dr Rebecca Cooper, input into manuscript 15%</i> 2) <i>Dr Maria Gindidis, input into manuscript 15 %</i>	No  No
Chapter 7	Teachers supporting EAL learners in mainstream biology classrooms: understanding learners and the system is the path to success	Submitted Under Review	<i>Concept, collecting and analysing data and writing first draft 60%</i>	1) <i>Dr Rebecca Cooper, input into manuscript 20%</i> 2) <i>Dr Maria Gindidis, input into manuscript 10%</i>	No  No

I have numbered the sections of submitted papers (chapter 6 and chapter 7) but I have not numbered sections of the published article (chapter 5) in order to maintain the original format of the published article.

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I hereby certify that the above declaration correctly reflects the nature and extent of the student's and co-authors' contributions to this work. In instances where I am not the responsible author, I have consulted with the responsible author to agree on the respective contributions of the authors.

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**Date:** 2/8/2022

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## **Dedication**

This PhD thesis is dedicated to my grandparents.

To Brindley & Josephine Fernando who have always been passionate advocates of education.

To Joyce Fernando (Ammika) who continues to inspire me and pushes me to work hard.

Thank you for all the tea, Ammika.

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## **Table of Abbreviations**

ACARA – Australian Curriculum Assessment and Reporting Authority

AMEP – Adult Migrant English Program

AusVELS – Australian Victorian Essential Learning Standards

BICS – Basic Interpersonal Communicative Skills

CMEP – Child Migrant Education program

CALP – Cognitive Academic Language Proficiency

CLIL – Content and language integrated learning

DET – Department of Education and Training

EAL/D – English as an additional language or dialect

FoK – Funds of Knowledge

IRF – Initiation, Response, Follow-up

LBOTE – Language Backgrounds Other than English

MEA - Multicultural education aides

MEP – Migrant Education program

NAPLAN - National Assessment Program – Literacy and Numeracy

RTI – Response to Intervention

SAC - School Assessed Coursework

SAE – Standard Australian English

SES – Socio-economic status

TESOL – Teaching English to Speakers of Other Languages

VCE – Victorian certificate of Education

ZPD – Zone of Proximal Development



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## List of Publications in Order of Appearance in the Thesis

- Chapter 5: Mapping a Language(s) Journey in Science; From Learning Biology to Teaching Biology: An Autoethnography
- Chapter 6: Great divide; Exploring the chasm between Victorian EAL policies in schools and teacher practices using Bronfenbrenner's ecological lens.
- Chapter 7: Teachers supporting EAL learners in mainstream biology classrooms: understanding learners and the system is the path to success

### Prefatory Comment

This thesis contains published and submitted articles under review. While the author has made every effort to avoid any unnecessary repetition, there are instances where this was unavoidable. Such examples are discussing student and teacher views as well as addressing the methodologies of this study in chapters 5, 6 and 7. Stylistic variations in the thesis presentation, such as referencing styles and US spelling in Chapter 5, were required by the journal or manuscript submission. First person has been used where appropriate except in direct quotations. For manuscripts under review or in press, tables and figures are placed in the text of the manuscript in accordance with the requirements articulated by the relevant journals. The references for each manuscript (published and pre-publication) are placed at the end of the thesis document to maintain consistency.

# Chapter 1: Introduction

## 1.1 Introduction

Australia, in particular the state of Victoria, is very diverse with significantly high migration rates, and many families migrating from countries where they speak a language other than English. Whilst immigration decreased by 71% between 2020 and 2021 due to COVID, the average number of migrant arrivals from 2010–2020 was 493,000 per year (Australian Bureau of Statistics, 2021c). Children of immigrant families often begin their schooling during the crucial middle years (Year 7–10, ages 13–16) and can experience difficulty learning content in addition to learning the language of a host country (Suárez-Orozco & Suárez-Orozco, 2009). Whilst there has been research undertaken on methods that can be used to support students from language backgrounds other than English (LBOTE), there is limited research that has studied how to support LBOTE students in content subjects such as science (De Oliveira & Campbell Wilcox, 2017; Duran et al., 1998; Nguyen, 2021; Satayev et al., 2022). Consequently, this thesis uses a variety of perspectives to study the support available for biology students in Victoria, Australia, whose first language is not English.

The broader term “language background other than English” (LBOTE) includes any student that speaks a language other than English at home (Williamson, 2012). This thesis uses the more specific term English as an Additional Language (EAL), referring to students who use English as their primary, additional language at school. The main distinction between the two words is that EAL applies to students participating in Victorian Certificate of Education (VCE) subjects and meets the criteria designated by the Department of Education and Training (Victoria). Because my research is focused on students studying biology in VCE, the term EAL is used.

The Department of Education and Training (DET) EAL handbook (Department of Education and Training, 2015) defines students as EAL if they meet the following criteria:

- Come from a language background other than English.
- Do not speak English as the main language at home.
- Have been enrolled in an Australian school for less than seven years.

It is important to note that the term English as a Second Language (ESL) will be used when referencing older research. This is because the term ESL was used in the past to describe EAL students. However, it did not acknowledge the multilingual nature of students who were able to speak more than two languages. Therefore, the term EAL acknowledges that English is a language in addition to various other languages the student may speak. Similarly, departments of education of various states have also included dialects in their definition of EAL by noting EAL/D students (Department of Education and Training, 2022). Whilst some of the research that has been used addresses both EAL and students with dialects (EAL/D), this research focuses primarily on EAL students. The narrow focus was employed to target students who are learning English as a different language as opposed to dialects of English. Dialects are considered forms of language that can have variations in vocabulary, grammar, and pronunciation but dialects consist of mutual intelligibility which means two individuals of different dialects can communicate with each other. Thus, a dialect cannot be considered a completely new language. Consequently, this research focused on EAL students as there was a need to support students who have less ability to communicate in the English language (Creagh et al., 2019; Gaipov & Brownhill, 2021; Merga, 2020).

EAL students are allocated to levels depending on their proficiency in speaking and listening, reading and viewing, and writing (Victorian Curriculum and Assessment Authority

(VCAA), 2015). Funding is provided for the students in their first five years (Department of Education and Training, 2015). The DET prescribes a whole-school approach to EAL programming and provision. This includes providing targeted EAL programs for students with greater learning needs and ensuring that all teachers are aware of the learning needs of the EAL cohort. An EAL policy is developed by each school and approved by the school council, while the EAL handbook (Department of Education and Training, 2015) suggests factors to consider and include. However, as will be discussed in this thesis, less support is provided for EAL students in mainstream subjects including VCE subjects.

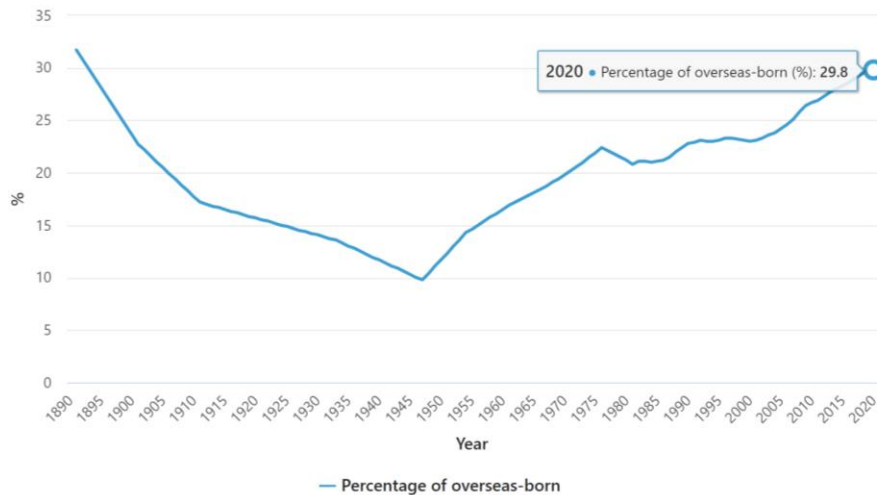
Some policies apply to LBOTE students because these policies consider all students outside VCE resulting in students who narrowly miss out on the EAL criteria and do not receive any of the EAL classifications but still require assistance due to limited English language proficiency. Research has found that a significant amount of students are missing out on adequate support because they do not qualify for the EAL classification (Premier, 2021). Williamson (2012) argues that most research that considers LBOTE students is completed with regard to international students or recently arrived migrants. Thus, students who arrived in Australia when they were younger and have the verbal ability of mainstream students, get neglected because they do not have cultural and linguistic differences markers. However, Williamson (2012) argue that these students classified as generation 1.5 still need support with regards for their learning.

The following sections of this introduction comprise further details of the context of this study; its rationale, including researcher positionality; research significance; aims and questions; and approach. This is followed by an outline of the structure of this thesis.

## 1.2 Context of the Study

### 1.2.1 The Demographics of Australia – Why EAL?

**Figure 1** Percentage of Overseas-Born Population of Australia

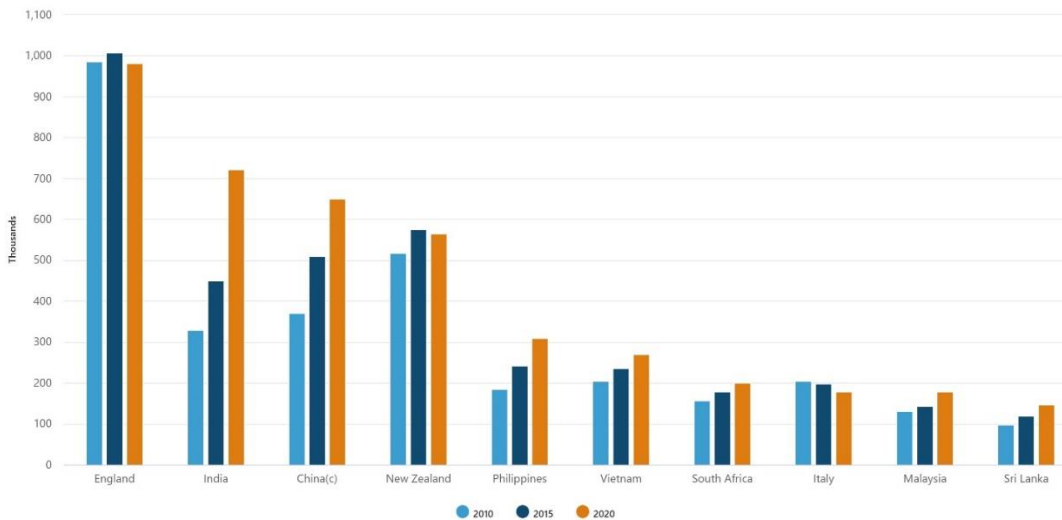


Note. Adapted from Australian Bureau of Statistics (2022, June 20). *Graph 1.1 Percentage of overseas-born, Australia – at 30 June 1891 – 2020 (a)(b)*.

<https://www.abs.gov.au/statistics/people/population/migration-australia/latest-release#state-and-territory-populations-by-country-of-birth>

**Figure 2** Overseas-Born – Top 10 Countries of Birth, Australia – on 30 June – 2010, 2015 and 2020

Graph 1.3 Overseas-born - top 10 countries of birth, Australia - at 30 June - 2010, 2015 and 2020(a)(b)



Note. Adapted from Australian Bureau of Statistics (2022, June 22). *Graph 1.3 Overseas-born – top 10 countries of birth, Australia – at 30 June – 2010, 2015 and 2020 (a)(b)*.

<https://www.abs.gov.au/statistics/people/population/migration-australia/latest-release#state-and-territory-populations-by-country-of-birth>

Australia is one of the most culturally diverse countries in the world with 29.8% of the population being born overseas in 2020, as seen in Figure 1 (Australian Bureau of Statistics, 2021a). In 2019, it was ranked second in countries with the highest foreign-born population (Organisation for Economic Co-Operation and Development (OECD), 2023). Australia continues to welcome new arrivals. During the year ending in June, 2020 Australia's population increased by 194,400 people due to net overseas migration (Australian Bureau of Statistics, 2021b). Furthermore, the national language of eight out of the top ten source countries was not English, as seen in Figure 2. Furthermore, regarding this research study's context of school education, 6% of the total people who migrated from 2014 to 2015, were children (Department of Immigration and Border Protection, 2015). In addition to immigration, the First Nations people also contribute to Australia's language diversity. Whilst most First Nations people speak English in Australia, it is an additional language for a significant portion of the population. Data from the Australian Council of TESOL Associations (ACTA) estimates that there were 27,329 Indigenous EAL/D learners in government and catholic school in Australia in 2021 (Holroyd, 2021). Whilst we acknowledge the need to provide further support for Indigenous EAL/D learners, this thesis focuses on supporting EAL students who have the immigrated to Australia. The strategies identified can be used to support Indigenous EAL/D learners, but the data collected focused on supporting immigrated students who spoke a language other than English.

In 2021, 149,958 out of 222,137 students in Victorian government schools did not speak mainly English at home. This makes up 68% of the student population in Victorian government schools. Whilst this does not constitute as language backgrounds other than English, the Victorian Department of Education and Training webpage (Department of Education and Training, 2014), revealed that in 2013, 27% of the student population is from language backgrounds other than

English. These statistics are also represented at a national level. The article “Hope and challenges in the Australian Curriculum: Implications for EAL students and their teacher”, states that 20–25% of students in Australian schools are EAL students (Hammond, 2012, p. 224). With the increased migration to Australia, the current EAL student population continues to grow. Therefore, the issue of providing an inclusive environment to EAL students continues to be relevant in Australia.

Hammond (2012) also states that EAL students are no longer a minority and that their presence at school is considered mainstream. She argues that instead of delegating the responsibility of teaching EAL students to specialist EAL teachers, mainstream teachers should also be educated and trained in teaching EAL students (p. 223). With the increase in EAL students, most teachers will work with EAL students at some point and thus should be well equipped.

Furthermore, even if students are withdrawn from mainstream classes, they will eventually return once they have a basic understanding of the English language, and mainstream teachers will be responsible for teaching content to these students. Thus, as Hammond points out, there is a significant need for mainstream teachers to be able to “understand the diverse linguistic and cultural background of these (EAL) students, their educational needs, and ways of addressing these needs” (Hammond, 2012, p. 224).

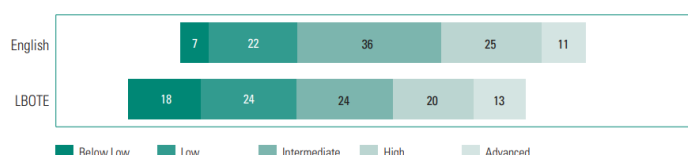
### *1.2.2 Student Results in Science – Why Science and EAL?*

The need for further research for supporting EAL students is highlighted by research conducted by the Australian Council for Educational Research Ltd (ACER) (Thomson et al., 2012), as seen in Figure 1. The ACER research included a test for Year 8 students, which consisted of earth science, biology, and physics questions. The results found that 18% of LBOTE students did not even reach the lower benchmark, while for students from an English-speaking background, this figure drops to 7% (Thomson et al., 2012, p. 57). This demonstrates that further support needs to be



provided for LBOTE students. Furthermore, the research also shows that 13% of LBOTE students reached the advanced benchmark compared to 11% of native English-speaking students. This demonstrates that LBOTE students can achieve higher levels with proper support.

**Figure 3** Percentages of Australian Students at the International Benchmarks for Science in Year 8 by Language Background in 2011



Note. Percentage of Australian students at international benchmarks for year 8 science in 2011, demonstrating the higher percentage of LBOTE students in the below low band. Adapted from Thomson, S., Hillman, K., & Wernert, N. (2012). *Monitoring Australian Year 8 student achievement internationally: TIMSS 2011*. Australian Council for Educational Research.

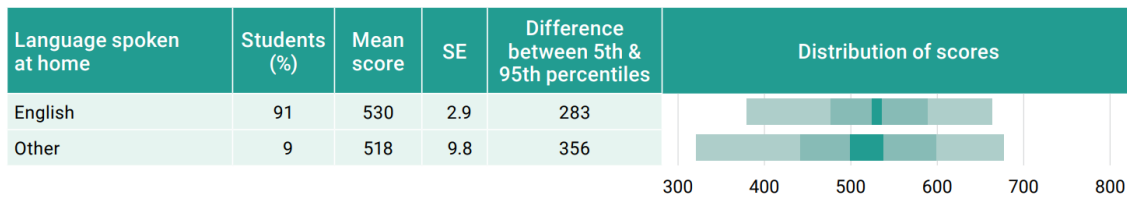
In the 2015 TIMSS data (Thomson et al., 2016), the difference in results between students who spoke English at home and those who spoke a language other than English was still evident, as seen in Figure 4. The table shows that 70% of the students who spoke English at home achieved the benchmark, which is the proficient standard for Australia. However, only 59% of the students who spoke a language other than English achieved the benchmark.

**Figure 4** Percentages of Australian Students at the International Benchmarks for Science in Year 8 in 2015, by Language Background

Language spoken at home	% of students	Mean	SE	Gap 95th–5th percentiles	Performance at each of the TIMSS international benchmarks				
					Below Low	Low	Intermediate	High	Advanced
English	93	514	2.4	263	8	22	36	26	7
Other	7	498	8.6	317	18	22	25	25	9

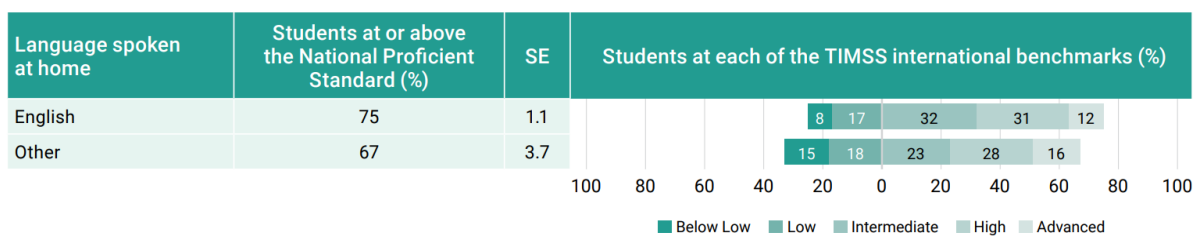
Note. Percentages of Australian students at the international benchmarks for year 8 science in 2015, demonstrating the higher percentage of LBOTE at the below low band. Adapted from Thomson, S., Wernert, N., O’Grady, E., & Rodrigues, S. (2016). *TIMSS 2015 - The first look at Australia's results*. Australian Council for Educational Research.

**Figure 5** Mean Scores and Distribution of Year 8 Science Achievement within Australia in 2019, by Language Spoken at Home



Note. Mean scores and distribution of Year 8 students' science achievement in 2019 demonstrating that greater number of LBOTE students were in the lower band and LBOTE students had a lower mean score. Adapted from Thomson, S., Wernert, N., Rodrigues, S. & O'Grady, E. (2020). *TIMSS 2019 Australia, Volume I: Student Performance*. Australian Council for Educational Research.

**Figure 6** Percentages of Australian Students at the International Benchmarks for Year 8 Science and Proportions of Students who Attained the National Proficient Standard by Language Spoken at Home



Due to rounding, some results may appear inconsistent.

Note. Percentage of Australian students at the international benchmarks for year 8 science in 2019, demonstrating that a higher percentage of LBOTE students were in the below level band of achievement. Adapted from Thomson, S., Wernert, N., Rodrigues, S. & O'Grady, E. (2020). *TIMSS 2019 Australia, Volume I: Student Performance*. Australian Council for Educational Research.

Continuing the patterns seen in the 2011 and 2015 data, figures 3 to 6 demonstrate that a significantly higher portion of LBOTE students scored in the lower quintile in the science achievement tests. These figures also show that there are students from LBOTE that can score higher than native English-speaking students. This phenomena has been addressed in some research (Creagh, 2014; Williamson, 2012) but is not widely discussed. In relation to students classified as LBOTE students in Australia, there is a significant variation in their ability. Some LBOTE students have had a significantly higher amount of schooling in English compared to others.

Additionally, some LBOTE students who are not classified as EAL students may require more support due to interrupted or an insufficient amount of schooling. In relation to such students, Creagh (2014) argues that a significant portion of Australia's most disadvantaged students are not being supported in their science knowledge. This statement is supported by the TIMSS data in figures 1 to 4 and emphasises the need to ensure adequate support for LBOTE students studying science subjects.

### *1.2.3 Department of Education and Training (DET) Programs*

To begin with, newly arrived students spend six to 12 months in a new arrival program, in educational contexts such as Metropolitan English language schools and centres, regional English language programs, outpost programs, visiting programs, isolated EAL student support programs and EAL online pilot programs. However, students have to enrol within six months of arrival, or within 18 months arrival for pre-school students. Permanent resident/refugee students are entitled to a 12-month program and temporary/international fee-paying students have a six-month program. Following this process, the students are enrolled in mainstream schools. Therefore, students may have to carry out their education in the mainstream setting regardless of whether or not they are adequately equipped for learning in mainstream settings.

Data from the 2014 Australian census was used to determine funding for 2015 EAL programs in mainstream schools. Factors considered were whether the students were classified as EAL under the DET definition and if they attracted student resource package funding. However, according to the EAL in Victorian government schools 2015 report (Victorian Curriculum and Assessment Authority (VCAA), 2015), out of the 153,227 students that were identified as being LBOTE, only 54,651 (35.67%) met the criteria to receive EAL index funding in a mainstream school, which begs the question: why were the remaining students not included? There is no guarantee

that the students who did not receive funding were at an adequate level of English knowledge to learn effectively in a mainstream classroom without support, resulting in some students who did not receive funding being expected to maintain the pace with mainstream students. Once again, this is supported by figures 1 to 5, which demonstrate that some LBOTE students are thriving whilst others are having difficulty staying on par with English-speaking students. This variety among LBOTE students was also evident during my teaching placement experiences and my teaching at the school I am employed at, where some students were lacking English skills but were not receiving any extra support.

Some methods of support that are currently in place for EAL students at mainstream schools include timetabled EAL classes taught by specialist EAL teachers; in-class support; withdrawal from a class followed by small group teaching; withdrawal from class followed by one-on-one support; and team teaching by an EAL and mainstream teacher (Department of Education and Training, 2015). Other strategies recommended in the DET EAL handbook include team teaching, flexible groupings, and specialist programs. There are also recommendations for collaborative planning, where an EAL teacher and a team of subject teachers work together to plan a unit to ensure that both the EAL teacher and subject teachers work towards the same goals. Team teaching is a process where the classroom teacher and EAL teacher share responsibility for assessing, planning, and teaching (Buckley, 2000). It is recommended when students are learning new information or carrying out new tasks.

Similarly, parallel teaching is recommended for EAL students starting a new unit when they may need to learn new vocabulary and concepts. Parallel teaching is where both the classroom teacher and EAL teacher present the same content, but the EAL teacher teaches EAL students, and the classroom teacher teaches the mainstream students (Buckley, 2000). Other strategies include

similar-needs classes where classes are organised in response to particular EAL needs, such as when they need to focus on a language that needs more practice. The DET handbook also recommends offering EAL as an elective subject on the school timetable, which will provide targeted help to EAL students. However, the document acknowledges that most of EAL learners' school time will be spent in mainstream classes. Therefore, the mainstream teacher will be responsible for ensuring EAL learners' needs are met in their day-to-day school life. They suggest that in such situations, it will be beneficial if EAL teachers can assist the mainstream teachers in developing programs and teaching some lessons. However, there may be challenges when teachers from different faculties teach the same class. This will be discussed further in the literature review and the case study covered in Chapter 8.

#### *1.2.4 School Dynamics and Collaboration Required*

##### *Collaborations between Biology Teachers and EAL Teachers.*

From 1 January to 31 December 2020, Victorian government schools enrolled 3608 newly arrived EAL students, despite the limitations on travel due to the COVID-19 pandemic (Department of Education and Training, 2021d). As EAL students continue to be integrated into mainstream classes, collaborations between subject teachers and EAL teachers are encouraged to ensure that EAL students' learning needs are being met. Huang (2004) argues that it is impossible to have classrooms that teach “content” without teaching “language”, at least implicitly. However, the degree of explicitness depends on the teacher's experience and conscious effort to make the integration between language and content explicit for students. For example, when teaching science, teachers are already automatically providing information on how to put together workable science sentences and paragraphs; how to combine terms and meanings; and how to speak, argue, analyse and write science. However, there may be many reasons why some teachers

are uncomfortable explicitly teaching EAL students. In addition to proper training, mainstream teachers suggested “some little strategies” (Haworth, 2009, p. 2190) are needed as a starting point for teaching EAL students. Therefore, this suggests that subject teachers will benefit from someone with experience in the particular field of teaching EAL students.

Arkoudis (2003) describes an EAL teacher's role and qualifications as someone who knows first and second language development and knows relevant language teaching methodologies. EAL teachers can offer mainstream or subject teachers an understanding of the demands of studying a second language. EAL teachers can take the required content and analyse the language that students need to learn for the topic, how they can structure their writing about the topic, and the key vocabulary they need to know in addition to the use and functions of the language taught. Arkoudis (2003) states that this may mean that the subject content is not prioritised as much as the language by EAL teachers. In comparison, mainstream teachers prioritise science language central to the scientific discourse and the content. This may cause challenges between EAL teachers and mainstream teachers, as explained in the following sections.

#### The Organisation of EAL Staff.

Within schools, the staff are organised according to subject disciplines. In addition to the subjects being taught, most of the social interactions, the professional identity and community will be formed among these groups. Members of a group will be a collective community that provides instructional help for one another and turn to each other for assistance (Arkoudis, 2003). Therefore, it can be challenging for members from different disciplines to work together and negotiate their teaching.

## Power Imbalance.

Another challenge teachers may face when collaborating is possible power imbalances (Turner, 2015). DelliCarpini and Alonso (2014) point out how EAL teachers are frequently marginalised and have lower status in schools than mainstream subject teachers. Due to this suggested status imbalance, it may be challenging for meaningful collaboration to occur due to an EAL teacher's lack of authority over the class. The article states how English language educators are at times reduced to the status of helpers rather than teachers. The lower status of EAL teachers was identified by Arkoudis (2003), who analysed interview transcripts with teachers and found there was a power imbalance between EAL and mainstream teachers. Because mainstream subject teachers are responsible for specific content, there is a higher priority placed on mainstream teachers. Thus, mainstream science teachers who are responsible for teaching the science curriculum to their classes may consider their content knowledge takes priority in favour of EAL teachers' goals. The conflicts in goal priorities can lead to challenges in collaboration. Nevertheless, there are stories of success (Nguyen, 2021; Sutherland, 2021) where teachers work well together and communicate effectively with each other to establish a successful collaboration and support student learning.

## Collaboration between EAL and Mainstream Teachers.

As stated by Hammond (2014), mainstream teachers who are required to teach EAL students would ideally have the following:

- A theoretical understanding of the nature of language and literacy (including theoretical understandings of the interrelationship between text and context and implications of this relationship for students' developing control of discipline-specific academic registers).

- Knowledge of different text types, including their predictable patterns of text organisation, paragraph structure, and cohesion.
- Knowledge of the relationship between spoken and written modes of language.
- Knowledge of strategies for intensive and extensive reading.
- Knowledge of grammar and the kinds of grammatical features characterising specific text types.
- Knowledge of vocabulary, especially technical vocabulary that facilitates understanding and discussion of specific scientific concepts.
- Knowledge of the alphabet, spelling, and punctuation.

However, for teachers who have not received any specialised EAL teaching, this may be challenging, demonstrating the importance and value of mainstream teachers working with EAL teachers to establish strategies and techniques and gain experience.

The need for communication between EAL and mainstream teachers is also highlighted in an example of research by Huang (2004). Two interviewees were quoted as saying the following:

Is John your student? He can't follow in my class. His lab report is so poorly written.

He needs your help. (A secondary school science teacher talking to an ESL teacher about an ESL student)

I am an ESL teacher. I can teach you how to write in English, but not a lab report. (A secondary school ESL teacher talking to an ESL student who has trouble doing his lab report assigned by his science teacher). (Huang, 2004, p. 97).



Huang's example demonstrates how a lack of communication between EAL teachers and mainstream teachers can negatively affect EAL students. Nevertheless, various studies (Nguyen, 2021; Sutherland, 2021) have observed how teachers can collaborate successfully to provide a better student learning experience.

Arkoudis (2005) discussed how an EAL teacher successfully collaborated with a science teacher by not challenging his authority over the science curriculum but rather offering suggestions for teaching. Furthermore, the authors note that activity-based tasks such as experiments resulted in easier collaboration. This is attributed to the teachers focusing on a particular task, meaning they can voice their opinions because they are locating their identities within teaching by working on the same platform and facilitating meaningful discussions. This is supported by another study by DelliCarpini and Alonso (2014), where the teachers noted that within successfully collaborating teaching teams, there was an increased partnership, reduced isolation, and increased efficiency and effectiveness among students. It was also noted that the teachers who shared responsibilities enhanced their ability to reflect on practice and learn from colleagues, supporting them to engage in a continuous improvement cycle.

Another added benefit for mainstream teachers working with EAL teachers is that they will be more aware of the language they use. For example, the study by DelliCarpini and Alonso (2014) describes a scenario where the teacher used the word "diagonal" in maths. An EAL student was confused by the word until they were informed that the word had two meanings. Arkoudis (2003) also supports this by stating that EAL teachers can teach language components that specialist subject teachers may not be aware of, impeding their teaching and the student's progress in that subject.

## 1.3 Rationale for the Research

### 1.3.1 *Researcher Positionality*

I migrated from Sri Lanka to Canada in Grade 4. I was 10 years old and unlike most migrant children, I had a background in English because I had studied English as a second language in Sri Lanka. Despite my exposure to English, I remember the difficulties I had fitting in with my classmates and understanding the colloquial language used by teachers and classmates. Similarly, I remember learning various science concepts, such as how the heart and the digestive system work, using rote learning techniques. This meant copying the diagrams of the heart and labelling them, followed by memorising the various functions and processes. After migrating to Australia and becoming more fluent in English, I noticed that the same topics made more sense because I was more confident with English. This meant there was less memorising and more understanding of the concepts. So, as I progressed through my science education, I prioritised understanding the content in favour of simply memorising concepts. However, I remember the challenges I faced in understanding the concepts when I was not fluent in English.

I first considered this research topic after completing placements at two schools with a high ratio of EAL students to mainstream students. I noticed that some teachers were well equipped to consider the needs of EAL students and differentiated content by providing them with many opportunities to develop their literacy skills concerning English and science. By doing so, more EAL students participated and contributed by providing examples and actively asking for help in classes. In contrast, some teachers lacked sufficient training and resources to provide students with such learning opportunities. As a result, they were likely to provide the students with busy work and were less likely to interact with the EAL students. The EAL students were also less likely to participate and contribute during such classes. Following this and noticing the

significant differences, I became very interested in what could be done to support EAL students in their learning and teachers in their teaching.

The first research project I completed on this topic was a master's research project, which contributed to my master's degree by coursework. Whilst I was interested in a whole-school approach to supporting the learning of EAL students in the VCE subject of biology, this topic was far too broad for a 10,000-word project. Therefore, I decided to focus on one aspect that influenced EAL students' learning, which was the impact of explicitly teaching and learning biology terminology/specific vocabulary. My research and literature reviews demonstrated that learning vocabulary was only a minor factor compared to integrating EAL students in mainstream classes and promoting them to learn the language through the content (DelliCarpini & Alonso, 2014). This work was published in the *Teaching Science* journal (Fernando & Cooper, 2017). Therefore, for my PhD topic, I wanted to expand my frame to biology as a VCE subject and look at various bigger picture factors that can affect student learning, including a look at policies and resources and working with teachers involved in EAL student support and their perspectives. The overarching research question for this thesis is: What are the current supports in place for EAL students studying VCE biology?

### 1.3.2 Why Biology?

Biology was chosen by narrowing down from STEM subjects to science literacy to focus on one subject that promotes science literacy. Whilst some authors have definitions that overlap the two terms, *scientific literacy* and *science literacy* (Fisher et al., 2009; Schielke, 2013), others argue they are distinctly different. Cavagnetto (2010) discusses how scientific literacy requires more than applying the knowledge of science components constructed in science classrooms; it is a complex process that requires the individual to interpret and construct science-based ideas and requires

and develops metacognition and critical reasoning. Science literacy focuses on science knowledge (Drummond & Fischhoff, 2017). In particular, the knowledge demonstrated at school and reflected in students' achievement at school (Fisher et al., 2009). Mailer (2014) refers to the ability to read and understand science literature in addition to interpreting and producing texts using vocabulary, symbols, and diagrams. While it is acknowledged that language plays a crucial role in scientific literacy (Cavagnetto, 2010), and one needs a certain foundation of science literacy to be scientifically literate, my research focuses on how to promote science literacy. This is because science literacy will lead to the individual applying the science knowledge to personal and societal issues, which will result in scientific literacy (Cavagnetto, 2010). Furthermore, while all science subjects promote scientific literacy, formal and summative assessment will assess science literacy. In Victoria, science literacy is assessed through various subject such as chemistry, biology, physics, and psychology in the end of year 12 VCE summative assessments.

Out of various science subjects, biology was chosen for this thesis because it can be considered as a separate language with its own vocabulary. The complex vocabulary and language can increase the difficulties faced when EAL students are already struggling with English. The challenges of biology are present across EAL and mainstream students, which is evident in the participation rates of students undertaking biology in VCE. Whilst there is limited research on the recent percentages of LBOTE or EAL students carrying out biology, Kennedy et al. (2014) revealed that the participation rate in biology fell by 10% from 1992 to 2012. However, they found that biology still had the highest participation rate out of all of the traditional sciences. The high participation rate can be attributed to students' belief that subjects such as biology should be chosen when pursuing a tertiary education pathway to maximise their final university entrance score (Goodrum et al., 2012). However, students studying biology had concerns that "the language

is difficult” (Choi & Slaughter, 2021, p. 95). This is further supported in the research by Kristian (2015), who highlight the need for literacy proficiency across various subjects such as VCE biology. For example, Kristian highlights that the 2014 exam had 41 pages, and I can confirm that the 2021 paper had 39 pages the students must read, interpret and respond to. The literacy requirements of content subjects such as biology are significantly more onerous because “reading and writing is far from trivial, requiring knowledge of and competency in using an extensive, specialised vocabulary” (Kristian, 2015, p. 2). Study by Cruz Neri et al. (2021) revealed that there was a strong link between students’ reading comprehension and word count on science performance. They concluded that reading comprehension was crucial for science performance. Therefore, this compounds the challenges that EAL students will face in a content filled subject such as biology.

### *1.3.3 Why VCE Level?*

The Victorian Certificate of Education (VCE) is the qualification completed in high school for university entry (Victorian Curriculum and Assessment Authority (VCAA), 2017b). Students (usually aged 16–18 years) complete internal and external assessments to receive a scaled study score for each subject. All subject scores are combined to provide a rank that tertiary institutions use in their application process. VCE is generally completed over two years. One VCE subject consists of four units. In most cases, units one and two are completed in Year 11 and units three and four are completed in Year 12. However, there are options for acceleration, for students to complete units one and two in year 10 and unit three and four in Year 11. Students are expected to complete four subjects and thus receive 16 credits. However, most students will carry out at least 12 units in Year 11 (six subjects) and ten units in Year 12 (five subjects), which includes the compulsory four English units.

There are five science subjects in the VCE: Biology, Chemistry, Environmental Science, Physics and Psychology. Students may elect to take none, one or more of these. Each is offered at the year 11 and year 12 levels; however, the year 11 units are not prerequisites for the year 12 subjects. While many university courses recommend that students complete a science subject at year 12 level, only Biology, Chemistry and Physics are ever listed explicitly by any Victorian tertiary institution as a prerequisite for entry into any of their courses. (Murphy, 2020, p. 1607)

Whilst all science subjects consist of a significant amount of content, biology has the most language demands. As discussed in the biology section in this chapter, biology continues to be one of the most popular sciences in VCE. I wanted to focus on the VCE years of biology because there has been insufficient research studying this topic. Secondly, the VCE years are the last two years of a student's high school education and can significantly impact their prospects. Therefore, it is crucial to ensure that students are well supported during this time. According to the VCAA, a significant number of students from language backgrounds other than English are currently in Victorian secondary school classrooms, and this number is only increasing. In Victoria, in 2020, 67.65% of students in government schools were from language backgrounds other than English (Department of Education and Training, 2021a).

#### *1.3.4 Why Various Perspectives?*

Finally, from my past experiences and research, it was evident that multiple groups contributed to EAL students' learning. Oliver et al. (2009) consider stakeholders such as students, parent/caregivers, principal teams, EAL teachers, mainstream teachers, Multicultural Education Aides (MEA staff), language school centre staff, migrant resource centre staff and EAL resource centre staff. Whilst this list is rather extensive, the state government of Victoria takes into

consideration and addresses EAL teachers, leading teachers, and mainstream teachers to support EAL students (Macer & Nicholson, 2014). To obtain a complete picture of the support for EAL students, the stakeholders identified by the government were identified as the voices to be considered. A positive school dynamic and collaboration needs to be supported, as discussed in section 1.2.4, to ensure that EAL students are receiving the necessary support. Thus, to provide a holistic approach to supporting EAL students in their biology content learning, the various stakeholders need to be considered. The information and guidelines for the various staff was provided through various policy documents such as government reports, websites and curriculum guidelines and provisions. Therefore, a policy review was conducted using the policy documents to provide the Victorian government perspective. This also gave an overview of the various staff and their responsibilities in addition to analysing how various stakeholders can work collaboratively. Due to limitations of time and the impact of COVID, I was unable to interview students and obtain student data. However, I used my experiences as a former EAL student and utilised the autoethnography method to provide student data in that manner. Therefore, my research will consider how to support EAL students in their biology learning using the following perspectives: students (autoethnography), government (policy review) and teachers (case study).

#### 1.4 Significance of this Study

The significance of this study is apparent from Australia's migration statistics. For South-Eastern Victoria, there were 1,793 new arrivals in 2015 (English as an Additional Language (EAL) Companion to AusVELS, 2015). Despite COVID limiting travels, in 2020, there were 1016 new EAL arrivals in South-Eastern Victoria (Department of Education and Training, 2020a). There were 1206 students who were eligible for EAL funding in 202 (Department of Education and Training, 2020a). The high number of LBOTE students in VCE subjects (Department of Education and Training,

2021a) and the results discussed previously for Year 8 science scores (Thomson et al., 2012; Thomson et al., 2016; Thomson et al., 2020) emphasise the significance and the relevance of this study. Steps need to be taken to improve the percentage of EAL students who reach the higher benchmark. Furthermore, while the government publications suggest how to cater for EAL students, the implementation can be challenging. This research hopes to identify methods and strategies to better support EAL students and present a model for how aspects of system knowledge, teaching practice and collaboration of different stakeholders can combine to support EAL students' learning in biology.

### 1.5 Research Aim and Research Questions

This research aims to identify what is currently available and what can be done to better support EAL students studying biology, their mainstream teachers, parents, Multicultural Education Aides (MEA) staff and leadership teams. This will include identifying what strategies they implement and identifying what factors will enable the stakeholders to provide better support. Two schools with high EAL populations, the biology teachers from these schools, my own experiences, and policy documents will be used to address these stakeholders and understand their perspectives.

Research Question:

What are the current supports in place for EAL students studying VCE biology?

Sub-Questions:

How have my experiences as an EAL biology student influenced how I understand and appreciate biology learning by EAL students as a teacher? (**Publication 1 – Published**) (Fernando et al., 2021)



What support materials and strategies are available for teaching biology to support EAL students, and how are these promoted and made available by the Victorian DET? (**Publication 2 – Submitted – Under Review**)

How do mainstream teachers currently support EAL students in their biology classes, and what support would enable more mainstream biology teachers to provide better support for EAL students in their biology classes? (**Publication 3 – Submitted – Under Review**)

**Table 1** A Summary of the Sub-Research Questions and the Linking Publications

Research Questions	Title of Article	Publication and Journals	Method and Data	Methodology	Analysis
How have my experiences as an EAL biology student influenced how I understand and appreciate biology learning by EAL students as a teacher?	Mapping a Language(s) Journey in Science; From Learning Biology to Teaching Biology: An Autoethnography	The Qualitative Report  <i>Published</i>	Autoethnography  Student perspective  (Informs and complements the research by situating me within the thesis)	Phenomenology	Personal journals, photographs, and artefacts were collected by talking to family members and carrying out self-reflection (Chang, 2008)
What policies and support materials are provided by the government of Victoria to support teaching biology to EAL students, and how are	Great divide; Exploring the chasm between Victorian EAL policies in schools and teacher practices using Bronfenbrenner's	Language Policy Journal  <i>Submitted: Currently Under review</i>	Document analysis  Government/Policy perspective  Eight documents and four policies in	Policy Review	Framework (Jie, 2016) was used to look at how various stakeholders interact with the policy, and these findings were compared to 10 countries that have similar LBOTE

these interpreted by mainstream teachers to support EAL students in secondary schools in Victoria?	ecological lens.		regard to EAL support		demographics to Australia
How do mainstream teachers currently support EAL students in their biology classes, and what support would enable more mainstream biology teachers to provide better support for EAL students in their biology classes?	Teachers supporting EAL learners in mainstream biology classrooms: understanding learners and the system is the path to success	Asia-Pacific Forum on Science Learning and Teaching  <i>Submitted: Currently under review</i>	Semi-structured interview  Mainstream teacher perspective  Four teachers from 2 schools with a high percentage of students from Language Backgrounds Other than English (LBOTE)	Case study	Semi-structured interviews were completed by first conducting exploratory focus group interviews followed by individual interviews with ongoing transcription and analysis (Turner, 2010)

## 1.6 Research Approach

An exploratory research method was used to identify what is currently in place to support EAL students. This combined various qualitative methods to look at the different stakeholders involved in supporting EAL students with science and biology learning (Swedberg, 2020). These stakeholders are students, governments, and mainstream biology teachers. Each stakeholder is

used to respond to the sub-questions for the study, and their data are presented in separate articles. The themes from the three articles are used to answer the overarching research question and identify major themes across the different stakeholders. As the participants and the sub-questions vary, different methods are employed in each article. An overview of each design element for each article is summarised in Table 1.

## 1.7 Thesis Structure

This thesis is a thesis including published works. Therefore, the chapters 5, 6 and 7 comprise published works and journal articles under review that answer my research questions from different perspectives. These articles/chapters are framed through chapter summaries that include and link the research, theoretical frameworks, and concepts. These are followed by the discussion and conclusion chapters.

The three results chapters (Chapter 5, 6, and 7) that consisted of published and unpublished articles included a detailed chapter summary. Each of the summaries consisted of a table that presented how the findings of the chapter contributed to the overarching thesis. Within the table, each idea that contributed to a specific manifestation of Bourdieu's cultural capital was colour coded. The consistent colour code was used throughout the thesis to demonstrate how the findings of each article contributed to Bourdieu's (Bourdieu, 1986) cultural capital manifestations of embodied (blue), objectified (orange) and institutionalised (grey). As the discussion section explores the overarching research question of the thesis within the cultural capital manifestations, the colours are used to reveal how all the manifestations combine to provide the overall support system for EAL students studying VCE biology.

Table 1 outlines the structure for this thesis. Due to the publications and following the format of a thesis including published works, some concepts or quotes may be repeated to ensure

that the thesis flows comprehensively. Every effort has been taken to minimise the repetition and provide a succinct overview of the research undertaken.

## 1.8 Chapter 1 Summary

This chapter has outlined the main elements of this research study. The contextualisation of the study has been provided inclusive of an understanding of the Australian context. An overview of the nature and scope of the research, significance, research design and research questions were presented. This chapter concluded with the structure of the thesis. The next chapter presents an overarching general literature review that underpins the three publications and discussion chapters.

## Chapter 2: Literature Review

### 2.1 Introduction

This literature review establishes the basic foundation for this thesis. It examines the literature related to the topic and thereby provides a background of EAL research, in addition to explaining the range of prominent theories that have been developed in relation to EAL support. This review will also discuss the history of EAL in Australia and research linked to learning language and biology/science content. This will be followed by a discussion and review of literature that studies the relationship between language learning and science and how the two subjects can work in conjunction with each other.

### 2.2 Background of EAL in Australia

Australia began as a British colony that consisted of convicts and free settlers. As the 19<sup>th</sup> century progressed, other groups, such as Chinese immigrants, arrived during the gold rush in the 1840s. As it progressed towards the end of the 19<sup>th</sup> century, the population of Australia primarily consisted of British people and 20% of people born overseas with Chinese, South Sea Islands and Afghan backgrounds (Cox, 2015). Furthermore, prior to colonisation by the British, the First Nations of Australia spoke over 250 languages that were not English (Reconciliation Australia, 2019). English only became the primary language of Australia because of colonisation. First Nations people didn't disappear, they are still part of the population as are some of their languages. These languages also contribute to the number of students who are EAL. As the British continued to colonise Australia, they required more people to assist in its development. Therefore, several immigration schemes were implemented to increase the population during that time. Some authors suggest that these immigration policies were based on the “maintenance of British hegemony and white domination; the strengthening of Australia economically and militarily and

the state control of these processes” (Jupp, 2007, p. 6). Nevertheless, while more immigration was sourced from Northern Europe the population continued to be primarily monocultural. This was in line with the “White Australia Policy”, which was in place during that time. This was taking place as assisted passage immigration was available, encouraging young families and women (Colic-Peisker, 2005). However, towards the end of World War II, there were many displaced people leading to post-war immigration, which significantly increased the population. As a result, the new wave of immigrants consisted of a greater range of backgrounds than the previous immigration movement, including people from Mediterranean countries.

### *2.2.1 Early Post-World War II Period*

The roots of EAL education can be attributed to post-war immigration. As a result of World War II, the mutual sentiment was to “Populate or Perish”. Thus, the assisted migration schemes were further extended to increase Australia’s population. During this peak immigration during the post-World War II period, a significant portion of the immigrants were non-European who required English support to settle in and thrive in Australia. Despite this, views such as monolingual English Only and the need to have a single culture without pluralism remained dominant in policy and pedagogy.

The initial versions of EAL support programs were developed when the number of non-English speaking immigrants was significantly high. At this point, the government provided two levels of English language support: the Adult Migrant Education Program (AMEP) and the Child Migrant Education program. The AMEP program was established first and aimed to be pragmatic and assimilation-oriented (Ozolins & Clyne, 2001). Theoretical underpinnings behind this traditional language teaching were that language learning consisted of lexis and structures as building blocks, and that language learning was grounded in behaviourism.

### *2.2.2 The Mid 1960s – Mid-1980s*

Compared to the AMEP, migrant children were considered Australian children once they enrolled in an Australian school. This meant that they were taught as mainstream students once enrolled at a school and thus received their teaching in English within the school curriculum. This continued until 1971, when the Child Migrant Education Program (CMEP) was established (Lo Bianco, 2002; Lowes, 2004; Ozolins & Clyne, 2001). It was similar to the AMEP as it was supported and funded by the government and led to the distinction between mainstream teachers and EAL teachers. While this distinction ensured that EAL students received targeted support from qualified individuals, the funding model resulted in EAL teachers having reduced rights in terms of their employment (Oliver, Rochecouste, et al., 2017).

The program consisted of two separate funded programs by the government. These programs were the New Arrivals Program and Multicultural Education program. Versions of these programs continue to be used to support EAL students. However, as a reflection of the attitude during that time, the programs were designed to address the shortfalls of multilingual students. This contrasts heavily with the current impression of EAL learning as a celebration of diversity. At this stage, students were considered eligible (determined by their school) if they were born overseas in a non-English-speaking country and had at least one parent born in a non-English-speaking country. While this did provide support for a large number of students, the current policy, as discussed later, considers EAL students' factors and circumstances.

While the new arrivals program continued, funding for the Multicultural Education program was discontinued in 1986. Consequently, the role of supporting LBOTE students who were not newly arrived migrants or refugees was allocated to schools. From here, the primary shift with students continued to be the importance of English language learning and the promotion of

English literacy. By comparison, the situational method used with adults in the AMEP program incorporated the mother tongue to support English language learning.

As the field of TESOL and second language acquisition continued to develop, teaching practice shifted towards learner-centred, needs-based, and proficiency-focused. By the mid-1980s, practice had evolved from developing linguistic competence to developing communicative competence (Ingram, 2003, p. 2).

### *2.2.3 The Late 1980s to 2000s*

The National Policy on Languages was revised and renamed the Australian Language and Literacy Policy in 1991. This program allowed 510 hours for adult migrants to ensure that their English level was at a standard where they could integrate successfully within the community and meet their vocational needs (Burns & de Silva Joyce, 2007; Lowes, 2004; Piller & Takahashi, 2011). Further allowances were made for younger adult migrants and anyone who had undergone certain trauma and difficulties. This program experienced a myriad of changes, such as changes in funding (Burns & de Silva Joyce, 2007), with skilled migrants partially funding their training, and the responsibility of adult education being transferred to Technical and Further Education (TAFE) institutions and other Recognised Training Organisations (RTOs) (Oliver, Rochecouste, et al., 2017).

For EAL student support during the same time, there was a focus on leading students towards the mainstream levels of English literacy. The pedagogy was governed by systemic functional linguistic theory (Halliday, 1994; Halliday & Hasan, 1989) and a genre-based approach was adapted to support EAL learning in adults and students (Feez, 1999). Furthermore, the band scales that led to the current progression levels and Developmental Continuum took place during this time. They were developed with input from practising EAL schoolteachers, which meant that it was more practice-based.



#### 2.2.4 *The 2000s*

As seen in the graph in Figure 1, the percentage of overseas-born people in Australia has increased progressively since 2000. Oliver, Rochecouste, et al. (2017) argue that despite the significant percentage of arrivals from non-English speaking countries, the EAL support has been overshadowed by various political agendas, with the fate of EAL support in contemporary Australian schools for and adult migrants in some states viewed as significantly insecure (Flohm, 2009).

Many changes in the late 1990s impacted the provisions of EAL. The federal funding for general EAL programs for immigrant school children ceased, and the funding of EAL programs was allocated only to newly arrived migrants. The responsibility for supporting EAL students 12 months post-arrival was allocated to state governments, with special considerations for students entering or re-entering schooling at any age or who experienced interrupted schooling, yet many students did not receive the necessary support.

While funding was allocated to EAL teaching, no specification was assigned to it. This meant that some states provided schools and principals with funds that could be used at the principals' discretion, resulting in funding for EAL teachers being threatened and EAL staff cuts taking place despite the increase in EAL students (Oliver, Rochecouste, et al., 2017). The lack of specificity in the allocation severely impacted the availability of EAL support in schools. EAL students who required targeted assistance were often merged into mainstream classrooms despite their lack of English proficiency.

Tucker (2011, August 6) discusses how some states progressed EAL students into mainstream classes after two terms of intensive English rather than three. The reduced duration of the intensive English program resulted in EAL students receiving any further support from

mainstream teachers who are not qualified in the fields of EAL support. The added responsibility placed on mainstream teachers highlights the importance of educating mainstream teachers on how to cater to the needs of EAL students. The introduction of assessments such as National Assessment Program – Literacy and Numeracy (NAPLAN) led to a greater focus on EAL students achieving the level of their mainstream peers as opposed to targeting their needs and considering the knowledge and experience they are already equipped with (Oliver, Rochecouste, et al., 2017).

The support provided by the government has continued to develop and evolve. Currently, there is significantly more consideration for the range of students who may need EAL support and a focus on additional language pedagogy. There is a more positive connotation associated with EAL students compared to the early years of EAL support development. This is demonstrated in the term itself of EAL as opposed to ESL. While some government documents from previous curricula and policies still classify students as ESL, this is rare, with many documents being regularly updated.

Current policy is based on more research and is reflective of more current teaching practices. The current policy allows a significant amount of freedom for schools and staff regarding the types of support provided along with the resources to be used to support students accordingly.

### 2.3 Theories Underpinning Language Learning

This section will discuss some of the prominent theories that address language learning. Some of the crucial key theorists include Stephen Krashen, Lev Vygotsky and Jim Cummins. These theories (Cummins, 1981; Krashen, 1987; Vygotsky, 1980) and their key messages are discussed to explore how language is learnt and how to support learning in current frameworks. These are applied to the research and used to analyse strategies that have been used to support EAL

students. I discuss the data and analyse the strategy considering the theorists and the prominent theories in the field. This assists in providing validity to the data and establishing trustworthiness in the findings of this thesis. Within each theory discussed, I extrapolate how the language learning theories can be applied and support language and biology learning in mainstream biology classes. Each section provides an overview of the theories and how they are relevant to this thesis.

### *2.3.1 Stephen Krashen's Hypotheses*

Krashen has five main hypotheses regarding learning an additional language (Krashen, 1987, 1988, 1989). They are explored because one crucial concept of my research question is that it addresses EAL students, which means I examine the subject of learning an additional language. The other aspect of my study, learning biology, is also addressed in Krashen's hypotheses because learning biology can be likened to learning another language. Thus, Krashen's hypotheses provide an opportunity to explore the acquisition of the language of English. By doing so, I extrapolate how it can also apply to acquiring the language of biology. Following an overview of each hypothesis, I link back to how it can be expanded to support biology learning in mainstream classes and be used by mainstream teachers.

#### **Acquisition-Learning Hypothesis.**

One of Krashen's hypotheses on acquisition-learning states that an additional language is developed during natural communication situations, but less focus is placed on grammatical forms. Krashen argues that language learning occurs when acquisition leads to subconscious internalisation, whereas rules lead to conscious learning, which is not as effective. Examples of subconscious internalisation take place when meaningful communication is initiated. Student-centred learning can promote acquisition-based learning because it takes place while the students subconsciously process information with the ultimate goal of leading their learning. An example of

the learned system is the use of formal instruction, which leads the learner to process the information consciously.

However, there are limitations when carrying out such communication when a speaker cannot communicate adequately in that language. Furthermore, authors such as Kobayashi (1996) argue that there is no clear distinction between learning and acquisition because there is an overlap between the two processes. Similarly, Gregg (1984) argues that while Krashen shows that learning does not need to precede acquisition, he does not disprove the idea that learning can become acquisition, which means that there is a possibility of an overlap between the two processes. Therefore, the role of both processes' learning, acquisition and interaction should be acknowledged, and will be further discussed later. The subconscious and conscious processes can be promoted to establish a foundation for further language development.

In Australian classrooms where English is the dominant second language for EAL learners, a natural acquisition environment occurs. However, in science classrooms, one of the challenges is that a significant amount of vocabulary specific to science learning is not always fully explained. EAL learners are exposed to and "acquire" the vocabulary of science learning or expressions but are often not sure of the definitions or applicability of the meanings. The acquisition is assumed but checking for depth of understanding by teachers who are not trained EAL teachers can be absent. As further discussed in Chapter 8, this can be attributed to the significant amount of content needed to be covered and the lack of time available for teachers. The acquisition-learning hypothesis emphasises the need to provide student-centred learning that will foster subconscious learning. It also reveals that learning opportunities need to be provided in conjunction with subconscious learning to ensure that students are building on the correct knowledge. In relation to

my study, the acquisition-learning hypothesis allows me to delve deeper into how mainstream teachers can balance the various aspects of acquisition-learning.

### **Natural Order Hypothesis.**

The natural order hypothesis identifies how learners follow a predictable order as they acquire language. Despite the predictable order, this hypothesis is different to the traditional views of language acquisition as a linear process. The natural order hypothesis argues that grammar is not teachable as teachers cannot control what students will naturally acquire in a specific order. However, in comparison with the traditional linear learning model, natural order hypothesis predicts that acquisition of grammar can be promoted through meaningful exposure to the language as opposed to explicit teaching of grammar. A range of research (Dulay & Burt, 1974; Fathman, 1975) states that the acquisition of grammar follows a natural order even during the acquisition of the language. Krashen rejects concern for grammatical sequencing when supporting and promoting language acquisition. Krashen argues that teaching the intricacies of grammar, such as analysis of language, formulating rules, setting irregularities apart and teaching complex facts about the target language, is just appreciation for the language instead of language teaching. However, if it is conducted in the targeted language, it can be used as a medium for the language input. This highlights the need to introduce language concepts that are relatively easy at first. This should then be followed by scaffolding on those language structures to allow students to build on their knowledge; for example, in the content that would include the understanding of keywords and action words that are then used to support students in decoding the content and understanding the concepts that are studied in science. However, in relation to EAL student support, mainstream teachers will need to provide the root structure for language as well as biology content knowledge. Nevertheless, strategies that initially provide students with the

foundation for their biology language structures and then use scaffolding to introduce the more difficult concepts will utilise the natural order hypothesis in biology learning of EAL students.

### Input Hypothesis.

The input hypothesis is focused on the acquisition aspect of learning an additional language. Krashen postulates that the learner improves and progresses along the natural order  $i$  (where  $i$  represents the current level of language proficiency) more effectively when they receive second language input one step ahead of their current stage of language competence. The article by Krashen (1989) states this as level  $i + 1$  where  $i$  represents the current level of language proficiency. However, Krashen argues that to have effective acquisition, one needs to ensure that the learner is provided with an input one level higher. However, this may be difficult as each learner will be at a different level. As such, it will be challenging to ensure that all learners are provided with input at the appropriate level. Therefore, Krashen proposes that natural communicative input should be incorporated in designing a syllabus. This will create more opportunities for learners to receive the “ $i+1$ ” input that will foster deeper acquisition.

This should be considered in regard to the classroom as well. While the learner can come into various inputs in terms of the target language, the intake will be the aspects used to construct sentences and build content in the target language. However, one should also consider the aspects of input as opposed to intake. A range of factors can determine the probability that information will become intake, and such elements can be internal, such as prior knowledge, or external, such as frequency of exposure. The learner must have a beginning comprehension of the language to convert the input to intake. Furthermore, a range of researchers such as Loup (1984), Gregg (1984) and Kobayashi (1996) argue about the feasibility of the hypothesis without a more transparent method of measurement of  $i$ , the learner’s current level proficiency, and the inability

to define the level of “i+1”. However, the concept of providing a learner with a level higher to promote deeper thinking has been acknowledged as an effective hypothesis.

In relation to incorporating the input hypothesis within mainstream science classes for EAL students, a very important aspect will be identifying the relevant input. Not only will the information have to be at the appropriate level for language ability and development, but it will also need to address the relevant science ability. To do so, teachers must regularly track students’ knowledge across the two areas. This can be supported by regular formative assessments where teachers can assess students’ levels in science and the English language. Following this, the teacher will need to create as many opportunities as possible to provide students with comprehensible inputs.

#### Monitor Hypothesis.

Whereas the input hypothesis is only concerned with language acquisition, the monitor hypothesis links the acquisition and learning processes in Krashen’s hypotheses. It points out how learning can affect the results of acquisitions. Krashen likens the learning system to the entity that monitors or edits the utterance produced by the initiator. Therefore, if

- The second language learner has sufficient time at their disposal
- They focus on form or think about correctness
- They know the rule.

They will then be able to take part in monitoring their use of language. The over-use, under-use and optimal monitoring use is affected by extrovert and introvert learners in addition to their self-confidence.

Furthermore, it comes with its challenges in science content and language learning. There are a significant number of rules when it overlaps both areas. Thus, mainstream science teachers

must prioritise what rules to teach their students explicitly. Some basic rules that would include both language and science are the use of tools to construct vocabulary. One example is Bowers and Cooke's morphological matrix (Bowers & Cooke, 2012). This allows students to be familiar with the structure of most words and thus build other relevant terminology. Some examples are endothermal, exothermal or geothermal. However, there may be discrepancies in the language rules between language and science. The alternative definition of science means that interpreting some terminology can result in challenges.

For example, a "blind test" would indicate an assessment completed without sight, whereas the technical definition in science is an experiment designed to eliminate bias. Thus, whilst some rules can be learned to support EAL students in science literacy, there will be exceptions to such rules. The other aspect of the monitor hypothesis is that students need to be able to focus on the form and reflect on its correctness. This relies heavily on students' independent learning and critical thinking skills. Furthermore, students who view science as too difficult are more likely to over-use the monitoring and be too critical of themselves. Thus, there is a need to ensure that appropriate monitoring measures are taking place. Finally, a common concern across all areas is time. As one of the conditions for carrying out the monitoring is the sufficient amount of time given for students, this can be especially difficult within the constraints of mainstream science subjects, especially VCE biology. Thus, there is a need to provide students with the time to carry out the monitoring, and teachers will need to create such opportunities to support the learning through this process.

#### **Affective Filter Hypothesis.**

Affective filter hypothesis considers factors that facilitate the development of an additional language without having a full causal impact. Such elements include self-confidence, motivation,



anxiety, and personality traits. Various studies support how these factors can affect a learner's language development (Khajavy & Ghonsooly, 2017; Peng, 2015), which discuss how self-confidence has been shown to positively correlate with learning an additional language based on perceived communicative competence and lack of anxiety. However, anxiety is considered to negatively correlate due to worry and negative emotions developing at the prospect of having to use a second language. It can be likened to a screen that prevents the input from reaching the language acquisition part of the brain. The affective filter hypothesis highlights the need to be aware of and address these factors when supporting students in their learning. For example, by making sure the classroom has a positive environment where a student is less likely to feel anxious and more likely to feel confident and therefore participate in the communication.

In relation to biology, the introduction chapter discussed how students can be overwhelmed by biology and see it as a difficult subject (Choi & Slaughter, 2021; Prokop et al., 2007). The difficulty and student perception of biology can vary from topic to topic. For example, genetics and immune system metabolism were considered the more difficult biology topics in the study by Fauzi and Mitalistiani (2018). Regardless, biology is regarded as one of the more elite sciences at the VCE level, and EAL student feedback has been that "it is difficult to get" (Goodrum et al., 2012, p. 38). It is also noted that there was a direct association between the topics that students perceived as difficult and topics that students underperformed in. This relationship is attributed to a lack of knowledge of the basic concepts in biology and thus resulted in weakness in answering questions related to the concepts. The lack of inquiry based approaches and persistent use of the lecture method is also considered detrimental for students' interest in biology topics (Agboghoroma & Oyovwi, 2015). The authors recommended more practical lessons to boost students' passion for biology and to encourage students to perceive biology as less difficult. Some

studies found that students' attitude toward biology is affected by their teacher's attitude toward the subject (Prokop et al., 2007).

However, while a range of issues are identified in this area, studies have also identified a range of methods to improve student perceptions of biology:

...teaching strategies, students' attitude, inadequate learning resources and students' learning habits were the reasons adduced by students of the perceived difficult topics. In remedying the problem, the students suggested using varied strategies that would involve appropriate instructional materials, use of hands-on and minds-on strategy, integrating biological concepts to daily life and provision of adequate and functional resources. (Etobro & Fabinu, 2017, p. 139)

Therefore, such strategies will need to be undertaken to address the consequences of affective filter theory, which states that students' emotions about biology, especially the feeling that it is too hard, can impact learning. This is especially relevant in biology for EAL students as the evidence indicates that such students already perceive biology as a challenging, complex subject (Gaipov & Brownhill, 2021; Meskill et al., 2019).

### *2.3.2 Lev Vygotsky's Sociocultural Theory*

Vygotsky considers three factors that contribute to the cognitive development of the individual which consists of culture, language and zone of proximal development (Vygotsky & Cole, 1978). Krashen's work which was discussed in section 2.3.1 aligns with the use of language as a tool in the learning process. The implementation of the theories in classroom settings utilise the sociocultural aspects of development (Krashen, 1987). Sociocultural theory considers the contribution society has on an individual's development (Kouicem, 2020). Based on Lev Vygotsky's work, it is the belief that a person's cognitive development is significantly influenced by their

surroundings such as parents, caregivers, peers and culture such as language, songs and arts (Vygotsky & Cole, 1978) . As such, Vygotsky posits that human development relies on social interactions and that human development can therefore vary among cultures. The range of theories that are discussed within this thesis will consist of sociocultural components because they will incorporate social interactions and relationships that students are part of. These include the interactions students may have with their peers, teachers and parents. The third factor of cognitive development is that learning should occur within the zone of proximal development, which will be discussed in section 2.3.2.

### *2.3.3 Lev Vygotsky's Zone of Proximal Development*

Understanding Vygotsky's theory, the zone of proximal development, allows for an understanding of the importance of scaffolding for learning, strategies that EAL students benefit from across all subjects, inclusive of science subjects such as biology. Much of the sociocultural perspective discussed previously in relation to Krashen's work can be linked to Vygotsky's Zone of Proximal Development (ZPD). Lightbown (2006) states how cognitive development, such as language development, is optimal when the learning takes place in the ZPD.

This is the overlap between what students can do and what the students cannot do. This is similar to the input hypothesis by Krashen, where the language level should be one level higher than the comfortable level for the learner.

Vygotsky (1980) defines ZPD as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem-solving under adult guidance, or in collaboration with more capable peers" (Vygotsky, 1980, p. 86). This could take place in the form of a teacher modelling behaviour or providing instructions. It can also take place during collaboration and dialogue between

students. The concept of ZPD is aligned with the concept of scaffolding. Wood and Ross (2006) defines scaffolding as “controlling those elements of the task that are initially beyond the learner’s capability, thus permitting him to concentrate upon and complete only those elements that are within his range of competence” (Wood and Ross, 2006, p. 90). Various strategies such as guided reading, video tutorials and ongoing support are suggested as methods to support within the ZPD. The ongoing support and providing the scaffolded support are especially crucial when students are learning two new languages, such as English and biology. Other strategies that are identified are the use of collaboration with peers and fostering student agency within the subject (Nicholas et al., 2021).

Such strategies are ideal when the activities occur among students of varying English proficiency levels. This aligns with the interactionist position on the sociocultural aspects of language learning, which suggests that interaction between native speakers and language learners provides more motivation, less anxiety over language use, and the learner gets the opportunity to negotiate meanings. Furthermore, this supports the use of group work among students with mixed abilities. These strategies can be incorporated into mainstream biology classes to encourage students to develop their biology and language learning. Additionally, grouping can be based on biology knowledge or language ability.

#### *2.3.4 Jim Cummins’s Academic Language*

An article by Allen and Park (2011) distinguishes between conversational English and academic English and how students who speak English among their peers cannot translate the terminology used on science tests into a language they understand. This distinction was studied by Cummins (1981), who labelled two definitions of literacy skills as basic interpersonal communicative skills (BICS) and cognitive/academic language proficiency (CALP). BICS includes

basic language skills such as pronunciation, vocabulary, and grammar. This is sufficient for everyday communication. However, CALP requires the person to manipulate and reflect on the language features to a greater extent. Therefore, while a student may seem to communicate well with others, they may still be lacking in CALP. It follows that one should consider this factor when they are teaching EAL students. Regarding timing, while BICS can take two to three years to develop, CALP has been proposed to take five to seven years (Cummins, 1981) or four to ten years, according to Thomas and Collier (2002).

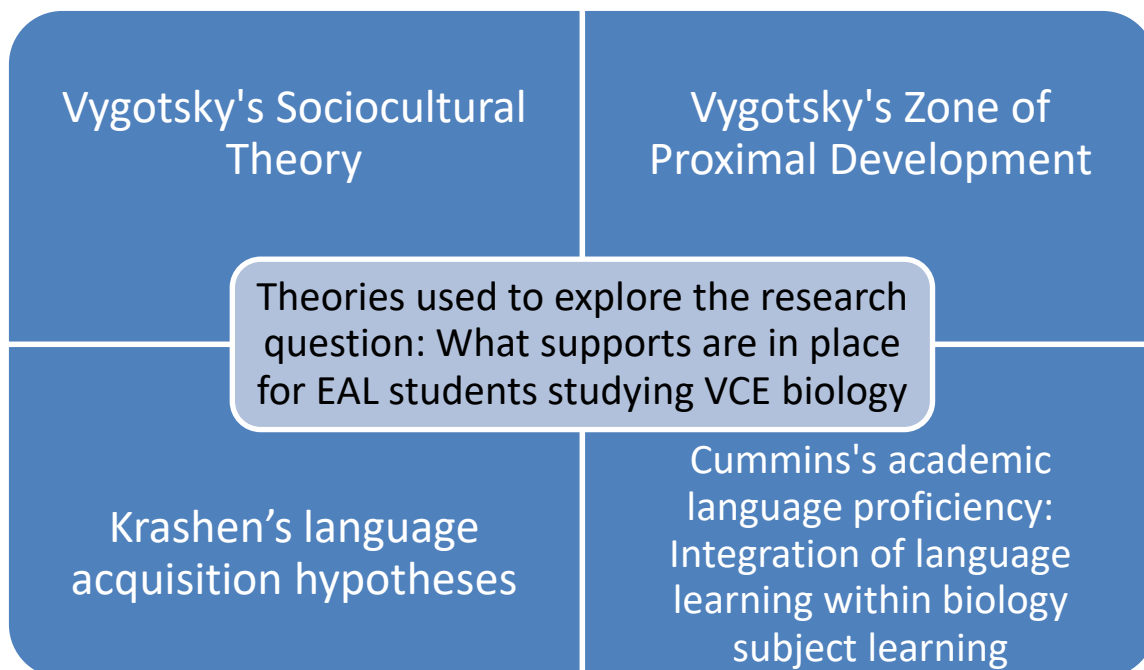
The language used in the classroom and workplace, tests and assessments, and language required for academic success are classified as academic language (Scarcella, 2003). Compared to basic inter-personal language, academic language consists of complex structures and discourse patterns. Himmele and Himmele (2009) classify academic language as “the type of language necessary to participate in successfully, comprehend and communicate in cognitively demanding and context-reduced age-appropriate activities” (Himmele & Himmele, 2009, p. 21). While students are introduced to academic language in the early years of schooling, the focus on academic language begins around Grade 4. It continues to become increasingly dominant through the schooling years and on to tertiary education. Thus, one of the concerns and challenges of EAL students studying biology is that some of these students may be able to communicate effectively in BICS but can face challenges in CALP. This has resulted in some students not receiving adequate support because they do not present with obvious language difficulties (Williamson, 2012).

### *2.3.5 Summary of Language Learning Theories*

The overarching theme across the range of theories described above is the sociocultural nature. The theories discussed above envision communicative competence as a goal with main components: linguistic competence, sociolinguistic competence, discourse competence and

strategic competence (Erton, 2017; Hymes, 1972). Figure 7 below demonstrates how Krashen's language acquisition hypotheses implemented within the ZPD can be used to support the academic language development theorised by Cummins (1981). The hypotheses of language acquisition whilst most relevant to language acquisition can also be implemented within the context of biology learning. As noted within each of the hypotheses in section 2.2.1, similar techniques can be implemented within mainstream biology classes to support EAL students to develop their biology and English language knowledge. Whilst this thesis approaches supporting EAL students from a holistic perspective, the teaching strategies that are implemented in class ultimately utilise the various language acquisition theories. Thus, these theories and hypotheses are presented here to demonstrate how cognitive and social cultural development work together to provide the current learning environment in mainstream biology classes. This presents the environment that mainstream biology teachers have to support their EAL students.

**Figure 7** *The Learning Theories used to explore the supports that are in place to support EAL students studying VCE biology*



## 2.4 Language Development Progress

A range of research has been undertaken to demonstrate that language development is not a static process but a complex and dynamic process (De Bot et al., 2005). While traditional views of the acquisition of an additional language considered it as a static and linear process, more recent research states the opposite. Studies by authors such as De Bot et al. (2005) and Larsen-Freeman (2006) discuss how learners may thrive in one area whilst they struggle in another area. They call such learning behaviour scouting and trailing. So, while one might be proficient in pedigree charts due to the lack of literacy required, they may struggle with genotypes and types of inheritance that is language heavy. Acknowledgement of the messiness of this process can help teachers appreciate and accommodate the variation in students' learning paths. Furthermore, this suggests that there is no end state, and this is a continuously developing process. It will be further beneficial in monitoring the growth of students' learning as this will explain the variability in the growth pathway. For example, if one looked at progression levels or a continuum of EAL

acquisition. In that case, the dynamic process theory provides a rationale for the variation in the path of development.

Therefore, while it is important to have a framework and monitor students' progress, the concept of scouting and trailing should be considered to reduce the pressure on students and teachers. This emphasises the need to celebrate growth and provide different opportunities for students to celebrate their successes. This also means that if all students are not following the same progression upward, teachers should be aware of it and pay attention to the other minor elements that may have impacted the learning. A range of factors can affect students' progress. This can be linked to complexity theory, which considers the interaction between social and cognitive factors in developing English as an additional language. This is similar to affective filter hypothesis which considers elements such as self-confidence, motivation, anxiety and personality traits. Thus, while it is important to ensure that students are being guided along an upward progression, the affective filter hypothesis highlights the need to ensure that students are provided a positive and supportive environment. This will be more challenging due to the nonlinear acquisition of language in the scouting and trailing process.

#### *2.4.1 Different Kinds of Proficiency in a Language.*

Cummins also considers proficiency in cognitive demand and context embeddedness (Cummins, 1981; Franken et al., 2005). Cognitive demand is how challenging the aspects of language learning is, and context level refers to how much the language content relates to the learner's experience. Academic language tasks are significantly more challenging than having a simple conversation. This is because academic language tasks such as formal speech and academic essays are more cognitively demanding than communicative tasks. Cummins argues that a communicative task is less demanding because communicative tasks are heavily embedded in



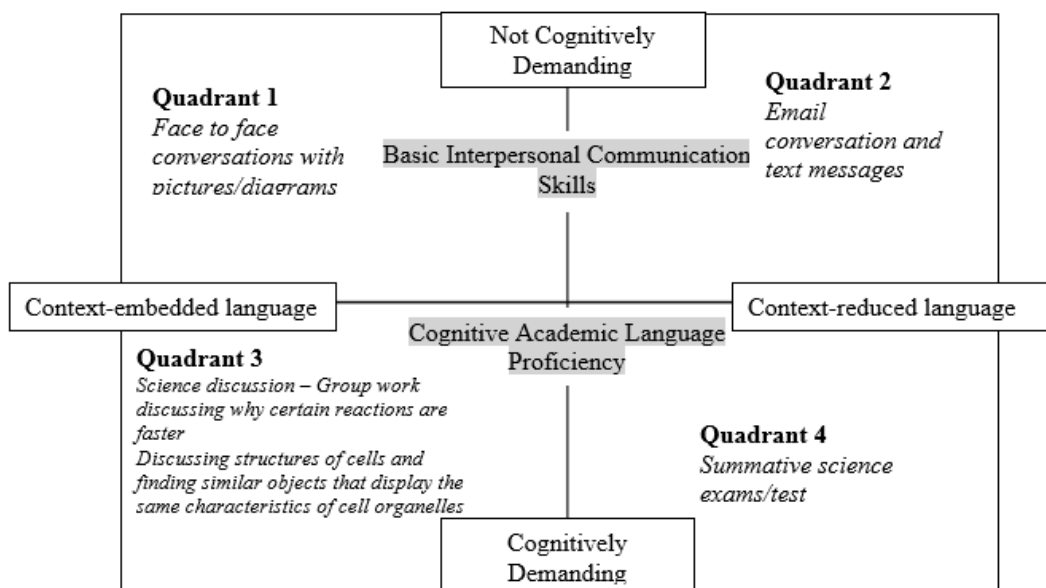
specific contexts. A conversation will have many cues in addition to the language. For example, there will be a range of non-verbal cues, such as facial expressions, stress, and intonation patterns in speech. There can also be various visual supports, such as the objects that can be referred to, pictures and diagrams.

#### *2.4.2 Negotiation.*

Communication provides many more opportunities for negotiating the meaning and understanding of a language. For example, the participants can repeat and rephrase themselves, request further clarification and maintain control of the topics being communicated. Therefore, the participant will be under less stress while still receiving the opportunity to learn, and this will be beneficial, as supported by Krashen's hypothesis of affective filters. However, contextual support, such as the non-verbal cues and negotiation, is less available in situations involving academic language. Tasks can be significantly more challenging when most cues are embedded in the language. For example, the difference between the communicative and academic language can be likened to a face-to-face call and email, respectively. While an email has cues in addition to the language meaning itself, it will still consist of far fewer cues than a face-to-face conversation, resulting in students experiencing challenges with a language being disadvantaged. Teachers should be aware of this as they utilise strategies to provide as many supporting cues as possible during academic language support.

Cummins proposed the dimensions of language quadrants to support students within ideal levels of cognitive demand and context embedded as presented in Figure 8.

**Figure 8** Dimensions of Language Quadrants



Note. Adapted from Cummins, J. (1996). *Schooling and language minority students: A theoretical framework* (2<sup>nd</sup> ed.), American Educational Research Association.

Figure 8 shows how the various dimensions of language proficiency can be applied regarding learning science. The four quadrants address different levels of the two dimensions (BICS and CALP). For example, quadrant one applies to situations where the content is heavily embedded in the context and not cognitively demanding. In instances such as face-to-face conversation, as discussed previously, there will be more context and factors outside the language to support the discussion. It will have minimal cognitive demand as a person has much freedom and ease in a casual conversation. In comparison, quadrant two showcases how reduced context and minimal cognitive demand can be demonstrated in email conversations and text messages. Ideally, a teaching transition method would be to start from quadrant one and chronologically follow the quadrants until quadrant four. However, it has been noted by Coelho (2008) that quadrant two is not an ideal instructional quadrant because it is challenging to develop academic concepts using low cognitive demand processes. Traditional EAL support consists of context-lacking drills, such as in spelling and grammar. However, while these methods should not be

discounted, they should not be the primary methods of instruction used as the lack of context will not assist in developing academic concepts. Gibbons (2002) emphasises that if the curricula provided are not intellectually challenging, students will fail to carry out higher-order thinking.

Academic language lies in quadrant four because there is usually minimal contextual knowledge as there is no involvement in the academic language. Furthermore, it is cognitively demanding because of the need to process the content and language and develop further thoughts based on this. The lack of contextual knowledge will not benefit students who need additional support with academic language.

The ideal quadrant to target for effective learning is quadrant three. The rationale is that it will provide a level of scaffolding for students who need more clarification with the language. However, by making the content cognitively demanding, the students are challenged and prompted to carry out deep thinking. This ties in with Krashen's theory of input being higher than the level where the student is currently proficient. Examples of activities that will facilitate training in quadrant three include activities that will incorporate models, videos, cooperative grouping, and use of primary language. In relation to science (see Figure 8) teaching in quadrant three will involve the use of models and diagrams and facilitating group discussion regarding the various concepts being learnt. To summarise, the various theories outlined tie in with the idea that content, context, and language education should be closely linked.

#### *2.4.3 Importance of Academic Language.*

Biology as a subject relies heavily on academic language for students to understand the content and generate appropriate responses to problems posed on assessments and as part of ongoing learning. Furthermore, it comes with specific jargon (Zukswert et al., 2019), which can also vary depending on the country and even book publishers (Taplin, 2017). Ability to master

academic language in biology can have a significant impact on students' success in their academic achievements. The institutionalised requirements of VCE biology include students' ability to communicate biology knowledge using academic language. Therefore, both EAL and mainstream students must master academic language to obtain success in this subject. Whilst this can be challenging for both cohorts of students, it is especially challenging for EAL students who must master both the English language and academic language together.

#### *2.4.4 Effects of the Amount of Prior Schooling*

How much cognitive demand is associated with a task is also affected by the extent of prior learning and prior knowledge the student has. After considering the heterogeneity of EAL students (Markic & Abels, 2014), students who are up to date with their schooling and have achieved academic language proficiency in their primary language may have Common Underlying Proficiency (CUP) (Cummins 1996), which can then be transferred to activities and content in their new language. The knowledge and skills used in their primary language can also be used to support learning an additional language. In relation to content subjects, this means that if a student understands the measurement and skill of reading data, this knowledge can be applied while using the new language as a medium, which is then built upon. Thomas and Collier (2002) identified the threshold for CUP as equivalent to Grade 4, while other researchers suggest that CUP can be much higher. This means there are many common cores in the primary language and additional language that can be used to support students even at higher grades. Other studies support this, such as Hashemzadeh's (2012) study, which suggests exercises to be completed to connect new knowledge to existing knowledge.

In comparison, students with limited or no prior schooling who enter the school system in the middle and senior years will face more significant challenges as they must learn new concepts,

skills, and processes in addition to the language. This means that these students will need significantly more time to reach the same academic language proficiency level compared to students with prior schooling. Therefore, a teacher must be aware of students' prior schooling when joining a new school after migrating to Australia as the Australian Curriculum lays the foundation for biology understanding throughout all of the previous years of education.

## 2.5 Learning and Teaching Science and the Impact for EAL Learners

### 2.5.1 *Scientific Literacy vs Science Literacy*

An essential aspect of learning science is to promote scientific literacy. Scientifically literate students can think critically and creatively about the natural world (Maienschein, 1998; McDonald, 2012). Science literacy is the ability to communicate ideas and carry out scientific discourse. Wright et al. (2016) classify science literacy as the application of reading, writing and literacy skills in science class. They state that once students have mastered these skills, they can retrieve information from existing texts and conceptually organize and connect different ideas to communicate their new scientific ideas with others.

According to Norris and Phillips (2003), teachers tend to focus on derived science knowledge, which focuses on the basic information that must be learned and most often retrieved for examination. Such a focus is understandable and expected because biology teachers have an extensive curriculum they must complete during the year. However, the focus on derived knowledge does not necessarily support students in developing the skills to understand and apply their knowledge or communicate their thoughts in writing. Such skills are essential for a majority of twenty-first-century professions. Furthermore, to obtain educational credentials in VCE and in their education, students need to be able to communicate their science knowledge. The overall focus of science literacy is the ability to communicate ideas with others. To facilitate such

communication, Robinson (2005) states that “to carry out effective discourse about a subject area, one must know approximately 95% of the words involved” (Robinson, 2005, p. 428). Thus, emphasising the need to learn the extensive vocabulary that is part of biology.

### 2.5.2 Learning Science Terminology

Kauser and Shah (2019) discuss how there is some biology terminology that is especially difficult and perceived as difficult by EAL students. These are terms without any roots or links to real BICS vocabulary, such as *quiescence* and *aortic semilunar valve*. In comparison, words such as *aqueous* or *inhibitor*, which are complex words that are formed by two roots, can be easier for students to interpret and understand. Kauser and Shah define two types of biological terms that are present when teaching biological terms. These are:

1. The terms that are representable with the help of diagram, e.g., urinary system.
2. The terms that cannot be represented by the help of figures, pictures, graphs, illustrations map/movies, E.g., denaturation of an enzyme.

A range of strategies are available for students to develop their terminology knowledge, such as use of multisensory strategies (Husty & Jackson, 2008), literature circles (Miller et al., 2007), flash cards (McCallum & Miller, 2013), modified work (Allen & Park, 2011), double talk (Brown & Spang, 2008), dictionary use (Safford & Costley, 2008) and first language annotations (Yoshii & Flaitz, 2002). Whilst these are just some examples of some strategies that can be used, they all tie in with the various learning theories discussed above. However, learning terminology is only one aspect of becoming proficient in science literacy. To successfully carry out verbal and written scientific discourse, students must be fluent in academic English, science terminology, and science content knowledge that will be enhanced by learning their content knowledge along with their language learning.

### *2.5.3 Teaching Science in Mainstream Classes for EAL students*

From a teacher's perspective, there is a need for collaboration and training to support mainstream science teachers in catering to EAL students in their content classes. For example, there is a need for collaboration between science teachers and EAL teachers (Nguyen & Dang, 2021). Similarly, the teachers would need specialised teacher training courses and access to academically appropriate, context- and language-specific materials (Afitska, 2016).

In terms of strategies, various materials have:

- Support for language development
- Support for subject knowledge development
- Use of first language in learning through the medium of the additional language
- Development of learner autonomy
- Promotion of learning outside the classroom (Afitska, 2016, p. 75)

Other strategies include ensuring to provide better foundation knowledge in science (Robinson, 2005) and dialogic inquiry (Haneda & Wells, 2010), which encourages students to engage in exploratory talk about their content subject. This dialogue coupled with the inquiry encourages students to answer questions about the real world and also to collaborate and collectively express their ideas and knowledge through words and graphics (Hapgood & Palincsar, 2006). A key aspect is that to cater for EAL students in science there is a need for content-based instructions that make a commitment to language and content-learning objectives (Creese, 2010). Whilst it does not have to be an equal commitment to either aspect, there is a need to incorporate language and content learning. An effective and popular method to cater to EAL students in science learning is through the use of Content and Language Integrated Learning (CLIL). It is an approach to teaching the content of curricular subjects through the medium of a non-native

language (Piacentini, 2021). In addition, learners will need to develop the proper use of scientific terminology as they carry out the content learning in science.

## 2.6 How Language and Science Can be Integrated – CLIL

CLIL is science taught specifically for EAL learners. Whilst the Department of Education and Training (DET) FUSE website has some materials to facilitate science learning by EAL students, such as worksheets with basic terminology and visual diagrams, there is a noticeable gap in the amount of research and materials that are available in science and biology CLIL. Recently there has been some emerging research that has utilised in CLIL for biology, such as

- Content and language integrated learning implementation through team teaching in biology lessons: A quasi-experimental design with university students (Satayev et al., 2022)
- Development of content and language integrated learning–based instructional material in cell biology (Radaza-Mero et al., 2022)

Whilst this means that CLIL may be becoming more common place in biology learning, the research incorporating biology and CLIL is still limited.

CLIL consists of a program that uses the mainstream content teacher and a language specialist teacher. It uses language-supportive methodologies that lead to learning of the content topic and the language of instructions. Catering to both of those aspects requires an alternate approach to teaching, specifically that the subject is not taught with the additional language but through the additional language (Marsh & Frigols Martín, 2013). A concern that has been raised is whether the students will learn less content as they endeavour to learn both language and content (Skinnari & Bovellan, 2016) and teachers have concerns that it will slow down EAL students and force teachers to reduce the content amount (Dalton-Puffer, 2007), which is not



possible in VCE subjects which require that all content is covered. Nevertheless, there have been observed successes using CLIL program in science subjects, in terms of listening (Aguilar & Muñoz, 2014), reading (Ruiz de Zarobe & Zenotz, 2018) and writing (Gené-Gil et al., 2015), which indicates that there is potential for it to be used successfully in biology classes. Such success provides an indication that there are many connections between these seemingly unrelated content areas. The barrier between language and science does not exist and, in fact, each discipline can be used to enhance and deepen the other. One of the key aspects of the EAL student journey in content classes is the learning of language within the content classes. Thus, implementing CLIL in mainstream biology classes provides an avenue for EAL students in VCE to develop both disciplines of English language and biology knowledge.

#### *2.6.1 The Language of Science Helps Enrich Language*

Science itself contains its own specialised vocabulary that draws on elements that are common to multiple languages. For example, the root word “therm-” is used to describe heat in English, French, Spanish, Greek and a wide range of other languages. Interestingly enough, science has a number of words like this. As such, scientific vocabulary can even be considered a kind of “universal” language, helping remove the confusion of language differences and providing common ground for communication. Lemke (1990) describes how teachers can use words with same roots to illustrate thematic patterns in the vocabulary and thus promote both science learning whilst enriching the language knowledge. Research has demonstrated that learning the language of science can help students to develop their English language skills by providing them with the opportunity to carry out specialise, cognitively demanding language functions and structures (Stoddart et al., 2002). There have been other instances of language of science supporting the development of English language proficiency where students in a CLIL groups were

found to outperform non-CLIL groups in several complexity, accuracy, and fluency measures (Rosset, 2022). CLIL also has been found to enrich student vocabulary size (Huang, 2020) which can support the communication of science knowledge whilst further developing the students' language proficiency.

### *2.6.2 Verbal Description is Part of Scientific Reporting*

Teaching language students how to accurately describe things is a significant aspect of meaningful instruction. EAL Language teachers offer different ways to describe things like colour, size, and texture. However, often this instruction feels disconnected from the world outside the classroom. When used, real-life contexts are limited when the students are making general and basic comments such as “the car is blue”, or “my friends are tall”. This kind of observation does not bear much resemblance to real conversations and authentic language. In comparison, when teaching students to report observation in a scientific manner, accurate description is crucial to the content and development of scientific enquiry and knowledge. It informs the student's hypothesis, observation, and interpretation of results. The ability to communicate whether something is solid, liquid or gas, whether it has changed size or changed colour, its length in inches or centimetres are all essential to quality reporting of scientific data. Thus, proficiency in science literacy is very limited without language proficiency.

Verbal descriptions also provide students with the opportunity to restate scientific expressions in their own colloquial language in addition to translating colloquial arguments into formal scientific language, thereby consolidating the students' proficiency in science and language. Talk as a tool has been identified as the most ubiquitous tool in teaching-learning context (Mercer & Littleton, 2007). It is able to provide real-time overview of a students' understanding and engagement with a specific activity. Especially in relation to science learning by EAL students,

verbal descriptions and dialogue can provide feedback on both science knowledge and language proficiency.

### *2.6.3 Science and Language Require a Collaborative Approach*

Verbal description also leads to collaboration which provides a space between learners and place for inter-thinking (Mercer, 2002) and sharing of knowledge in addition to dialogic engagement (Wegerif, 2010). Both science and language are hands-on disciplines that encourage students to work together to reach specific goals and objectives. Whether one is building scientific knowledge or building a conversation, the process requires intense collaboration and teamwork. Kozar (2010) emphasise the need to make a distinction between cooperative learning and collaborative learning. Cooperative is working together to accomplish shared goals. In comparison, collaborative learning is when learners work together to achieve a common goal while respecting each individual's contribution to the whole (Kozar, 2010, p. 1). Benefits of collaborative learning includes more meaningful psychological connections, creating new insights and considerations of alternate perspectives. Furthermore, collaboration results in learners challenging other's ideas and defending their own. This can provide further opportunities for EAL students to develop their language proficiency. The sharing of ideas can also take place between students with the same first language backgrounds or students of varying English proficiency. Both of which can provide learning opportunities for the students involved. Whilst concerns have been raised about the possibility of passivity among EAL students in collaboration with mainstream students, Markic and Abels (2014) that EAL students are increasingly less passive compared to past EAL students, and will use collaborative opportunities to actively contribute with adequate scaffolding. Collaborative learning has been identified as a key theme of how students and teachers construct and enact language policy at the classroom level (French, 2016).

In addition to collaboration between students, CLIL also consists of collaboration between student and teacher. Thus, CLIL concepts can be further built on and extended by considering the role of language and translanguaging (Lin & Lo, 2017). Language is when language is used to mediate conceptualisation and problem-solving. Swain and Lapkin (2013) argue that this process can take place during language-related issues, science or mathematical issues. The Language process can be beneficial for EAL student with multiple opportunities to practice their language skills. Translanguaging refers to “the act performed by bilinguals of accessing different linguistic features or various modes of what are described as autonomous languages, in order to maximize communicative potential” (García, 2009, p. 140). Using translanguaging during various collaboration opportunities can foster development in students’ language and science knowledge development. Similarly it alludes to the benefits of dialogic teaching methods where multiple opportunities are provided to students to share their knowledge, co-construct and develop their language. Lin and Lo (2017) also discuss the benefits of teaching models such as Initiation–Response–Follow-up (IRF) triadic exchanges where teacher follow-up on students’ responses by offering and asking for elaboration and comments in addition to challenging students’ views. These opportunities can utilise the collaborative approaches to carry out effective translanguaging and develop both science and language proficiency.

#### *2.6.4 Science and Language Bridge Cultural and Linguistic Barriers*

Regardless of the language background of the student, DNA cells function in the same manner, ecosystems are in precarious balance and gravity has the same effects. These phenomena do not change. Thus, the need to communicate specific science topics exists regardless of one’s language background. The study of science and language are both ways to surmount the barriers that divide us. Whilst studies have described how language can reduce the cultural and linguistic

barriers (Good et al., 2010; Howland et al., 2006), limited research has been carried out in regards to science. However, concerns have been raised about bridging the gap of health literacy (Singleton & Krause, 2009). Thus, science knowledge can support to bridge the gaps that are present in health literacy due to cultural and linguistic barriers.

## 2.7 Chapter 2 Summary

This chapter discussed Australia's history and immigration as relevant to EAL students. It provided an overview of the lack of supports for EAL students initially to the current climate that provides more support. The chapter presented how, in the latter part of this century, researchers began to investigate how to support language learning. As this thesis explores how to support EAL students in mainstream biology classes, it was crucial to delve into language learning theories first. Each of these theories were considered with context to biology learning and how the theories can be expanded to incorporate both disciplines. Following this, theories such as academic language and CLIL, which incorporate language learning in content subjects, were discussed in relation to how they can be incorporated in mainstream biology classes. The various learning theories provided aspects that should be addressed by mainstream teachers when targeting support for EAL students in their classroom. However, this literature review revealed the lack of research and studies of EAL and specifically relating to teaching of biology. The next chapter describes the theoretical framework developed and used to integrate the teaching of EAL and science, and specifically biology. These frameworks provide a basis of understanding the best overall support that EAL students need to succeed in mainstream biology subjects.

## Chapter 3: Theoretical Framework

### 3.1 Introduction

In this chapter, I introduce the theoretical frameworks used to answer the research questions. Four theoretical frameworks, cultural capital (Bourdieu, 1986), ecological systems theory (Bronfenbrenner, 1976), funds of knowledge (Moll et al., 1992) and the initiation, response, follow-up model (Wells, 1993) were used to analyse different data. The theories utilised were identified as most relevant based on the data obtained, the identified themes, and the focus areas for each research question. The use of different theories within the thesis allowed for focus on different aspects of support and strategies for EAL students. Cultural capital was used as the main framework for the thesis as it encompassed the range of findings identified in the whole thesis, various manifestations, and opportunities for supporting EAL students. A summary of all theoretical frameworks used in the thesis is presented in Table 2.

**Table 2** *Summary of Theoretical Frameworks*

Research Question	Chapter and Title	Theoretical Framework(s)
<b>How have my experiences as an EAL biology student influenced how I understand and appreciate biology learning by EAL students as a teacher?</b>	<b>Chapter 5 – Autoethnography</b> Mapping a Language(s) Journey in Science; From Learning Biology to Teaching Biology: An Autoethnography	Cultural capital (Bourdieu, 1986)
<b>What policies and support materials are provided by the government of Victoria to support teaching biology to EAL students, and how are these interpreted by mainstream teachers to support EAL students in</b>	<b>Chapter 6 – Policy Review</b> Great divide; Exploring the chasm between Victorian EAL policies in schools and teacher practices using Bronfenbrenner’s ecological lens.	Ecological system (Bronfenbrenner, 1976)

<b>secondary schools in Victoria?</b>		
<b>How do mainstream teachers currently support EAL students in their biology classes, and what support would enable more mainstream biology teachers to provide better support for EAL students in their biology classes?</b>	<b>Chapter 7 – A case study of teaching practices</b>  Teachers supporting EAL learners in mainstream biology classrooms: understanding learners and the system is the path to success	Funds of knowledge (Moll et al., 1992)  &  Initiation, Response, Follow-up (IRF) model (Wells, 1993)
<b>What are the current supports in place for EAL students studying VCE biology?</b>	<b>Chapter 8 – Findings and Discussion</b>	Cultural capital (Bourdieu, 1986)

## 3.2 Bourdieu’s Cultural Capital

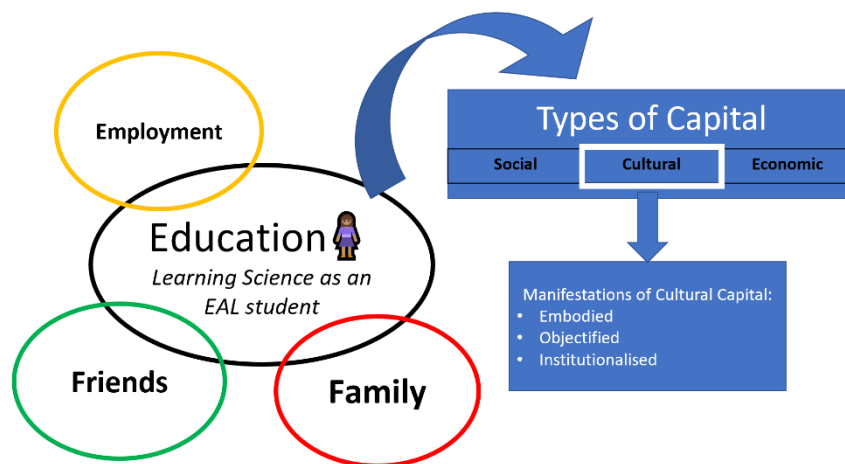
### 3.2.1 Theory Overview

Bourdieu (1986) defines *capital* as “accumulated labour (in its materialised form or its ‘incorporated,’ embodied form) which, when appropriated on a private, i.e., exclusive, basis by agents or groups of agents, enables them to appropriate social energy in the form of refined or living labour” (Bourdieu, 1986, p. 15). It is an individual’s power to change or control situations (Tomlinson, 2004). By possessing capital in a particular field, individuals can maintain and reproduce their position within the field, which means they have currency. In the analogy of a game, possessing capital involves knowing the game’s rules.

The game itself can be classified as a field. Some fields include education, employment, art, religion, and economics. Tomlinson (2004) argues that discussion of capital cannot be done without reference to a *field*. This is because the field is the space in which various changes and impacts of capital take place. Bourdieu (1986) has also described the field as a “field of struggles” where the various forces in place endeavour to preserve the current status quo. Edgerton and

Roberts (2014) further explore this concept to describe how there can be overlaps of multiple fields and partial nesting of various fields within each other. For example, the fields of education and employment will have a range of common factors and aspects of capital. In my study, there are nested fields of family within and outside education. This is depicted in Figure 9, below. The overlap of various fields with education reflects how currency in the fields of family, friends and employment can be converted to currency in education.

**Figure 9** Bourdieu’s Cultural Capital Fields, Forms, and Manifestations



In line with the game analogy, *habitus* consists of the feel for the game (Gaddis, 2013), which includes disposition, skills and habits that are formed based on a person’s capital. Whilst some research argues that the term *habitus* is too broad (Sullivan, 2002), Edgerton and Roberts (2014) argue that *habitus* shapes an individual’s sense of agency and possibility. Bourdieu has termed it socialised subjectivity framed by structural circumstances of one’s cultural capital (Edgerton & Roberts, 2014). Furthermore, as a set of dispositions acquired based on family upbringing and one’s social structure, *habitus* can shape how one perceives the social world and the capital they will be able to demonstrate. Research has also observed that the “dispositions of *habitus* represent master patterns of behavioural style that cut across cognitive, normative, and corporal dimensions of human action. They find expression in human language, nonverbal



communication, tastes, values, perceptions, and modes of reasoning” (Swartz, 1997, p. 467).

Therefore, researchers acknowledge the importance of habitus and the importance of a set of acquired dispositions. However, this aspect of Bourdieu’s theory was not utilised in this thesis because it cannot be transferred directly to the context of my study where the focus is only on the field of education. As dispositions in this thesis were studied in relation to one particular culture and field of education, funds of knowledge (Moll et al., 1992) were used to explore it more comprehensively.

As seen in Figure 9, capital can take the forms of economic, social, and cultural capital. Economic capital entails possessing financial resources such as money, properties, inherited wealth, and land. Social capital consists of contacts, networks and relationships, which individuals are part of and can be used to give them an advantage in the relevant field (Huang, 2019). Bourdieu (1977) defines culture as “individuals interacting in societies using accepted practices that have specific meanings and objectives to reach culturally acceptable results” (Bourdieu, 1977, p. 73). Based on this definition, I identified three different cultures that are part of EAL science learners. These three cultures were the English Language, scientific language and integration of language and science.

Each of these cultures requires its own ideas, attitudes, values, and behavioural patterns, which will give individuals an advantage within the culture. For example, students must understand colloquial language and various mannerisms in English language learning. However, scientific language in academia makes it more important to identify the various terminology and understand the content. Furthermore, one can possess a rich amount of culture within scientific language without being proficient in English. This is especially relevant among EAL students, migrant parents, and their extended families. In the culture of integration of language and science,

it is essential that students can decode questions and present findings and arguments in the format required for the summative assessments. Thus, whilst there may be some overlap, people can belong to each of the separate groups. Each culture was studied separately so that cultural capital within each culture could be analysed to determine how one can possess and build on it within each culture.

Cultural capital is “familiarity with the dominant culture in a society, and especially the ability to understand and use ‘educated’ language” (Sullivan, 2001, p. 893). While there are relationships between economic, social, and cultural capital and how various forms can support each other, this thesis focuses on Bourdieu’s cultural capital theory in the autoethnography and discussion chapters. Bourdieu provides other examples of cultural privilege in education, such as having someone who can provide a good reference, the right contacts in places of power; individuals who can help with studies and provide extra teaching and contacts that can provide information of the educational system and job outlets (Bourdieu, 1974).

Research has found that schooling inequalities have resulted in differential achievement and participation in the educational system. Bourdieu’s cultural capital theory provides a platform to explore the primary causes of the inequalities. Various studies have been conducted to study how cultural capital influences different aspects of student learning. Examples include reading, mathematics, science, and occupational aspirations in science (Tan, 2020). The research also found that highbrow cultural capital (higher socio-economic group capital) was less associated with children’s learning attainment compared to other cultural capital, such as parent-child discussion and student reading. This suggests that other forms of cultural capital can contribute to children’s learning attainment regardless of their socio-economic background. After assessing the various definitions of Bourdieu’s cultural capital, the interpretation by cultural capital by Edgerton and

Roberts (2014) was used. They define cultural capital as “adaptive cultural and social competencies such as familiarity with relevant institutional contexts, processes, and expectations, possession of relevant intellectual and social skills” (Edgerton & Roberts, 2014, p. 196). This definition was used because learning can be impacted by a variety of factors. By using a definition that considers the various social and intellectual skills in addition to the various methods of transferring it allows a variety of factors to be considered in the thesis. In the field of education, these skills and competencies promote success in students’ educational outcomes. Within the field of education, parents can transmit cultural capital to children. This can occur passively or actively as children are exposed to parents’ manifestations or as parents deliberate investment in transmitting cultural capital through resources and various practices (Andersen & Jæger, 2015).

Andersen and Jæger (2015) argue that sometimes cultural capital is falsely converted into educational success due to the misrecognition of cultural capital as academic brilliance. This thesis avoids this by acknowledging that cultural capital can affect educational success but also looks at how cultural capital is utilised to promote educational success. By identifying the cultural capital manifestations followed by instances of educational success, I avoid any overlap of cultural capital with educational success. I use three manifestations of cultural capital to study how cultural capital can contribute to students’ educational success. These manifestations are as follows:

- Embodied: internalised and tangible
- Objectified: cultural products
- Institutionalised: officially accredited

Bourdieu (1986) defines embodied cultural capital manifestation as linguistic competence, mannerisms, and cultural knowledge. Further elaborated definitions concerning education include “predispositions, propensities, body language, intonation and lifestyles that signify individuals’

internalisation of normative attributes valued in schools” (Tan, 2020, p. 1342). Objectified cultural capital “refers to physical resources at home that enables students to develop dispositions, values, perceptions, knowledge and skills that are rewarded in schools” (Tan, 2020, p. 1342). Some examples include cultural goods, pictures, books, and technology devices. Institutionalised cultural capital “is formed when embodied cultural capital is publicly recognised as a marker of social distinction (Tan, 2020, p. 1342). These are usually presented as educational Credentials. Different manifestations have been found to have different amounts of impact. Tan (2020) reveals that embodied manifestation of cultural capital is the most impactful, followed by objectified and, lastly, institutionalised.

### *3.2.2 Cultural Capital Theory in Autoethnography*

The autoethnography in Chapter 5 uses the cultural capital framework to analyse the various manifestations of cultural capital that were present within the different cultures under examination. The cultures were identified as:

1. English language
2. Scientific language
3. Integration of language and science

The cultures were separated to allow for comparison and contrast between how cultural capital manifested within the different cultures. Identifying where different manifestations took place in the cultures can be used to provide more targeted support for students. It also allows teachers to identify areas where students may require further support and cater to students individual needs as required. Further information on how cultural capital is integrated into the autoethnography will be provided in Chapter 5.

### *3.2.3 Cultural Capital Theory in Discussion Section*

For the discussion section, the cultures were combined, and all studies and in-depth analyses were done on the basis that the culture was an integration of language and science. This answered the overall research question “What are the current supports for EAL students studying VCE biology?” Because this study’s focus is regarding the integration of language and science, the various manifestations were analysed within the context of integrated language and science as a culture. The definitions of the manifestations by Bourdieu (1986) were modified to align with the findings of this study. They are as follows:

- Embodied state (personality, speech, skills): Involving Parents
- Objectified state (clothes or other belongings): Resources and Tools
- Institutionalised state (education credentials or specialised knowledge): Creating a Sense of belonging and achievement

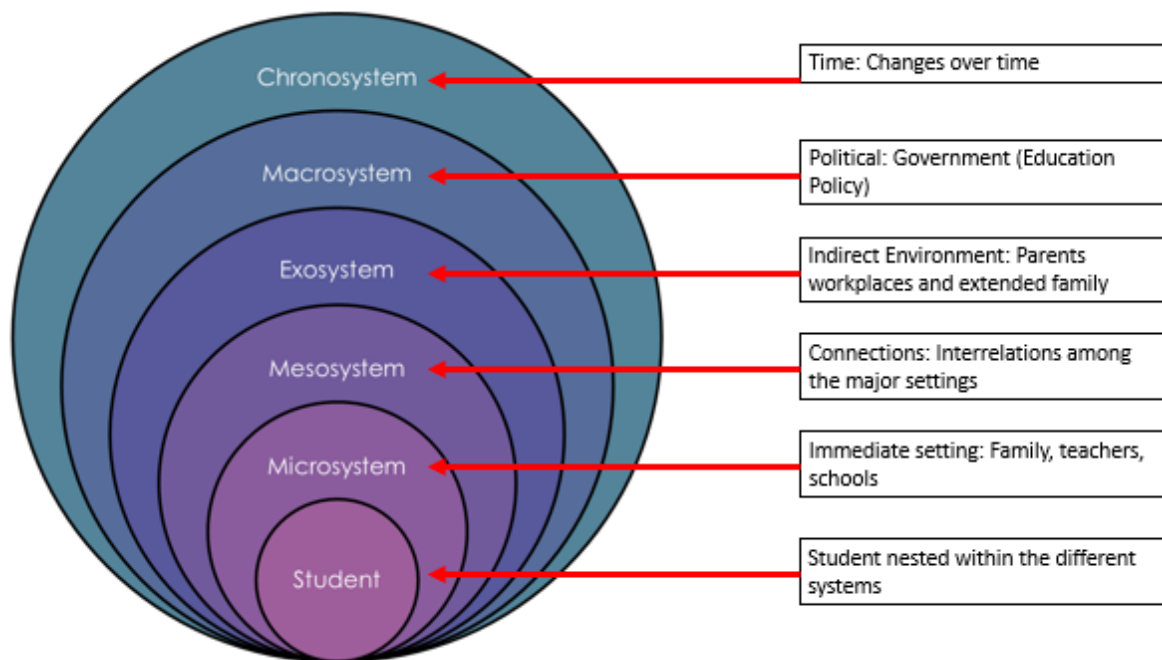
This ensured that the overarching areas were relevant to this study whilst also building on the current cultural capital manifestations framework. Therefore, for practising teachers this thesis provides practical and streamlined strategies in the findings and discussion sections. Teachers can also explore areas they can target to promote cultural capital for their EAL students in mainstream biology classes.

## **3.3 Bronfenbrenner’s Ecological Systems**

### *3.3.1 Theory Overview*

Bronfenbrenner’s ecological systems theory is used to present the findings of the policy review. Bronfenbrenner proposes a child is formed and developed based on their relationships. The relationships are presented as like nested Russian dolls (Leonard, 2011). The relationships and the association within the context of this research are presented in Figure 10.

**Figure 10** Bronfenbrenner's Ecological Systems Theory Framework



Bronfenbrenner (1976) proposes that most education research should be conducted in real-life education settings. Based on this, he argues that whether a student learns and how they learn is a function of a set of forces or systems. He proposes that one of the systems will consist of the “relations between the characteristics of learners and the surroundings in which they live out their lives” (Bronfenbrenner, 1976, p. 1). Examples of such surroundings include home, school, peer groups and neighbourhoods. The second system consists of the relations and interconnections between various environments. Bronfenbrenner proposes his model of the ecology of education to study how the various environments and systems affect students’ learning. One of the important concepts that was relevant to this study was the manner in which the ecological systems frame the investigations of person-environment and environment-environment relationships. This allows the study of learner and microsystem but also allows for the study of macrosystems and microsystems, such as between parents and teachers, but also

between parents and policies. A microsystem is defined as the immediate setting of the learners where the learners engage in activities with roles such as parents, teachers, and other learners. This definition has been consistent across most studies. Macrosystem consists of the broad all-encompassing influences that impact the learner and all the examples that surrounds them. Examples include various systems such as education, law, cultural in addition to geographic location. The range of the interactions considered in the ecological framework and the presentation of the different systems allow for a more holistic study and method of studying the various interactions.

Various researchers have interpreted and expanded on the definition of Bronfenbrenner's systems. The different interpretations were examined for this project, and various components of each interpretation were used to create the appropriate framework for the data collected. Whilst some studies have interpreted microsystems as relations and interactions (Puroila et al., 2021), this study focuses only on individual environments for the microsystems. The isolation of the various environments allows for the acknowledgement of how each system can individually support EAL students.

Classifying the microsystems as individual environments allows the interactions between the microsystems to be studied in the mesosystem, as proposed by Bronfenbrenner to mean interactions/interrelations among the major settings. Other studies have also used this interpretation (Lee et al., 2013; Leonard, 2011). Bronfenbrenner (1976) also defines the mesosystem as "the interrelations among the major settings containing the learner at a particular point" in their life (Bronfenbrenner, 1976, p. 1). Some examples provided include church, camp, or workplace. Thus, this study interprets the interrelations at school and home in relation to the

learners. Broadening the definition of mesosystem to allow for interactions with parents is crucial because it is an important relationship that fosters students' learning.

Bronfenbrenner (1977) classifies the exosystem as an "extension of the mesosystem embracing the concrete social structure, both formal and informal" (Bronfenbrenner, 1977, p. 515) including the major institutions and systems that are not directly connected to the learner or the person at the centre of the ecosystem. Thus, for this thesis, the exosystem is interpreted as the outer circle of parties involved in the child's development, as defined by Leonard (2011). Therefore, the exosystem is considered as parents' employers, family health care workers or extended family.

There are some overlaps between researchers' interpretations of macrosystem and exosystem, particularly in relation to government and policies in place. Some consider policies and the legal system as an exosystem, and general values and political economy has been considered a macrosystem (Neville & Mobley, 2001). However, this was in relation to health infrastructure as opposed to education. It can also be attributed to the interpretation of the examples given by Bronfenbrenner, who states mass media and agencies of government as examples of exosystems. Thus, because government agencies develop a policy, it can be considered an exosystem.

Bronfenbrenner (1976) classifies macrosystems as "carriers of information and ideology that both explicitly and implicitly endow meaning and motivation to particular agencies... roles" (Bronfenbrenner, 1976, p. 2). Based on Bronfenbrenner's (1976) definition, policy and its implications can be classified as a macrosystem. Other studies have interpreted this definition of macrosystems to include national curriculum frameworks and regulations (Puroila et al., 2021); politics (Leonard, 2011); and social norms, policies, and laws (Naughton, 2018). Thus, this study uses the definitions used by Hung et al. (2016); Mahlo (2013); Schaefer and Kieslinger (2016);



Stabler et al. (2021), where policy decisions about education are classified under the macrosystem. Similarly, studies examining how different policies affect different levels of the ecosystems have considered policy documentation and policymakers as macrosystems (Aizawa & Rose, 2019).

The rationale for using Bronfenbrenner's system for Chapter 6's policy review is to allow for the focus of the individual student developments whilst simultaneously allowing the examination of the complex systems and layers that affect the student. Whilst this study's data was mainly analysed using Bourdieu's cultural capital (Bourdieu, 1986), Bronfenbrenner allows for the focus on individual layers in the policy review. 'The crucial layers are the student, parents, and teachers as separate entities, and Bronfenbrenner's system supports this. These distinctions allow examination of the mesosystem to address the various interactions between the individual microsystems.

### *3.3.2 Ecological Systems Theory in the Policy Review*

Bronfenbrenner is used to frame the policy review in Chapter 6 because it helps to differentiate between the immediate factors that affect the students and the broader influences, such as the government and its policies. For this chapter, the aim is to demonstrate the effects that the government has on mainstream teachers and how they utilise government documents to support EAL students navigating their learning journey in biology. The data was collected through teachers and provide the teachers' perspectives on how the government policies are implemented and how they impact various parties. The data was analysed using the Bronfenbrenner system, thus allowing for an in-depth study of the interactions students had with various microsystems, such as parents and teachers, and macrosystems, such as government policies. The Bronfenbrenner system also allows for the study of interactions between different microsystems,

such as teachers and parents, mainstream teachers and EAL teachers. Overall, this theoretical framework enables a closer inspection of policies and how teachers utilised the policies to provide support within various environments for the student.

### 3.4 Funds of Knowledge

#### 3.4.1 What are Funds of Knowledge?

The concept of *funds of knowledge* (FoK) was first introduced by Moll et al. (1992), defined as various skills and knowledge that supports an individual in their culture. It was a tool developed specifically for education research by Moll et al. (1992). It helps organise findings and helps the researcher search for and identify findings (Rice, 2013). The original form of FoK was designed to be used by teachers or researchers visiting students' families and conducting an inquiry on site. Using FoK, the teacher or researcher can complete ethnographies of a student's household, including "inquiries into family work history, recreational interests and other types of knowledge necessary for family survival, especially economic survival, in the community" (Rice, 2013, p. 201). From these observations, aspects that could be used to support students in their education were considered as FoK. This links very closely with inquiry-based projects where teachers should design projects such that they are linked to students' real-life experiences.

The use of FoK in the data analysis for Chapter 7 also promotes a model that includes student agency. In a study by Cho and Yi (2020), students from less privileged socio-economic backgrounds used their agency to "interpret the social-cultural space, adopt [their] identity as a learner, and determine viable courses of actions" (Cho & Yi, 2020, p. 78). Using FoK in the data analysis presented in Chapter 7 allows for a deeper study of how teachers foster student autonomy through using students' FoK.

In addition to presenting a model that is not deficit-based, FoK also promotes a model where teachers can be involved in conducting and applying research and, thus, link theory and practice. One main concern about funds of knowledge and its use in practice and research is the stereotyping of cultural and ethnic groups. Oughton (2010) raised the concern that developing culturally responsive pedagogies can lead to educators and researchers portraying the groups as having fixed cultural traits. However, Basu and Barton (2007) describe funds of knowledge as a “dynamic process of students’ lived experiences within a particular family and community” (Basu & Barton, 2007, p. 468). Furthermore, research has shown that educators can use funds of knowledge to provide a diverse learning experience. Oughton (2010) found that none of the studies in their reviews revealed any negative stereotyping or classifying of students with the same fixed cultural traits. Rather, the study revealed that any applied generalisation referred to the FoK approach and not individuals or their cultures. Various research has used funds of knowledge to study student interest and engagement in science (Barton & Tan, 2009; Basu & Barton, 2007; Moje et al., 2004). The definition of FoK used in this study is the research-based interpretation of FoK. This is the definition by González and Moll (2002). They define funds of knowledge based on the premise that “people are competent and have the knowledge, and their life experiences have given them that knowledge” (González & Moll, 2002, p. 625). González and Moll note that the funds may take the form of dispositions and values that are affected by the context and life experience of the student. Within the model of FoK, there have been disputes about various factors. These include

- FoK is a source of knowledge or areas of knowledge
- What knowledge is incorporated in FoK
- Whose knowledge is incorporated in FoK (Hogg, 2011, p. 669)

For this study, FoK is considered an area of knowledge that encompasses a broader meaning, instead of viewing family, community, popular culture, and peer groups as the only sources of knowledge. Areas of knowledge allow the definition of FoK to include the students' life experiences as a source of knowledge (Upadhyay, 2006). The study by Upadhyay (2006) revealed that science teachers who utilised their students' lived experiences could help linguistically and culturally diverse learners access meaningful science knowledge. In terms of what knowledge is incorporated in FoK, this study considers bilingualism, cultural knowledge, language vernacular, personal life experiences and home practices as knowledge incorporated in FoK. The FoK model also encompasses various stakeholders' knowledge, such as household members, parents and students (Thomson & Hall, 2008). Overall, this study focuses on students' funds of knowledge to emphasise how their life experiences have contributed to their dispositions in relation to language and science learning, which is expanded on below.

#### *3.4.2 Expanding the Definition of Funds of Knowledge*

González and Moll (2002) also discuss how funds of knowledge are practised based on what individuals and communities do, especially how they think about what they do. Thereby allowing Basu and Barton (2007) to expand the definition of funds of knowledge to classify dispositions as funds of knowledge. "One's disposition toward being a particular way in a given situation can be an outgrowth of what one has learned to value in a situation" (Basu & Barton, 2007, p. 468). Building on this interpretation, Basu and Barton (2007) argue that funds of knowledge can include knowledge, action, and disposition.

Other researchers have also expanded the definition of funds from practical skills to include interpersonal and meta-cognitive skills (Baker, 2005). The definition of funds of knowledge

proposed by Oughton (2010) and Baker (2005) were combined to create a definition of FoK, including a range of other components within the definition of FoK. These are students'

- knowledge, experiences, histories, identities, and images of themselves
- attitudes, dispositions, desires, values, beliefs, and social and cultural relations
- relationships with learning, teachers, and mathematics itself, and
- numeracy practices beyond the classroom (Baker, 2005, p. 16)

For this study, the most important aspect of the definition is the attitudes and dispositions formed due to the students' experiences and histories. By classifying students' dispositions as funds that can contribute to their learning, I could focus directly on the students and how their dispositions contributed to their success. Similarly, I could identify which dispositions of the students were well regarded by mainstream biology teachers and also examine how teachers utilised the various dispositions of students. FoK also allows for the study of dispositions as directly related to students. Specifically, it allows for an in-depth study of students' dispositions due to their background and focuses on what funds they possess individually. Although a student's parents and their community contribute to a student's funds of knowledge, Chapter 7's data analysis aims to assess what traits supported students to succeed in VCE biology classes. FoK allows for an individual focus on students and funds that students possess individually due to their family, community, and background.

How funds of knowledge are used for this study is depicted in Figure 11. This figure demonstrates how the focus of FoK for Chapter 7 is solely on the student. The teacher data is used to identify what factors EAL students used to succeed in VCE biology. The identified characteristics are studied using FoK and dispositions as funds. Following this analysis, I studied how the funds

were used and how mainstream teachers built on students' FoK to promote success for EAL students in their mainstream biology classes.

**Figure 11** *Funds of Knowledge Used in Chapter 7*



### 3.4.3 Comparison with Bourdieu

One concern regarding dispositions being used within the FoK definition is that dispositions have also been classified under embodied manifestations in cultural capital by Bourdieu (1986). Crick and Goldspink (2014) define dispositions as a “form of embodied cultural capital, inculcated through childhood experiences and the cultural practices and values of the classroom” (Crick & Goldspink, 2014, p. 29). Similarly, Bourdieu’s embodied manifestation has been interpreted to include dispositions and practice (Willekens & Lievens, 2014). Therefore, in Chapter 8, the findings and discussion chapter, the dispositions of funds of knowledge were allocated to the embodied manifestation. This is used because the overarching theoretical framework of cultural capital is used for this study.

However, Bourdieu’s embodied manifestations of cultural capital are significantly broader than what individual students possesses. It consists of the dispositions of the mind and body that are transmitted from one person to another. This most often includes parent to child, to the extent that family education is considered the greatest source of a student’s embodied cultural capital (Claussen & Osborne, 2013). However, embodied manifestations include traits and practices such as accents, dialects, tastes, preferences, and linguistic skills. Whilst these aspects of embodied manifestation are discussed in the autoethnography and discussion, they are not aspects that were important for the case study analysis of teaching practices. Chapter 7 focusses

on the research question, “How do mainstream teachers currently support EAL students in their biology classes, and what would enable more mainstream biology teachers to provide better support for EAL students in their biology classes?” The students’ dispositions are studied in relation to how they contributed to students’ learning practices and how the teachers utilised these traits. Thus, in Chapter 7, the focus needed to be narrower and more directed toward students’ specific dispositions due to their experiences. Based on this need and this lens, the funds of knowledge are used to study the dispositions in Chapter 7. However, in Chapter 8’s discussion, the dispositions are considered within the embodied manifestation when considering all other aspects of parents’ influence and upbringing.

Furthermore, while considering learning dispositions, cultural capital dispositions do not allocate as much autonomy for the students’ successful learning habits and dispositions. Instead, it allocates it to the parents’ upbringing. However, the research question covered in Chapter 7 is focused specifically on student and parent interactions. Similarly, despite Bourdieu’s habitus theory including dispositions and practice, funds of knowledge allow for a broader view of various aspects that the student brought to the table, and it allows the focus of the case study to remain on students and what they possess. Thus, this enabled the in-depth analysis of how mainstream teachers utilise students’ dispositions.

**Table 3** *Cultural Capital and Funds of Knowledge in Analysis of Students’ Dispositions*

<b>Chapter</b>	<b>Chapter 7: Case Study Chapter</b>	<b>Chapter 8: Findings and Discussion Section</b>
<b>Theoretical Framework used</b>	Funds of Knowledge	Cultural Capital
<b>The rationale for the framework used</b>	Dispositions are considered as Funds of Knowledge There was a need to focus on students and what aspects and traits they presented in classrooms	Dispositions are considered as a component of embodied cultural capital manifestation

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Embodied cultural capital is too broad for Chapter 7's research question focusses on students, as this includes all aspects of parental and community influence.

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All parental impacts and background/life experiences needed to be grouped together

#### 3.4.4 FoK in the Case Study

Funds of knowledge have been described as providing a platform for teachers to rethink what are valuable traits to utilise with underrepresented students (Cho & Yi, 2020). Furthermore, FoK research and practice approach working-class, ethnic, and linguistic minority students' families as sources of knowledge. Whilst that interpretation is similar to cultural capital, FoK has a greater focus on including the resources from less privileged backgrounds. FoK also places more emphasis on celebrating students' successes. This was relevant to the case study described in Chapter 7 as the analysis demonstrates that mainstream teachers celebrate their students' dispositions, and they endeavoured to promote such dispositions further. The critical dispositions identified in this chapter are work ethic and high expectations. These traits are then utilised with the initiation-response-follow (IRF) model, explained in the following section, to analyse how mainstream teachers support EAL students in their mainstream biology classes.

### 3.5 The Initiation-Response-Follow (IRF) Model

#### 3.5.1 What is IRF?

The IRF model is a classroom discourse format. It encourages students and teachers to conduct discourse and dialogue to co-construct knowledge and learning. The IRF model established by Wells (1993) was built on the triadic dialogue introduced by Lemke (1989). It is a discourse format that can be implemented in classrooms. It involves the initiation, consisting of the teacher asking a question, a response from the student and the teacher's follow-up, which involves teacher feedback. Whilst there have been different versions of the triadic dialogue, such



as the initiation, student response and teacher evaluation (IRE) model, the IRF model aligns better with this study's data and the key findings from the interviewed teachers. Wells (1993) states that "when the third part of this structure is characterised as a follow-up, rather than more narrowly as evaluation, there are compelling reasons for seeing the IRF sequence as the prototypical action structure for the achievement of the overarching goals of education" (Wells, 1993, p. 35). This aligned with the teacher data where they emphasised the need to repeat and practice the skills and knowledge following the response stage. The teachers' concerns for lack of time were relevant to this stage with limited class time resulting in less repetition, practice and follow-up.

IRF has been described as an effective method to monitor students' knowledge and provide a collaboratively constructed path to attain knowledge. Researchers have raised concerns about the triadic dialogue because it may be overused in classrooms due to a false belief that it fosters maximum student participation (Mercer, 2004). However, Nassaji and Wells (2000) demonstrated that how IRF is used decides the model's effectiveness. Research has demonstrated that over 50% of the exchanges between teachers and students occur in the IRF format (Viiri & Saari, 2006). The role of the teacher in the IRF process has been studied in terms of teacher-guided discussions or peer discussions, and it was found that a careful balance was required between the two modes. When a teacher maintains a central social scaffolding role, it fosters more student-led discussion and ensures direction, whilst also ensuring the discussion is focused (Nathan & Knuth, 2003). Consequently, there is a need to broaden the IRF process to ensure that both teacher and peer-guided discussions are implemented. Also, there is space within the model to study how teachers can foster peer-guided discussions to support EAL students in their mainstream subjects, such as biology. Within the context of the IRF model, peer-guided discussion can be challenging in mainstream classes where all students do not have the same literacy

abilities. In acknowledgement of this, the data analysis in Chapter 7 provides various methods that can foster IRF processes in diverse mainstream classrooms.

There have been variations in the IRF model, and research demonstrates that the same model can be used in various forms based on the goal of the activity (Nassaji & Wells, 2000). One key area of focus is the follow-up component of IRF. Nassaji and Wells (2000) classified the follow-up component within six categories. These are evaluation, justification, comment, clarification, action, and metatalk. These categories are about teacher-student dialogue, but they can be expanded to include student-student and teacher-student interactions and discourse. A variation that is similar to the format used in Chapter 7 is by Mortimer and Machado (2000). They assessed the follow-up component as being either dialogic or authoritative. It is considered authoritative if the feedback is in the form of an evaluation. In comparison, if it involves further extension from the students or promotes more student contribution, it is classified as dialogic. Dialogic discourse can generate conversations and generate meanings for the students. The optimal combination has been identified as the alternation between the two methods. Meaning-making benefits can be especially useful in EAL students with language learning. It can also be useful in mainstream subjects such as biology, which consists of a significant amount of subject-specific terminology.

### *3.5.2 IRF in Similar Studies*

Whilst there are limited studies on IRF specifically in science subjects, IRF has been analysed in research on language development. The study of IRF used in two foreign language immersion classrooms (Miao & Heining-Boynton, 2011) demonstrates how the IRF model is common and dominant in all content-area classrooms. Whilst the study was completed in conjunction with Response to Intervention (RTI), it found that IRF can positively affect instructional delivery and increase student discourse. The study also found that the IRF model opened

classroom discourse and resulted in more student interactions. In addition, it allowed more opportunities for student output, encouraging students to recast, classify and extend their expressions. These opportunities can be especially relevant to EAL students developing their language and studying subjects such as biology. The study by Miao and Heining-Boynton (2011) also suggest that further studies should be undertaken on structuring student-centred classes where students are guided to lead all phases of the IRF model. This is incorporated into the analysis in Chapter 7 to allow more student-student interactions.

Similarly, the study by Liu (2008) assesses how language is used to serve the functions of mediation and to provide learning opportunities in the IRF process. The study focuses on lessons completed in mathematics, science, social studies, and English. The researcher found that with IRF students were likelier to explore ways to understand and express certain topics and themes and experiment with new words and sentence patterns. The research thereby demonstrates how the IRF process in a subject like biology can be used as an opportunity to develop students' language ability.

Finally, Viiri and Saari (2006) found that in addition to the process of IRF, there was a need for balance in discourse forms. As such, the authors recommended analysing teachers' talk, using lesson plans that include both the content and the talk types and practising talk types. A crucial aspect for this is the knowledge of different talk types and how the balance can be implemented in classrooms. Thus, the analysis in Chapter 7 incorporates how IRF is used whilst balancing the teaching instructions and student-student discourses.

### *3.5.3 IRF in this Study*

The case study of teaching practices examined in Chapter 7 incorporates the IRF model by demonstrating how funds of knowledge can be incorporated within the system requirements of

VCE biology. The initiation is used to demonstrate how the VCE questions were asked and how mainstream teachers could support students in understanding what was asked. The response component of the model is addressed by the theme of crafting the response using various terminology and tier two words which are words that students will likely encounter in many texts but are unlikely to be exposed to in everyday contexts (Kucan, 2012). This component focuses on how mainstream teachers can support the students in providing adequate responses to the question, especially ensuring that it aligns with the system requirements of VCE. The follow-up component is used to look at how mainstream teachers utilise communication, translation, and collaboration. These are various methods by which teachers could follow up on students' work and provide feedback in accordance with the VCE requirements. Finally, an additional component is added to the IRF model based on Chapter 7's findings. This was the concept of repetition. Whilst it is assumed that repetition is present in the classroom discourse, the analysis in Chapter 7 makes explicit notes of repetition as a component because of the noticeable benefits of repeating the various conversations and practices identified.

Finally, the usefulness of IRF is also supported because it allowed for the link between funds of knowledge with the system requirements of VCE. One of the aims of the IRF model is to "be used to achieve other, and more productive, goals, including the co-construction of knowledge on the basis of ideas and experiences, contributed by the students and the teacher" (Wells, 1993, p. 35). This ties in with the funds of knowledge, which promotes the students' funds to support their learning and fosters discussion and communication. This communication can promote both language and content knowledge development. Thus, in Chapter 7, the IRF model is used to present how the teachers can utilise students' funds of knowledge to meet the system requirements of VCE biology.

### 3.6 Chapter 3 Summary

This chapter explained how the theoretical frameworks of cultural capital (Bourdieu, 1986), ecological systems (Bronfenbrenner, 1976), funds of knowledge (Moll et al., 1992) and Initiation-Response-Follow model (Wells, 1993) are used to frame various aspects of this thesis. Bourdieu's cultural capital is used to frame the perspective taken in Chapter 5, and the overarching ideas of the thesis in the findings and discussion section in Chapter 8. Consequently, cultural capital is the main framework of this study. However, throughout the thesis, the concept of cultural capital is informed by other theoretical frameworks that have particular strengths in relation to aspects of the data analysis. Bronfenbrenner's ecological systems is used to obtain a more focused view of the policies and the interactions of mainstream teachers and students with the government perspective. Funds of knowledge is used to focus on the direct relationship between students, their learning dispositions, and mainstream biology teachers' interactions with them. Finally, the IRF model is used to link the student dispositions and the system requirements of the government and the Victorian Curriculum and Assessment Authority (VCAA). These four theoretical frameworks were chosen based on each chapter's data and the research questions. As such, the methodology chosen for each chapter was similarly based on each research question and the perspectives being addressed. The following chapter explains the study's multi-method design and how each method is relevant to the research questions.

## Chapter 4: Methodology

### 4.1 Introduction

This chapter describes the multi-method research design used to conduct this study on supporting EAL students in biology classes. It uses three methodologies, being phenomenology, policy review and case study, to consider the three sub-questions that relate to EAL students' biology learning. These methods help consider the various perspectives, which include students, governments, and mainstream biology teachers. Furthermore, this chapter also provides a rationale for the interpretivist paradigm, qualitative methodology and case study approach used in this study. A discussion of the various methods to collect and analyse data is also included. Care is taken to minimise repetition caused by the nature of this thesis including published works.

The overarching aim of this study was to investigate the experience of learning for EAL students in mainstream classrooms via relevant perspectives, students, teachers, and policy, which encompasses the three components of the study: autoethnography, policy review and a case study of teacher's voices. Each perspective offers different insight into this overarching aim. The results are intended to be used as a framework to provide better support for EAL students from a mainstream teacher's perspective. Research was carried out as a PhD with publications. This was chosen over a traditional thesis because while the three components are closely related, they are discrete studies. This is supported in the study by Moodie and Hapgood (2012), who compared the advantages and disadvantages of a thesis by publication. Another reason for choosing research by publication is that feedback from the previous publication can be used to benefit the next component of the research. Thus, while the research project has a central focus on EAL students learning biology in mainstream classes, it will be analysed and interpreted from a variety of perspectives.

## 4.2 Research Questions and Overall Study Design

### Overarching research question:

What are the current supports in place for EAL students studying VCE biology?

### Subsidiary research questions

**Table 4** Research Questions and Approaches

Perspective	Research Questions	Methodology	Method	Article Title
<b>Student</b>	How have my experiences as an EAL biology student influenced how I understand and appreciate biology learning by EAL students as a teacher?	Phenomenology	Autoethnography	Mapping a Language(s) Journey in Science; From Learning Biology to Teaching Biology: An Autoethnography
<b>Resources</b>	What support materials and strategies are available for the teaching of biology to EAL students, and how are these promoted and made available by the Victorian DET?	Policy Review	Document analysis Semi-structured interview	Great divide; Exploring the chasm between Victorian EAL policies in schools and teacher practices using Bronfenbrenner's ecological lens.
<b>Teacher</b>	How do mainstream teachers currently support EAL students in their biology classes, and what support would enable more mainstream biology teachers to provide better support for EAL students in their biology classes?	Case study	Semi-structured interview	Teachers supporting EAL learners in mainstream biology classrooms: understanding learners and the system is the path to success

## 4.3 Research Paradigm

Creswell and Clark (2007) emphasise the need to identify a researcher's paradigm stance. A paradigm that is defined as a researcher's worldview influences how they design and conduct their

research. A paradigm is based on assumptions about ontology, epistemology, methodology and methods (Rehman & Alharthi, 2016). These will be discussed below in the context of this research.

To understand the various important components of a paradigm, I will present my stance on different paradigms by unpacking each and its relevance to this thesis. Ontology, as classified as the nature of one's beliefs about reality, varies among researchers based on their assumptions about how reality exists and what can be known about it (Richards, 2003). This affects how the researcher frames their questions and what knowledge is pursued in the research. This study was undertaken under the assumption that reality can be considered a single verifiable reality of multiple realities that are socially constructed (Patton, 2002). Therefore, the ontology of this study is that the understanding obtained is based on observation and interpretation (Ling & Ling, 2017). This means that it is understood that this research is framed by my experience, in addition to the acknowledgement that the data is framed by the participant's reality. Therefore, the final product of this research is a socially constructed reality, which is also a reality underpinned by an epistemological stance.

Epistemology is classified by Gall et al. (2003) as the branch of philosophy that studies the nature of knowledge and how knowledge is acquired and validated. Following an ontological belief system leads to certain epistemological assumptions. Under the assumption of multiple socially constructed realities, it is understood that the researcher is involved with the subjects and attempts to understand phenomena in the participants' context, as opposed to studying people as objects for a singular verifiable truth. This therefore links to the interpretivist paradigm. Adding to this, Ling and Ling (2017) state that the epistemology associated with the interpretivist paradigm is that the understanding of elements of the world is subjective and socially constructed. In this thesis, the reality and context of the participants are provided by presenting a case on each of the



participants and their school. The reality of myself as a researcher is presented as an autoethnography to explore my perspective.

#### *4.3.1 Interpretivist*

Based on the ontology and epistemology discussed and the methodology and methods discussed below, the paradigm implemented in this study is the interpretivist paradigm. Grix (2004) argues that researchers will always be involved within the process of answering their research questions and this leads to a reality that is socially constructed. Furthermore, the interpretivist paradigm relies on participants' views while acknowledging that the researcher's experience and background will have some impact on the research.

#### **4.4 Methodology**

As classified by Ling and Ling (2017), methodology is the approach and the rationale of how research is implemented. Ellen (1984) refers to methodology as a production of data that is informed by theory. Rehman and Alharthi (2016) emphasise the need to carry out critical analysis of the techniques that are used to produce the data. Crotty (1998) discusses how the methodology can be presented in terms of the strategy, plan of action, process or design that will decide the choice of research methods that are implemented. Furthermore, Rehman and Alharthi (2016) emphasise how identifying the methodology can lead to the identification of the type of data that is required and confirmation of which data collection tools are ideal for the required data.

Methodology that is associated with an interpretivist paradigm predominantly consist of qualitative data collection methods or mixed (combined qualitative and quantitative) methods. This study utilises qualitative data as it provides a well-rounded view of the subject being studied. This is because it is believed that qualitative methods will allow for "systematic, in depth, holistic

examination" (Leko, 2014, p. 2) of EAL teaching, whilst using the participants' voices to shape the product of the research.

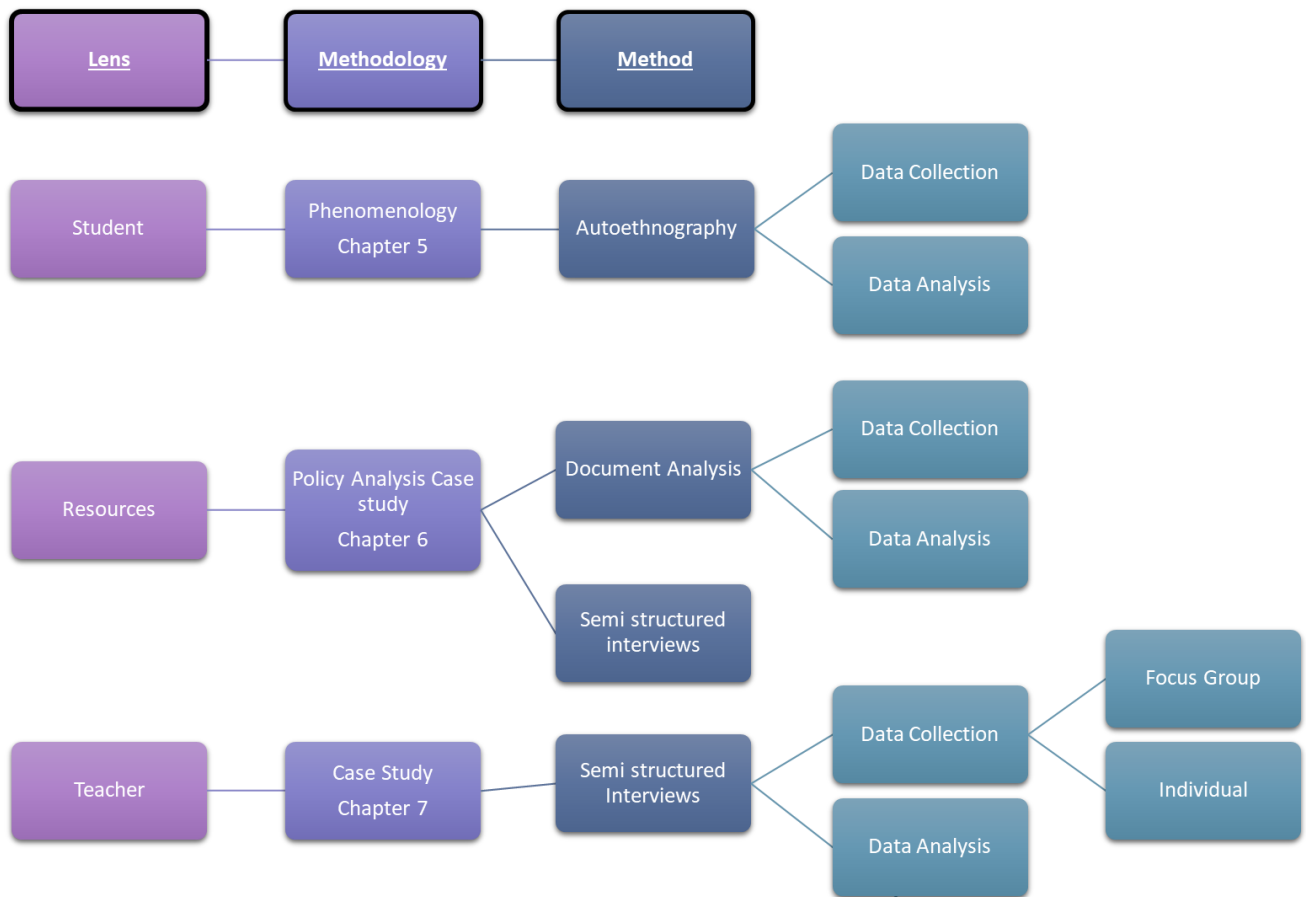
#### 4.5 Methods

Research methods that are referred to in this section are the mode of procedures used to carry out the research (Ling & Ling, 2017). This consists of the selection of data, the forms of data gathered and the procedures used to analyse the acquired data (Ling & Ling, 2017). Rehman and Alharthi (2016) consider that while methods such as questionnaires and open-ended interviews that are used for a specific project will depend on the researcher's theoretical mindset, use of a particular method does not necessarily confirm certain ontological and epistemological assumptions.

In the following section, the three components of the study are presented with details about the methodology used and the methods used to collect and analyse the data.

Figure 12 provides a flowchart on the presentation of the various methodology and methods used. It also outlines the links between the various perspectives that are presented in this study.

**Figure 12 Methodology and Methods Used for this Study**



*Note. Figure 12 is an advanced organiser. Section 4.6 will provide in depth information about each of the methods used for the various lenses.*

## 4.6 The Methodology and Methods Used for Each Perspective

### 4.6.1 Student - Phenomenology

Neubauer et al. (2019) describes phenomenology as a qualitative methodology of research that focuses on an individual's lived experience with the world and the phenomenon being studied. In this study, the phenomenon being studied is the integration of EAL students in mainstream classes, specifically VCE biology. Phenomenology is used to describe the meaning of my experience within the various roles of the phenomenon (Teherani et al., 2015). In this study, the phenomenon was classified as factors affecting EAL students' learning. Though it has been argued phenomenology is not as reliable nor objective as data that is obtained from sources

outside the researcher's life world (Neubauer et al., 2019), conducting a detailed investigation of a subject can assist in obtaining a new understanding of the phenomena. Therefore, I aim to subjectively examine my experience to promote new meanings and appreciation that can further develop the understanding of the phenomena of supporting EAL students (Lavery, 2003).

This study implements the hermeneutic (interpretive) phenomenology. This is heavily based around the term *lifeworld*. Initially introduced by Edmund Husserl, hermeneutic phenomenology refers to his student, Martin Heidegger's definition of lifeworld (Husserl, 1983). Heidegger defines lifeworld as a person's reality that is influenced by the world they live in (Heidegger et al., 1962). Therefore, it is understood that my experience with the phenomena (support for EAL students) is not isolated from my lifeworld and personal history as an EAL student and teacher. Instead, this experience and knowledge is considered as valuable inputs for the inquiry. Neubauer et al. (2019) encourages researchers to openly acknowledge their preconceptions and reflect on their subjectivity as part of the analysis process. Therefore, discussing my experience as an EAL student and mainstream teacher can shed light on my perspective on supporting EAL students in mainstream biology classes.

#### **Autoethnography.**

Pitard (2017) describes an autoethnography writing as when the author retrospectively and selectively writes about their experience as part of the culture being studied. Brodkey (1996) discusses how autoethnography is the study of a phenomena through an individual's self-study, which is completed as an interpretive study of the data and culture as opposed to being an observational study.

### Data Collection.

For my autoethnography, I collected the data by recollecting memories of my past, conversations with my family, and artefacts such as letters and photographs. Further information of the recounting process is provided in Chapter 5's data collection section. Autoethnographic strategies of chronicling, inventorying and visualising self by Chang (2016) were used to collect the data.

### Data Analysis.

Data was transcribed and notes were incorporated into the transcription. Further memories and thoughts that were provoked by the data were also included. I analysed the data by interpreting how different factors affected my journey as an EAL student. This was then extrapolated to consider which forms of cultural capital greatly impacted my journey. In this context, culture refers to something beyond ethnicity and can include the ideas, customs, and social behaviour of a particular group of people. Therefore, I was able to use a variety of customs and behaviour associated with being an EAL student and teacher as data of the various cultural capital I utilised. This method of research requires the author to retrospectively select experiences that were made possible by being part of the culture being studied and the cultural identity associated with it. Thus, by delving into my cultural identity and cultural capacity as an EAL student, I intend to promote deeper cultural understanding of EAL students and their experiences (Ellis & Bochner, 2000).

While an autoethnography can produce a meaningful piece of research that is grounded in personal experience, it needs to meet the standards of research rigour. This requires critical reflection and analysis of the experiences discussed in the research. Ellis et al. (2011) suggest that autoethnographers should use personal experience to illustrate various aspects of the cultural

experience, while Pitard (2016) suggests the use of vignettes to analyse the relevant experiences to provide the reader with a greater understanding of the culture being researched. Therefore, various vignettes across my journey as an EAL student to my role as a teacher were used to contribute to a richer understanding of the culture of EAL students in mainstream classes. In addition to this, the autoethnography was used to present my perspective as a researcher.

#### *4.6.2 Resources - Policy review*

This policy review uses semi structured interviews with current teachers in conjunction with the document analysis. Further information will be provided in section 4.6.3 as both Policy review and Case study utilise the interview data.

A policy review was completed to systematically study public policies related to EAL support. The purpose of the policy review is to obtain understanding of the causes, factors and institutions involved in policy decisions (Schmitt, 2012). Comparative policy making is classified into three groups: comparing public policies, analysing the patterns of policy making, or analysing the process-oriented aspects of different policies (Schmitt, 2012). The process-oriented method considers how stakeholders involved in the policy perceive and process policy experiences; that is, how various perspectives shift as the policy is transferred and how it travels from one unit to another. In this study, interactions of teachers with the various stakeholders such as students, other teachers, parents, and administration staff are considered in relation to the policies and their implementations. To address the various stakeholders and the context of the policies, the policy review was completed as a case study with Victoria as the case. Pal (2005) argues that case studies can contribute to policy reviews in two forms:

1. By providing a contextualised definition of the issue being studied

2. By illuminating relevant concerns and questions and also providing practical solutions

Thus, by conducting the policy review as a case study, it allowed me to incorporate the teachers' perspectives within the context of Victorian EAL student demographic, policies and teachers involved.

#### Document Analysis.

The identification of policies was completed in the form of a document analysis (Owen, 2014). Documents such as policy documents, policy review documents, and related papers such as academic papers and reports were used (Springate-Baginski & Soussan, 2002). These documents were collected from the Department of Education and Training website and the various tools and links provided by the Department of Education and Training. Further information regarding the data selection is provided in Chapter 6.

#### Data Collection.

Initial exploration of the policies that were available was achieved using a document analysis of the school policy and advisory guide of the Department of Education and Training (DET). The A-Z index in the guide (Department of Education and Training, 2019e) contains a list of all the governance and operational policies for Victorian government schools. Each policy was assessed for any relevance to EAL support. Three policies were identified as policies that relate to EAL students in addition to the school census policy that was used to inform the three main policies.

The three main policies are

- Assessment and Reporting for English as an Additional Language (Department of Education and Training, 2019a)

- English as an Additional Language Index Funding (Department of Education and Training, 2019c)
- EAL Provision for Newly Arrived Students (Department of Education and Training, 2019b)

Supporting policy:

- School Census policy (Department of Education and Training, 2019d)

Following the collection of the relevant policies, a search was conducted on the Australian Department of Education and Training website to identify any documents or webpages that are used to support the implementation of policies. For the purpose of this study, various documents that were available online and webpages were classified as documents used by the Department of Education and Training to implement various policies. To identify any relevant documents provided by the government, an initial search using the term “EAL” was conducted on the State Department of Education and Training website. The results were then assessed for their relevance to this study by opening and studying the document and also reading the overview of the documents.

The criteria for relevance were

- Any document that provided support or advice for any stakeholders involved in supporting EAL, such as EAL students, mainstream teachers, language support staff, leadership team members and administration staff at a school level.
- Documents that discussed allocation of resources for EAL students.

Documents rejected were

- Documents that were reporting only statistics.



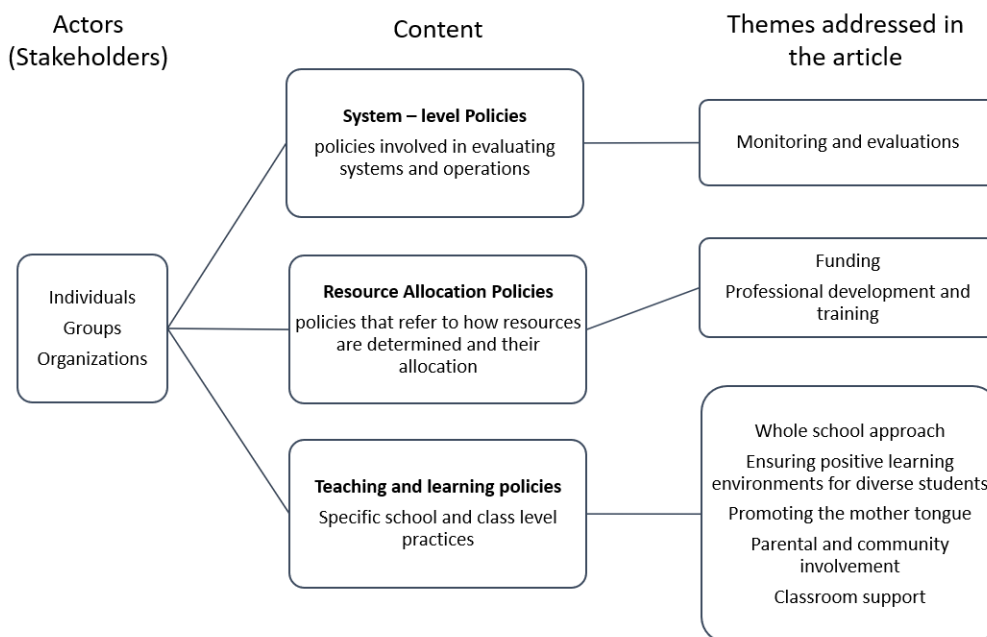
- Documents that were looking at training for post-school vocations.
- Any documents discussing adult education.

The range of identified documents are designed to be implemented at school and within classes by mainstream teachers and staff. Thus, the impacts of the policies need to be considered from the perspective of mainstream teachers. For this purpose, semi-structured interviews with mainstream teachers who taught EAL students, were used to obtain the teachers' perspectives. The school profiles, teacher profiles and data collection methods are provided in section 4.6.3. Following the teacher perspectives, the policies were compared with other countries with similar ratios of LBOTE students in mainstream schools. Thus, Victoria as a case study was used to study the stakeholders and impacts of the policies. The teacher interviews were used to obtain teachers' perspectives of the implementations of the various policies that are in place to support EAL students in Victoria.

#### Data Analysis.

Bronfenbrenner's ecological model was used to differentiate the data that was used. The identified policies were classified under the macrosystem, and the school data and interviews with teachers was considered a microsystem (Hertler et al., 2018). Within the macrosystem, the framework by Jie (2016) was used to differentiate between the different types of policies. This framework looks at how the various actors (stakeholders) interact with the policy. The actors can be the individuals, organisations and groups, which includes teachers, students, parents, schools, and tutors. Within that framework, an in-depth analysis was completed to assess the implementations of the various policies and their effectiveness in regard to the different stakeholders involved. Within each type of policy, teachers' interpretations and feedback were incorporated to obtain teachers' perspectives of the policies.

**Figure 13** Ng Ding Jie’s Framework Adapted for the Study’s Context



Note. Adapted from Jie, N. D. (2016). *Towards a framework of education policy analysis*. The HEAD Foundation.

It must be noted that while the above policy framework is useful in systematically presenting the data, the factors affect each other, and their effects are not isolated. However, for the purpose of presenting various themes, the content has been divided based on the framework's content section. Following this, a corresponding policy in countries with a similar demographic was compared to the policy in Victoria. Some of the countries that were used include Denmark, Ireland, Canada, United Kingdom, Germany, Norway, Sweden, United States, New Zealand, and Ireland. Table 5 presents the multicultural nature of the countries by presenting the proportion of foreign students per 1000 students and percentage of population that was born overseas. These countries have been presented in Table 5 to allow for comparison between the various countries and Australia. The statistics are used as indicators of the similarity and differences to Australia and Victoria’s overseas born demographic.

**Table 5** *Proportion of Foreign Students from Another country in the Countries of Comparison*

<b>Country/State</b>	<b>Proportion of foreign tertiary students from another country (per 1 000 students enrolled) (2001 Data)</b>	<b>Percentage of population that was born overseas (2012 Data)</b>
<b>Australia</b>	125.9	26.5 (2019 Data)
<b>Australia – Victoria</b>	-	31 (2019 Data)
<b>Denmark</b>	17.3	7.5
<b>Ireland</b>	48.4	17.2
<b>Canada</b>	27.9	19.6
<b>United Kingdom</b>	108.1	11.3
<b>Germany</b>	81.6	12.9
<b>Norway</b>	31.6	10.9
<b>Sweden</b>	44.8	14.4
<b>United States</b>	32.4	12.5
<b>New Zealand</b>	36.7	22.7

*Note.* Proportion of a foreign students from another country per 1,000 students enrolled obtained from Organisation for Economic Co-Operation and Development. (2001). *Trends in International Migration - Continuous Reporting System on Migration - Annual Report 2001 Edition*. <https://www.oecd.org/els/mig/2507712.pdf>

Percentage of population that was overseas born in Australia: Australian Bureau of Statistics. (2019). *Australia's population by country of birth - 2019*. <https://www.abs.gov.au/statistics/people/population/migration-australia/2018-19>

Percentage of population that was overseas born: The Organisation for Economic Co-operation and Development (OECD). (2012). *Indicators of Integration 2012 by country*. <https://www.oecd.org/migration/integration-indicators-2012/>

In addition to each of the comparisons, the data analysis involved Bronfenbrenner's ecological system to frame the whole case and link the macro system of government policies and microsystems (Bronfenbrenner, 1976). Microsystems consist of schools and teachers involved in implementing the policies and individual teachers' perspectives on the various policies. The

mesosystem (interactions between microsystems and macrosystems) is addressed in the discussion to demonstrate how the interaction of various microsystems can be beneficial for EAL students and supporting staff.

#### *4.6.3 Teacher - Case study*

The third method approach is a case study of teachers' perspectives. A case study is recommended as the ideal methodology when studying phenomena that is rich in complexity and has varying dimensions. Case studies use a range of data collection methods, such as observations, interviews, questionnaires, document reviews and visual data analysis. Merriam (1998) emphasises the importance of delimiting the object of study and setting boundaries to the phenomenon being studied when carrying out case studies. For this part of the research, the phenomena being studied was how mainstream biology teachers support EAL students in their classes. Furthermore, the area for participant recruitment was narrowed down to the South-East Victoria region as this region has the highest number of new EAL arrivals (Department of Education and Training, 2018a, 2018b)

Some potential concerns have been raised about case study research, such as the likelihood of bias and lack of generalisability that could reduce the credibility of a study (Johnson & Onwuegbuzie, 2004). However, this can be addressed through the specificity of a given case study and limiting the boundaries to focus on VCE biology and EAL students because the findings will be more congruent within the narrow boundaries of that reality as expected to ensure credibility (Merriam, 1998). This helps to maintain the credibility because it reduces the effects of other factors that may affect subjects, such as physics (which may be affected by maths) or humanities (which are more language based). Therefore, this data will be relevant within the administered constraints.

### Semi-Structured Interview.

The synchronous interviews took place in real time in person and via zoom. They provided me with the opportunity to ask for further clarification on the participants' responses to the interview questions and allowed participants to elaborate on their responses. For example, when the participants discussed the challenges of identifying students experiencing difficulty, I was able to ask them to elaborate on strategies that they used to address such issues. This provided a richer set of data.

### Data Collection.

To obtain relevant data in relation to teaching EAL students, I conducted a search on the “My School” website for schools that had a significant percentage of students from Language Backgrounds Other Than English (LBOTE). To keep the initial sample size manageable, 70% was selected as the cut off and schools that were identified as having over 70% of LBOTE students were sent an email inviting them to participate in the study. From the responses received, I selected two schools to participate in the study. Profiles of the two schools are provided in Table 6 with pseudonyms used.

**Table 6** Profiles of the Two Participant Schools

School code	L	H
% Of students from Language Backgrounds other than English	81	70
School Sector:	Government	
School Type:	Secondary	
Year Range:	7 – 12	
Location:	Major Cities	
Teaching Staff:	92	104
School ICSEA Percentile:	24*	12**

*Note.* Data obtained from: Australian Curriculum Assessment and Reporting Authority (ACARA). (2020). *My school*. <https://www.myschool.edu.au/>

\*This means that this school is more educationally advantaged than 24% of schools in Australia and more educationally disadvantaged than 76% of schools in Australia.

\*\*This means that this school is more educationally advantaged than 12% of schools in Australia and more educationally disadvantaged than 88% of schools in Australia.

In addition to having similar percentages of students from LBOTE, both schools are located close to a language school that accepts new arrivals and refugee students. Both have an intimate relationship with their respective language schools, which results in a significant number of EAL students transitioning from the language school to mainstream schools.

Participants were selected using purposive sampling, which has a clear rationale to fulfil the specific purpose of the research questions, as described by Cleary et al. (2014). The participants for this component of the study were chosen based on their professional experience and background in the field of teaching biology in schools with a high proportion of students from LBOTE. The criteria for inclusion in the study was years of teaching experience, experience with EAL students and level of EAL related training. The intention was to bring different perspectives and opinions together to provide a well-rounded understanding of the current situation related to teaching EAL students in mainstream biology classes. Profiles for each participant are provided in Table 7. Pseudonyms are used for all the participants throughout the study.

**Table 7 Profile of the Participating Teachers**

	<b>Number of Years Teaching</b>	<b>Number of Years Teaching Biology</b>	<b>Specific or formal training in language teaching?</b>
Michelle	3	3	No
Amber	3	3	No
Ryan	12	11	No
Jane	7	6	No

Interviews were undertaken to learn about participants' backgrounds. While I believed that the participants in my research had enough knowledge and experience to participate in unstructured interviews, I wanted to ask a specific set of questions that provided relevant insight into their work with EAL students. However, as I wanted to encourage the participants to elaborate on their answers, semi-structured interviews were completed to allow them to voice their thoughts and ideas freely while still allowing me to obtain the required information (Abdulai & Owusu-Ansah, 2014). The whole basis of qualitative research is to allow room for unknown information, which was facilitated in this study by allowing participants to voice their thoughts and opinions with open-ended questions (Turner, 2010).

**Table 8 Data Collection Timeline**

	<b>Date</b>	<b>Participants</b>	<b>Description</b>	<b>Type of Data collection</b>
Group - Initial exploratory	16 <sup>th</sup> December 2019	Michelle & Amber	60 minutes semi-structured and open ended	
Group - Follow up 1	6 <sup>th</sup> July 2020	Michelle & Amber	40 minutes semi-structured and open ended	Focus group
Group - Follow up 2	7 <sup>th</sup> July 2020	Michelle & Amber	40 minutes semi-structured and open ended	
Individual - Participant 1	19 <sup>th</sup> January 2021	Ryan	40 minute semi-structured and open ended	Individual Interview

Individual - Participant 2	20 <sup>th</sup> January 2021	Jane	60 minute semi-structured and open ended	Individual Interview
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### Focus Group Interviews.

Initially, an exploratory focus group was completed at School L with the two participants, Michelle and Amber. While the group only consisted of two participants, a focus group approach was applied during the interview to encourage the two initial participants to feel more comfortable. As these two participants had limited experience with EAL students, it was evident that they would prefer to participate in the interviews together; therefore, their interviews were conducted as a pair. It also fostered an environment where participants' discussions stimulated rich data and new ideas as a result of the communication between the two participants (Lederman, 1990). As the two participants had similar experiences and were colleagues, they were able to highlight and elaborate on each other's ideas and concerns. The interview was conducted in a quiet, private, staffroom at their school at a mutually convenient time.

Participants were invited to reflect on the cohort they were currently teaching and discuss the various strategies they were using and what strategies they could implement in the future. Initial information was obtained such as the teachers' background, experience, overview of their profile and what they considered important in supporting EAL students in their classes. Following this, further questions were modified to delve deeper into the areas that were considered significant. For example, as the topic of training was discussed in the initial exploratory interview, further elaborations were asked in regard to the types of training and targeted support in the follow up focus groups.

Following the initial interview, two follow up interviews were conducted seven months later with the same two participants to maintain consistency. Further questions were asked in



regard to types of training they would prefer and how their approach to teaching biology to EAL students had developed over time.

The initial focus group with Michelle and Amber was audio recorded and the interviews that followed were conducted via zoom and, therefore, both video and audio recording were done. Once again, this provided another element to the discussion as the video provided more indications about areas the participants were confident in and passionate about. Their expressions and gestures provided another layer during the analysis of the data. Video recording is acknowledged as a method that adds rich nonverbal, contextual and behavioural information (Williams et al., 2013).

#### **Individual Interviews.**

Individual interviews were completed with the second two participants. They were held after the completion of the focus interviews. The necessary and follow up questions were all answered during the individual interviews. Therefore, a single individual interview per participant was sufficient following the focus interviews. As these two interviews were conducted during the COVID pandemic, they were completed via zoom and video and audio recording was used once again, providing richer data with the non-verbal cues.

#### **Data Analysis.**

All interviews were transcribed to carry out the analysis. While transcription is often considered as data management, the process of transcription has a significant part in the analysis process and helps the researcher familiarise themselves with the data (Riessman, 1993). Some even consider it as the initial analysis itself (Kvale, 2007). The transcription was completed verbatim to include any long pauses and exclamations, which assisted in providing more clarity about the participant's confidence and attitude towards the topics. The non-verbal cues such as

expressions and gestures were noted in the transcription notes and used to support the data analysis. However, it was noted that they did not make a significant contribution to the overarching themes extracted from the data and are thus not reported as data in the thesis.

Analysis of the data was achieved as an ongoing process. This was used to ensure that the interviews were providing relevant data to answer the research questions and to adapt and amend the interview questions accordingly. The data from the focus groups were analysed and common themes such as professional development, collaboration and support staff were identified. Similar to following a pilot interview, the identified themes from the focus groups were used to refine the questions for the individual interviews (Turner, 2010).

Thematic analysis was used to analyse the interview data, as it extracts meanings and concepts from data by examining and recording patterns and themes. One of the advantages of thematic analysis is the flexibility it provides while effectively assisting in reflection and clarification of the reality being studied (Braun and Clarke (2006). However, some of the pitfalls of thematic analysis, such as use of main interview questions as themes, need to be considered and avoided with priority given to deeper analysis resulting in data that is better organised rather than summarised (Clarke & Braun, 2013). While the semantic themes consider the explicit meanings behind the data, this only provides a surface level understanding of the data. To obtain an understanding of the underlying ideas and concepts, one should look at the latent themes. These are the themes that shape the semantic content of the data.

A range of formats, such as notes in the field, political documents and pictures, can be used to carry out thematic analysis (Javadi & Zarea, 2016). For the purpose of this study, transcription of participants' interviews was used to carry out the thematic analysis. While there is a range of

methods to approach thematic analysis, the steps involved in the thematic analysis was adapted from the work by Maguire and Delahunt (2017) and Braun and Clarke (2006).

**Table 9** *Six Phases of the Framework for Thematic Analysis*

Phase number	Process involved
Phase 1	Become familiar with the data
Phase 2	Generate initial codes
Phase 3	Search for themes
Phase 4	Review themes
Phase 5	Define themes
Phase 6	Write-up

*Note.* Adapted from Braun and Clarke's six-phase framework from Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.

**Phase 1:** Become familiar with the data

As suggested by Denscombe (2010), one of the main principles in conducting efficient qualitative data analysis is to compact the raw data into a succinct structure. This was achieved by completing a reflection of dot points after each interview. This was written down to note my early impressions and ensure that I am familiar with the data and to refresh the topics and discussions that took place. The transcription process itself was also used as an opportunity to familiarise myself with the data.

**Phase 2:** Generate initial codes

My research and data collection sought to answer specific research questions outlined in this thesis. I used thematic analysis to analyse qualitative data. I carefully coded the data that was relevant to and addressed the research questions. While there is a discussion about the use of software as opposed to manual analysis, the use of software meant that all data and codes were compiled together. NVivo software was used to carry out the coding efficiently. Alhojailan (2012) acknowledges how the use of software can improve the rigours of the coding process. However, researchers need to carefully label and organise the filing data to avoid recontextualised data

(Bryman, 2001). This was addressed by coding the transcriptions and printing a pdf document of the coded data within excerpts of the interviews. This provided context even as coded data was isolated from the transcripts.

### **Phase 3: Search for themes**

While there is no hard and fast rule about what constitutes a theme, a theme is generally considered as a pattern that captures something significant about the research question. Furthermore, it is acknowledged by Alhojailan (2012) that a small data set such as for this study may present with some overlap between the coding stage and the stage of preliminary theme identification. The process involves identifying several codes that address a similar theme and grouping them to identify overarching themes across the data and participants. While it is possible to classify a group of codes as miscellaneous, this was not required in my study.

### **Phase 4: Review themes**

During this phase of the analysis, the themes that were identified previously were reviewed. This was done by looking at the codes and grouping them once again. From there, any overlapping codes were considered to ensure that they were grouped to address the correct theme. Furthermore, the themes were modified, and their classifications adjusted, to ensure that they were clearly distinct without any overlap. Other concerns raised by Alhojailan (2012) were also considered, such as the validity of the theme, the link between the data and the theme, the amount of content that was encompassed by the theme, and any possible overlap of themes.

### **Phase 5: Define and name the themes**

Once the themes were finalised, it was essential to identify the meanings and the purpose behind the themes. For example, the types of support that teachers preferred varied but there was an underlying theme of support needed and the different areas that required that support. This was presented in a thematic map in the results.

## **Phase 6: Write-up**

Finally, the write up was completed by creating two different chapters to identify the feedback provided from the teachers. Because there were two different overarching themes apparent in the discussion in the research questions as well as in the discussion, one chapter was designed to address the strategies that were used and the underlying ideas and conceptualisations behind them. Another chapter was used to address the training that teachers require to provide such support to the students. While they are both important aspects of teaching and catering to EAL student in biology classes, they were kept as separate chapters in the write-up to account for the different components of teaching that were addressed by the two overall themes.

### **4.7 Trustworthiness of the Study**

Qualitative studies have been criticised as being a “soft variety” of research (Patton, 2014). Thus, it is essential that the quality of the study is enforced by focusing on credibility, transferability, dependability and confirmability (Guba & Lincoln, 1994; Rehman & Alharthi, 2016).

#### **4.7.1 Credibility**

Steps were taken during the study to demonstrate that the research findings represent plausible information and was a correct interpretation of the participants’ views from the original data (Korstjens & Moser, 2018). As this study was completed with an interpretivist paradigm, there is an acknowledgement that the reality will be affected by the researcher. However, steps were taken to ensure that the data is conveying the participants' views and feedback accurately, such as prolonged engagement, persistent observation and triangulation (Lincoln et al., 1985).

In this study, the initial two participants had interviews spread out over a year. This ensured that as a researcher, I was able to become familiar with the setting and the context of the participants. This prolonged engagement with the participants which provided time for me to

build trust with the participants, which ensured that I could test for misinformation and obtain rich data (Korstjens & Moser, 2018; Lincoln et al., 1985). Similarly, the interviews for the second case study school were conducted after engaging with the participants over a prolonged period by maintaining contact, sharing useful resources that were found during the research, and building rapport during the conversations. This meant that I was familiar with the setting and was able to confirm the credibility of the data collected.

Persistent observation was achieved by conducting an initial exploratory focus group, as suggested by Korstjens and Moser (2018). In this study, the initial focus group was considered as an exploratory interview and was used to identify key characteristics and elements that were most relevant in supporting EAL students in mainstream classrooms. From the initial interview, it was evident that while there was a range of strategies that teachers used to scaffold and support EAL students learning in biology, further support was needed for teachers. Therefore, the following interviews focused more on the training and types of support that could help teachers in supporting the students. Furthermore, follow up questions were asked, and examples were requested throughout the interviews to ensure the credibility of the data obtained.

Patton (1999) identified four types of triangulation: method, investigator, theory and data source (Carter et al., 2014). In terms of investigator triangulation, while I completed the initial coding, a supervisor followed up the coding to ensure that accurate and unbiased interpretation was achieved in regard to the analysis and coding of the data. Data triangulation was implemented by collecting data at different times in the year and across different test sites. Online interviews, face to face interviews and focus group discussions were completed in addition to ensuring that different times of the day were used to account for any inconsistency due to these factors. Furthermore, the four participants had different levels of experience with different responsibilities

to ensure that there was triangulation across the sources of the data. While method triangulation was implemented by conducting focus group and in-depth interviews to collect the teachers' data, other methods such as document analysis and the autoethnography were used to support the data that was collected during the interviews.

Theory triangulation was implemented throughout the research process, as the four theoretical frameworks were used to ensure appropriate framing for the data analysis. The theoretical frameworks by Bronfenbrenner (ecological system), Bourdieu (cultural capital) and Moll (funds of knowledge) were used to provide various perspectives on the data, which were then combined and modified to present and analyse the overall data for this thesis, as outlined earlier in Chapter 3.

While an approach suggested by Guion et al. (2011) is to involve professionals outside of a particular field of study, this study instead involves three researchers within education but with different backgrounds. I, the main researcher, drew on my recent experience as a student and a teacher, while my main supervisor has a science education background and secondary supervisor has a TESOL background. This combination of experience provided a solid basis from which decisions about theoretical frameworks and other areas of this study were carefully assessed.

Furthermore, by completing a thesis by publication, I was able to present individual articles to professionals in different fields. For example, in the autoethnography, the analysis was reframed to consider overall manifestations of cultural capital (embodied, objectified, and institutionalised) and then the language, science and integration of both within the manifestations. These changes are intended to support the credibility of the research.

#### *4.7.2 Accuracy*

Creswell (2009) defines accuracy as an assurance that the research findings are accurate from the perspective of the researcher, participant, and the reader. Various approaches were included during the interview process to ensure that the research adhered to the accuracy of the research, as suggested by Bolderston (2012). Member checking was carried out by providing participants with the opportunity to review their transcripts. This process also further supported the credibility of the study by ensuring that the data was a correct interpretation of the participants' views. Other approaches for accuracy included quality checking of the interview questions. This was conducted by planning the interview questions prior to the interview and sharing with my supervisors. A description of each of the teachers and the schools are provided to present a realistic impression of the data to the reader.

#### *4.7.3 Transferability*

Korstjens and Moser (2018) suggest that transferability can be supported by providing a rich description of the behaviour and experiences of the participants in addition to their context. This study was kept significantly small and specific, which allows for further exploration and transferability into other similar topics. For example, while this study focuses on EAL students being supported in biology subjects, the intentions are that the methods can be applied to other science subjects to obtain similarly aligned results.

#### *4.7.4 Dependability*

Dependability of research considers the stability of findings over time. Dependability involves researchers' evaluation of the findings, interpretation, and recommendations of the study (Korstjens & Moser, 2018). This should be supported by the data received from participants of the study. In addition to providing detail on the methods within the methodology chapter, the various



research steps taken from the beginning of the project through to the development and the reporting of findings was logged throughout the study in addition to consolidating the various steps with my supervisors. By keeping accurate logs of the research process and consulting with my supervisors, the research was able to be carried out with more rigour. Similarly, this process ensured that the participants were able to participate in a more consistent and vetted research process, thereby further supporting the credibility of the results obtained.

#### *4.7.5 Confirmability*

Korstjens and Moser (2018) argue that while dependability considers the aspect of consistency in research, confirmability accounts for the aspect of neutrality as proposed by Lincoln et al. (1985). This highlights the need to ensure that the interpretation of the data is not based on the preferences and the viewpoints of the researcher; rather, the interpretations should be based on the data. This was adhered to by regular follow ups and consultations with my supervisors to ensure that the interpretations are supported by other researchers in the field and not solely based on my interpretation.

#### **4.8 Ethical Considerations**

One of the primary considerations when carrying out research is to ensure that no people are harmed physically or emotionally as a result of the research (Abdulai & Owusu-Ansah, 2014). In response to the voluntary informed consent, the participating teachers were approached through their school or a professional network. Therefore, they were under no obligation to participate in the research and had the opportunity to refuse. I endeavoured to make the participants comfortable during the interview by conducting it at a time and location (or via zoom) that was convenient for them and ensured that they were informed about the content and the procedure of the interview prior to commencing. The participants were informed that they could

stop the interview at any time and that they had the right to withdraw from the study.

Pseudonyms have been used in the study, for schools and participants/teachers, to protect their privacy. This project received approval from Department of Education and Training (Victoria) and Monash University (Monash University Human Research Ethics Committee (MUHREC) Approval - Project ID: 8384).

#### 4.9 Chapter 4 Summary

This chapter outlined how three different perspectives were used to frame the overall research question, what could be done by mainstream teachers to provide better support for EAL students and provide an overall guideline to support mainstream teachers and students. This chapter discussed the processes in collecting and analysing the data in this multi-method comparative approach qualitative study. As part of this research, data collected between 2020 and 2021 included a total of four participants, me as a participant, and various policy documents. Finally, this chapter covered the trustworthiness of this study, as well as the ethical considerations involved. Triangulations, cross-checking and other methods were used to ensure the strength of this study and that it is applicable to EAL students in mainstream science classes. The next chapter contains the first publication developed for this thesis. This autoethnographic study was written in the first year of my candidature and contains the inspirations and motives to pursue a doctoral degree and the development of the research questions framing this thesis. As was mentioned in Chapter 4, this chapter “brackets” myself as a researcher and includes my own experiences.

## Chapter 5: Autoethnography

### **Mapping a Language(s) Journey in Science; From Learning Biology to Teaching Biology: An Autoethnography**

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This paper focuses on my experience as an English as an Additional Language (EAL) student in the context of multiple emigrations and investigates the formation of my identity as an EAL science student, science Education researcher, and science teacher. The study was guided by both my innate curiosity and the research question that sought to explore which factors significantly affected my journey of developing my English language and science knowledge based on my experience as an EAL student. The second and third authors acted as critical friends to provide a layer of reliability to the study. Within the autoethnography methodology (Ellis et al., 2011), I used Bourdieu's cultural capital to frame the thematic analysis (Bourdieu, 1986). In this paper, we show how the range of factors that affected my journey of developing my English language and science knowledge can be ascribed to Bourdieu's cultural capital and we posit how support can be provided to future EAL students based on this.

*Keywords:* EAL, LBOTE, auto-ethnography, pedagogy, science teaching, cultural capital, Bourdieu, teaching strategies, learning strategies

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The teacher asks me a question. She talks really fast. But I know English. I studied English in Sri Lanka, and I was the top student in my class. I am very good at spelling big words. But I do not understand what the teacher is saying. She is waiting for me to answer. Now everyone else in the class turns to me as well. I nod yes and say, "Yes, teacher." She nods back satisfied and continues to talk to the whole class. I look at the drawing on the board and copy down the labels into my worksheet. I am not sure what I am doing. I must be doing it right because as the teacher walks

past me, she looks at my work and gives another satisfied nod. I continue to copy down the words on the picture. I still do not know what I am doing.

If I had had experience as a mainstream local student, I would have had the English knowledge to communicate and ask questions for clarification. I would have known what the teachers expected me to say when I did not understand. In Sri Lanka, it was rude to speak up to the teacher. You should stay quiet, listen, and nod. Even if I thought to say something, I did not know how to communicate that I did not understand. If I had the cultural experience of science knowledge, I would have known that it was important to know more than just the words. I would have known that I needed to understand the meaning behind the words, how the words were related and what story it was telling. I would have known how to use different tools to look up the words. I did not know that then, but I learned.

At that time, I did not know how much I was lacking in the cultural capital that was necessary to succeed in school. Bourdieu refers to cultural capital as knowing the rules for the game of life (Bourdieu, 1986). Cultural capital refers to the knowledge, skills, and behaviours that are required to succeed in society and it is transmitted to an individual within their sociocultural context (Claussen & Osborne, 2013). As a student and even as a teacher, I was unaware of my lack in cultural capital. When I started my research, my supervisors, the second and third authors, asked me to reflect on my past and how it framed me as a researcher. It was at that point, with my research and teaching experience that I noted my lack of cultural capital as an English as an Additional Language (EAL) student and within science learning. In this article, I use autoethnography to discuss how I acquired cultural capital and built on it during my journey as an EAL student studying biology and through that I answer the question, how have various manifestations of cultural capital affected me as an EAL biology students and how did I address it?

## Research Approach and Methodology

### *Why an Autoethnography?*

In this study, I engaged in auto-ethnographic research that is in line with the methodology of Chang (2016), who presents the process of conducting and producing an autoethnographic study through the understanding of self, other, and culture. This allowed me to reflect on my personal journey whilst using it to analyse and interpret my culture as an EAL student who then proceeded to become a teacher and researcher (Snyder, 2015). I also incorporated a narrative inquiry approach (Clandinin & Connelly, 2000) which allowed me to retell my experience as a story. The collaboration of three authors was guided by previous work by Zhang et al. (2020). This example inspired all three authors in this study to collaborate during the research process, allowing for a deepened approach to autoethnographic writing, beginning from the data collection process. The study is in one voice, my own.

Throughout the study, the second and third author provided a critical lens to the research in addition to ensuring that my own researcher's perspective and lens were adequately addressed in the research. They were involved throughout the analysis and discussion of the data as critical friends and during the writing up of the article. They do not use first person voice in this research as they do not speak directly about their experience with EAL students. However, they use their experiences with EAL and science teaching to support the interrogation of my memories throughout the research.

In addition to developing the idea for the autoethnography together, the second and third author were asked to participate due to their experience in their respective fields. The second author who has significant experience in languages education in both secondary and tertiary contexts was able to provide a lens based on her expertise to probe and reflect on my analysis of

experience as an EAL student. Similarly, the third author who has significant experience as a science teacher educator was able to critically review my analysis with regard to science education strategies and analysis. Thus, I was able to obtain critical feedback on the key learning areas explored and researched in this article.

Motivated to explore the phenomena of learning as an EAL student through the lens of a teacher with experience in supporting EAL students and a researcher of teaching, I wanted to retrace and describe and explore my own experiences. However, my shared experience, my reality is unique and may not align with other EAL students who may have memories of different realities. It is for this reason that I approach this research using the constructivist view that there is no single reality (Teherani et al., 2015). This ontology aligns itself with qualitative methodology (Lichtman, 2014). I provide data that is rich in detail within my contexts of an EAL student and science teacher by employing a qualitative study for exploring these experiences (Libarkin & Kurdziel, 2002).

As I explored my learning journey to elucidate the cultural capital involved, it was important to consider researcher subjectivity. As I was both researcher and participant, it was important to acknowledge that the research process involved my experiences. Ellis et al. (2011) argue that "Autoethnography is one of the approaches that acknowledges and accommodates subjectivity, emotionality, and the researcher's influence on research, rather than hiding from these matters or assuming they don't exist" (p. 274). Using autoethnography became the vehicle for my inquiry of delving into my journey.

The term autoethnography also has its etymological roots in three words: auto (self), ethno (cultural) and graphy (writing). In this context, I used autoethnography as the research method to analyse a collection of written records and memories related to my personal experiences in order

to explore and build a cultural understanding of various phenomena that shaped who I am today as a science teacher and as a researcher in search for the optimum learning spaces and conditions for EAL students (Ellis et al., 2011).

As a qualitative research method that involves narrating and or describing research data collected from personal and interpersonal experience(s), Custer (2014) notes that “autoethnography can radically alter an individual's perception of the past, inform their present, and reshape their future if they are aware and open to the transformative effects” (p. 2). I was able to reflect on my past and reflect on various aspects of my experiences that become a transformative awareness of cultural capital that could be used to support future EAL students. Similarly, readers can use my journey to rethink their perception(s) of EAL students and their journey. Rich descriptions were deliberately used to provide an understanding of the culture being studied within EAL and learning science for insiders and outsiders of those cultures (Jorgenson, 2002). Using autoethnography as my methodology allowed me to provide research that can be used by individuals who are involved in EAL and science learning as well as other individuals of teachers with limited exposure and understanding of the impact of EAL on science learning.

I conducted a reflexive and reflective methodology where I could explore the hurdles I experienced as a result of my culture, limited English literacy, and strategies I used to overcome them. My story described in this study presents how I integrated strategies whilst learning English as an immigrant student and how these impacted on my science learning. Furthermore, Chang (2016) also emphasised the need to link the narrative back to the research inquiry and the culture being studied. This supports my choice of methodology as I wanted to share a critical reflection of my schooling journey to explore the culture of EAL students studying biology. Choosing an autoethnography with myself as the participant facilitates this research inquiry examining my past.

## Motivation

Ethical permission to carry out and publish this study was requested and granted by the Victorian Department of Education and Training and the Monash University Human Research Ethics Committee. As I am the main researcher and participant, I had direct access to my in-depth experience as an EAL student who studied biology (Chang, 2016). To account for the relationship between the researcher and the researched in this study, I was conscious of my role as I collected the data. My data entailed providing rich and relevant memories together with artefacts such as photographs and documents that were reflective of my culture as an EAL student studying biology. My role as a participant required me to be critical and analytical of my memories. As the researcher, I explored the overarching themes and considered how my culture and experiences can be used to support my own students, other EAL students, and teachers. To maintain the boundaries of the roles, I noted down the commentary from the participant's perspective and separated it from a researcher's lens. I differentiated between the participant and researcher's commentary by making notes and colour coordinating my results and records. Similarly, this was followed during the analysis, where I predominantly utilized the researcher's lens and additional memories and emotions emerged. These occurrences were noted as participant commentary and participant views.

I chose to use an autoethnography due to my experience within the different roles of EAL culture and science learning and teaching. I am also a researcher investigating the current Australian classroom landscape of teaching science to EAL students in the senior years. I began by exploring my personal journey and the strategies I had used over the years, to delve deeper into how I navigated the difficult path of successfully learning science with English as my second language. Within that, I also noted strategies and suggestions that may support EAL students



studying science subjects in their final years of high school. As a former EAL student who grew to love science, I empathise with students who are currently facing difficulties navigating the learning of English and science. As a teacher who taught in schools with a high demographic proportion of EAL students and volunteered at a community centre for EAL students, I empathise with teachers who provide additional support for EAL students. This is especially relevant in mainstream science classes where teachers have not received adequate support and do not have enough resources to cater for the needs of EAL students. So, I employed autoethnography to develop a deeper understanding of what drives me as a teacher of science seeking to work with students who have challenges with English learning in Australian secondary school classrooms as well as to examine the hidden factors that brought me to this place in my life. Hickey and Austin (2007) noted that,

One of the crucial underlying beliefs of critical pedagogy and those who see teaching as something more than the reproduction of existing social relations is that a socially transformative education requires authentic knowledge of and connection with the experiences, histories and hopes of those who inhabit the margins. (p. 22)

During my research for this study, I drew upon my experiences within the context of EAL and science, as opposed to that of invited teacher and student participants. Whilst it is possible to invite and interview students and teachers, I was unaware of my cultural capital and lack thereof until I carried out and reflected on my past learning journey as a researcher. I wanted to use my experience as a teacher and researcher to analyse and discuss my experiences as a student. This duality allowed me to deeply reflect on my journey as an EAL student (Roger et al., 2018) and provide another lens to the topic of supporting EAL students in science. As a student, I would not have had the knowledge in teaching and learning strategies to describe my learning or gaps in my

learning and critically analyse my experiences. So, by conducting an autoethnography, I provided both an analytical student voice and teacher reflection. My research can then be considered when planning lessons by teachers and when carrying out research which involves EAL students.

## The Process

### *Reflection*

As I am both the researcher and the participant, my investigation commenced with a reflection of significant life events that marked my journey as firstly a student with English as a second language and then as a teacher of science. As I engaged in a reflective analysis of the written memory recollections, I gradually formed fresh insights into how I developed into the “I am” now through time and space (Custer, 2014). Engaging in autoethnographic research was a difficult and interesting task, requiring me to relive both pleasant and challenging moments that marked my path in the process of becoming who I am today. Ellis and Adams (2014) note that,

Autoethnography requires that we observe ourselves observing, that we interrogate what we think and believe, and that we challenge our own assumptions, asking over and over if we have penetrated as many layers of our own defences, fears, and insecurities as our project requires. It asks that we rethink and revise our lives, making conscious decisions about who and how we want to be. (p. 271)

However, it is these challenges and difficult recollections that allowed me to build my cultural capital of science learning as an EAL student. Therefore, I described and wrote out my memories and various recollections to explore my experiences within the two cultures. This investigation explores my personal lived experiences and important points during periods of my life in which family, teachers, and events played a significant role in shaping and transforming my

identity (Denzin, 2013). Each event, at a specific moment in my life, once located in my memory was interrogated and described by writing down the memory as a student and annotating it based on my experience as a teacher and researcher. This moment was then analysed with one of two critical friends who in turn further facilitated me in describing the cultural “representations and voices that define the experience in question” (Denzin, 2018, p. 36). Through the lessons uncovered from this investigation, I hoped to become a better science teacher capable of contributing to the success of my students who are struggling with learning science due to language difficulties.

### *Data Collection*

Autoethnography requires an extensive data collection and my data collection aligned with various strategies suggested by Chang (2016). Data collection was utilised as opposed to data generation because data generation requires the author to arrange for situations that can produce rich and meaningful data (Goldkuhl, 2019). In comparison, autoethnography does not require this as the data is already accessible and available in my memories and through the use of my recollections and various artefacts. To increase the accuracy of my recollection of events, I used various artefacts including letters, photographs, and notes from significant people in my life including family. By experiencing and documenting these events repeatedly in order to deeply analyse with rigor, the essence of each experience was challenging yet simultaneously a fascinating and transformative process. I used Chang’s (2016) autoethnographic strategies of chronicling, inventorying, and visualizing self, in this study. My personal memory was used first-hand to recall the past. I then wrote describing my lived experiences that were linked to my research focus. As the research progressed and the data provoked further thoughts, I found that, for some specific periods of time, the detail of my memories had only a very bare skeleton of

memory (Clandinin & Connelly, 2000). To counteract this, I turned to people who featured strongly in my life including family members, friends, and teachers and in so doing others were integrated into my study. To search for the detail in these experiences, I also worked with two critical friends, the second and third authors in this study, who prompted and questioned my memories asking for further detail and descriptions which could then be used to provide an overview of areas and strategies for which EAL students can be supported in learning science subjects.

### *Analysis of Data*

Chang (2016) emphasises the need to provide a meaningful structure to collected data to avoid messy fragmented results. Similar to her suggested methodology, I differentiated between data analysis and interpretation as two separate processes while balancing both simultaneously throughout the analysis process. The data analysis aspect focused on identifying excerpts that addressed common factors that were associated during my journey as an EAL student studying biology. I interpreted the data by looking at how these common factors can be applied to cultural meanings beyond the data (Chang, 2016). Strategies such as identifying recurring topics, cultural themes, exceptional occurrences, and contextualizing broadly were used to facilitate this.

These strategies led to the identification of factors and strategies that could be allocated to only EAL, that is, only science or the combination of science learning for EAL students. For example, as I was reading through my recollections of the difficulty of communicating due to my strong accent, it was evident that while it affected my communication with English, it did not significantly hinder my science learning. Similarly, using diagrams to understand the meaning behind it was more crucial in science subjects to understand the concepts. Finally, the sentence structures and format of the responses were crucial for both science and EAL. I identified three common themes as three cultures: (a) English language; (b) scientific language; and (c) integration

of English and scientific language. By respecting those three cultures, I identified my cultural capital within each of them.

Cultural capital, conceptualized by sociologist Pierre Bourdieu (1986) includes non-economic resources that enable social mobility. Examples of such cultural capital include knowledge, skills, and education. Going to school, from kindergarten through high school or university, generates a potential to build both social capital and cultural capital. How do we build social capital? We belong to groups and networks, some of which we may not even be aware. Bourdieu defined cultural capital as familiarity with a legitimate culture within a society. He saw families passing on cultural capital to their children by introducing them to dance and music, taking them to theatres, galleries, and historic sites, and by talking about literature and art over the dinner table. In my family, this form of capital was passed on by my parents who valued the sciences and who supported me with many hours of homework support and interest in my assessment school results.

Cultural capital defined by Pierre Bourdieu (1986) is also cultural currency in exchange of social activity. Olneck (2000) refers to the work by Bourdieu (1986) in which the authors refer to linguistic and literacy practices, mastery of prescribed vocabulary, and standard pronunciation and grammar as aspects of cultural capital. They discuss how this includes particular forms and styles of expression and patterns of responses that are not directly related to linguistic competence and intellect. Olneck (2000) also refers to a variety of studies in which difference in cultural capital has influenced how various teachers interact with their students (Collins, 1989; Heath, 1982). In addition to the distinction among individuals due to their cultural capital, it is inherited and reproduced. I will use this definition of cultural capital to differentiate between the three different cultures of English learning, science learning, and the integration of the two.

The purpose for differentiating between the three cultures is such that I can analyse the factors that are linked to my learning within the three cultures. By identifying factors within these cultures, I can provide more targeted findings for researchers and educators who can then provide more relevant outputs. For example, teachers can provide appropriate support depending on which area their students are struggling in, and educators can address the support within different areas. Furthermore, while lacking in cultural capital in the dominant culture can be detrimental, Ball (2003) discusses how middle-class groups have made complex and sophisticated use of a range of forms of cultural capital in education. As an EAL student from a middle-class family, I look at how I have utilised and acquired cultural capital within the three cultures of science learning, EAL learning, and dual proficiency of both science and English learning.

Once these three cultures were identified, I explored all the different factors that I had used and advantages that had been passed on to me within those cultures. In addition to Bourdieu's (1986) definition of skills knowledge and behaviour which lead to cultural capital, I also used the definition by Jaeger (2011). They consider indicators such as reading habits, educational resources in the home, extra-curricular activities, and other factors that demonstrate cultural capital or influence an individual's cultural capital. For example, while strategies such as annotation (Miller, 2009) and use of dictionaries (Safford & Costley, 2008) have been discussed in studies, the expanded meaning of cultural capital allowed me to refer to other behavioural strategies I used. Some examples included explaining various concepts to my parents in another language and waking up early to establish a better pattern for studying. Including the expanded meaning of cultural capital by Jaeger (2011) allowed me to demonstrate that in addition to specific academic strategies, there was a range of behaviours and practices that I used to overcome my lack of cultural capital across the cultures of English learning and science learning. Thus, this

expanded view of culture and cultural capital within the autoethnography methodology allowed me to provide a well-rounded view of my experience as an EAL student studying biology.

### *Organization of Results*

As I progressed through the analysis of the range of cultural capital within each of the cultures, it was evident that within cultural capital, the strategies and the factors that affected me could be classified into three overall groups. These groups were

- training from my parents and background that I already had or received
- tools and resources I used
- adapting to meet the school and assessment board requirements

As a teacher, it was evident to me that I had advertently addressed these three areas when I was supporting my students. This was most likely due to my experience. I would get to know my students and focus on various aspects depending on their point of need. Further research into the literature demonstrated how these three groupings aligned with Pierre Bourdieu's (1986) manifestations of cultural capital:

- the embodied state (personality, speech, skills),
- objectified state (clothes or other belongings)
- institutionalised state (education or specialised knowledge)

Given these varied elements, Bourdieu's cultural capital is difficult to measure objectively. It can however be understood and explored subjectively. I use these manifestations to organize my results and identify what capital I had and lacked within the three different cultures of EAL, science learning, and dual proficiency in English and science. The findings and the areas discussed areas can then be used to support EAL students studying science subjects.

### *Rigor and Trustworthiness*

Throughout the research, steps were taken to ensure that rigor and trustworthiness of the study. Analytic autoethnography was used and notes and chronicling of data and memoing was carried out throughout the data collection to ensure transparency of methodology (Acosta et al., 2015). Similarly, the methodology was explicitly detailed and described to ensure transparency (Acosta et al., 2015). I regularly conducted debriefings with the second and third author throughout the study and we collaboratively examined previous research to ensure credibility (Anderson, 2006). Collaborating with the two other researchers allowed them to contribute to the data generation, analysis, and writing. This allowed us to produce a multi-dimensional perspective on the EAL culture being studied and in turn, the research (Chang, 2016; Lapadat, 2017). This contributed to the overall rigor of the study as well as the trustworthiness.

### *Limitations of the Methodology*

The purpose of qualitative research is to examine any social phenomenon by enabling the researcher to go into the participants' naturalistic setting and try to attain a comprehensive understanding of it (Bryman, 2008). Autoethnography, as with all such research methods, has advantages and disadvantages. Sparkes (2000) states that "autoethnography and narratives of self. . . has not been trouble-free, and their status as proper research remains problematic" (p. 22). Criticism and the limitations of autoethnography centres on the strong emphasis on self (Atkinson, 1997; Coffey, 1999) and how it is a story of the past as opposed to the past itself (Ellis & Bochner, 2000). However, newer research has acknowledged the many advantages of an autoethnography such as allowing the researcher to explore and portray the culture in which a phenomenon is being experienced. This cultural knowledge can help in the understanding of the interpretation taken from participants' accounts and the "reality" presented. Although presenting the "real"



truth is something we cannot fully represent or capture through reflection, qualitative methods can help us to better understand a phenomenon in a given community or setting (Flick, 2002). By exploring my journey in this article, I want to enable the reader to enter the world of an EAL student to feel and understand the factors that were involved in a journey of developing English language knowledge whilst simultaneously learning science (Méndez, 2013).

## Results: My Story

### *My Journey... Sri Lanka and My Experiences of Rote Learning...*

My earliest memory of learning English is waking up at 5am and writing down spelling words. I would wake up and sit at the dining table as my parents made me copy each word 5 times with no mistakes and 10 times if I made a mistake. This was because the tuition class I went to for English would have a spelling test at the beginning of each class. In Sri Lanka, small private group classes or individual classes that are provided outside school are called tuition classes. They are run by individuals who have some expertise on the subject being taught. From the age of 7 I attended tuition classes to learn English. However, for the spelling tests, there was no need to even learn the words' meanings as the test only assessed accuracy of spelling. I remember vividly instances when I was so sleepy in the mornings that I would lie down on the dining table and write my words while I was still half asleep. Nevertheless, the effort my parents and I put in would always show on the day of the test. I would always receive full marks on the spelling test and achieve special recognition from my tutor in front of all my classmates. Rote learning was relied upon heavily when I was young in Sri Lanka. I remember my father making me write down the number seven repeatedly because I was writing it incorrectly.

Rote learning is described as a method of learning that uses repetition. As a variety of studies have described, most immigrant students, particularly from Asian backgrounds are likely to

rely on rote learning. Angelo (2013) discusses how many EAL students use simple short correct texts they have learned by rote. By doing so they avoid editing and constructing sentences, this in turn does not allow time to practice writing their own sentences and developing their own ideas in English. Yu (2017) describes this as the avoidance phenomenon in writing because students want to avoid making mistakes.

Similarly, the research by Robles (2008) discusses how many of the participants from Asian cultural backgrounds relied on acquiring knowledge using traditional methods such as rote learning. His study also revealed that once these students arrived in Canada and were exposed to other methods, they had an affinity and preference for self-directed learning. The biggest advantages of self-directed learning are suggested to be the ability for the student to learn at their own pace, in their own style and own terms. While it seems to be a traditional and superficial method of learning, Kwan and Mafe (2016) note that learners such as medical students use rote learning to memorise a vast amount of content. The authors point out that superficial knowledge needs to be learnt prior to carrying out complex understanding. They also state that rote learning is an unfortunate but essential part of medical school training and learning for them.

**Figure 1**

*School Photograph from Sri Lanka*



Currently in Sri Lanka, Sinhala and Tamil are the official languages, English is recognised as a second language and is spoken by 24% of the population (Department of Census and Statistics, 2001; Multicultural Health Policy Unit, 2014). In terms of the medium of instruction used in schools, 2016 data shows that 11% of schools in Sri Lanka have English as a medium of instruction. However, the statistics do state that in terms of students studying in English medium, 30% of them are from the Western Province, which is where I was originally from.

My school was established in a developing area and consisted of a lot of students from middle class families as evidenced by my uniform in Figure 1. Whilst people from rural areas were not as focused on building English knowledge, people from similar demographics to my family were learning at least basic English at school. However, the level of English taught at school was very low and only the basic vocabulary and expressions were taught. In comparison, wealthy students had the option of attending schools aptly named “International Schools.” All subjects at these schools were taught in English and anyone who spoke in a language other than English was

punished. While this was a harsh system, it also meant that students were immersed and forced to communicate only in English. This accelerated their proficiency to a native-like standard. In comparison to the amount of English I learnt, students at International Schools were significantly more fluent in English than I was at their age. Nevertheless, when I was young, only the wealthy could afford such schools. Therefore, if one wanted their child to be proficient at English, they had to send them to extra classes outside school.

From the age of 7 I attended not one but two tuition classes. One class focused on the vocabulary where the main purpose was to learn words and their spelling. I remember my parents being frustrated that whilst I learnt the accurate spelling of words in class, I did not learn their meanings. My teacher briefly explained the meanings when she assigned the words for the spelling test, she did not further test these meanings or my understanding of the words. So, my parents and I did not put as much effort into learning the meanings. The second class focused on applying the words. This involved copying many sentences and reading poems. I relied more on memorising or rote-learning the sentences and poems, so I was able to re-write them, but it would have been far more challenging for me to explain the poem or answer any deep questions. My learning was specifically focused on the vocabulary and memorisation of the poems rather than on any understanding of the meanings of the expressions, words, and sentences.

Something I remember that really helped me when I was learning English as a child, was a series of picture books. These books had a story that continued throughout the book. However, each sentence was accompanied by a picture and each sentence was written in Sinhalese, English, and Tamil. While I had minimum knowledge of Tamil vocabulary, I solidified much of my English knowledge through these books. As I developed a basic knowledge of the words, when the Sinhalese sentences were corresponding with the English sentence, I already knew the meaning of

the sentences. From then on, the challenge was to determine which word corresponded to which meaning. However, as I continued to read, I became faster at deducing the meanings and became more familiar with the words and the context they were used in. Furthermore, because it was simply a storybook, it did not feel like homework, or a chore and I was able to enjoy the learning experience.

#### **An Apple Does Not Fall Far From the Tree... My Parents' Background and Proficiency in English.**

My parents were both university graduates, so they had more exposure to English than most people from lower socioeconomic backgrounds. I believe that due to this they were able to support me in developing my English. Most EAL students, especially refugee students, would not have the luxury of having parents who are competent in the English language. While this topic will be discussed in greater detail in the emergent themes section, research has demonstrated that parent's education can positively influence the students' achievement (Steinmayr et al., 2010).

Due to their proficiency in English, my mother attempted to communicate in English with me during our day-to-day lives. However, during my younger years, I lacked both the proficiency and confidence, so I did not respond to her or find her attempts at involving me comfortable. She states that as I grew older and learnt more, I was more likely to respond. She also notes that I did not like speaking in English in public and did not like her speaking in English to me in public because I was too embarrassed to do so in front of my friends. This pride and embarrassment of speaking in my second language has been studied by Pagett (2006). Furthermore, whilst I was embarrassed about speaking in English in Sri Lanka, when I moved to Canada and Australia, I was embarrassed to speak in Sinhalese. I believe this can be attributed to me trying to retain my social capital and trying to be like everyone else in that environment (Pagett, 2006).

## A Diet of Vocabulary, Vocabulary and More Vocabulary – The Goal of Learning English.

In Sri Lanka, the best method my parents and my tutors could determine to introduce me to English was making me learn vocabulary and spelling. My parents always held the dream of migrating to a Western country. It was made clear to me from a young age that this was our family's future. To make the transition smoother, they wanted to ensure that my sister and I had a solid foundation for our English learning. Even during those years, as my father recollected in a conversation with me for this paper, a considerable percentage of the Sri Lankan population could communicate in English.

A challenge I faced was the avoidance of writing. In terms of vocabulary, I remember thinking I needed to use impressive superordinate and complex words. This phase is also documented in the literature for EAL learning as there is both a challenge and emotional trepidation when using synonyms inaccurately, the negative transfer of native language and paraphrasing and rephrasing of sentences (Yu, 2017). These were also my experiences when writing English. I can still recall emotions of discomfort bubbling up at the thought of writing in English even today. While it is expected that EAL students face linguistic challenges, this is best addressed when teachers are aware of such challenges. They can then support the students by providing more input in terms of vocabulary and expressions, modelling the use of a range of words, ensuring students are expanding their vocabulary, and correcting their errors and encouraging them to try and decrease any stress and anxiety. I believe as I became more confident with my English ability and more comfortable in my environment, I experimented more with my vocabulary. I have vague memories of wanting to master more and more words in English; I innately felt that the more words I had the more arsenal I was accruing in the fight for writing in English and pleasing both my parents and teachers.

Nation (2006) proposes that if 98% of text needs to be understood to comprehend it, then an 8000 to 9000 word-family vocabulary is needed for written text and 6000 to 7000 words for spoken text. This is supported by Cameron (2002); the mainstream subject teachers in his study pointed out that the students' lack of vocabulary in English was a major factor for failure. Burgoyne et al. (2011) and Stuart (2004) found that lower levels of vocabulary knowledge significantly limited EAL learners' comprehension of spoken and written texts. Burgoyne et al. (2010) also recommended implementing methods to support the learning of vocabulary prior to Grade 3. So, while the method of rote learning vocabulary was not the ideal method, the learning of vocabulary at a young age supported my development of English literacy.

#### **Advantages of Bilingual Reading.**

By stumbling on my loved strategy as a child of reading content in two languages at the same time, I was applying bilingual concepts instantaneously. I inadvertently compared the structure of the sentences because the sentences of my two different languages were written simultaneously on the same page. Studies have found that dual-language learning can provide bilingual reading advantages. For example, a study by Berens et al. (2013) states that when learning to read two languages, learning them simultaneously is more beneficial for students. This study found that 50-50 (simultaneous) dual language learning paired with phonological training during the early school years was the most beneficial and long-lasting method of bilingual language learning. This is supported by Cummins (2000) who stated that concepts and ideas learned in one language can be transferred to other languages. Therefore, as stated by Bruen and Kelly (2017) a strong foundation in the student's first language will allow them to form connections to the second language and obtain literacy and fluency in both languages. This is supported by Joyce (2018) who found that students who learnt vocabulary through L1 translations

had better results of L2 vocabulary recognition compared to learning L2 vocabulary through L2 definitions. Similarly, Yang et al. (2013) state that identifying differences in forms, functions, and structures between the first and second language can help the students to form sentences.

### *A Dream Realised - Canada - Learning English in a Western Country*

When we finally migrated to Canada in 2001, I was able to understand basic words and carry out a simple conversation in English. However, once I arrived in Canada, I realised that there was more to communicating in Western countries than learning the language alone. One of the major issues was my accent and the speed with which others spoke. It took me a few months to get used to the accent and the speed and I realise it was easier as I was so young. I know my parents faced more difficulties with the accent and the speed. While they were very proficient in English, the accent was new and to a certain extent, it was similar to learning another language or another dialect. One example that is a running joke in my family is when my father went to work and one of his co-workers asked him, "You came today?" It took a couple of seconds for my father to realize that the co-worker was not asking, "you came to die?" Whilst this is a minor misunderstanding, it demonstrates how even people who are proficient in English can face challenges when they migrate to a Western country where English is the main language. This is supported by other studies which found that despite having the ability to speak English, there are many students who experience accent-related problems, particularly in educational settings (Gilakjani & Ahmadi 2011; Park et al., 2017).

Learning English in Canada was accomplished as I learnt other subjects. While I was assessed as an English as a Second Language Student, I was not given any additional, separate, or any extra learning opportunities because I was from a non-English speaking background. In my first year in Canada and in my year level, I was the only migrant student and in the whole school



there were only a limited number of EAL students. I remember not being able to form a connection with the one Sri Lankan student at my school. This is because despite her being from a Sinhalese background, she had gone through different experiences, and we were very different. Therefore, I am glad now that as migration is becoming more common, most EAL students are not alone when they are settling into new schools. I was overwhelmed as I recalled memories from Canada. They brought with them an immense loneliness, an emotion that aptly frames these years in Canada. My solace at that time was in doing well at school, yet I yearned for real friends.

While maths was the most straightforward subject for me, English and science proved to be the most challenging. This was evident by the amount of effort I had to put in. Even more than English, science was complicated because I had to communicate my thinking. English generally involved reading comprehension which I could understand. This is showcased by various comments in my reports over this period of time living in Canada, by my English teacher who was also my homeroom teacher: “She has demonstrated her ability to read short stories/dialogues accurately and expressively. Reading story books will help her to further improve her writing and reading skills” (Grade 4 Report, 2002).

This teacher was my homeroom and English teacher in both Grades 4 and 5, so she was able to monitor my development over the year. Therefore, her feedback in Grade 5 links back to her comments in the previous year.

Primani has gained more confidence in her reading. She reads with great expression and enjoys reading. She self-corrects using picture and contextual cues and is reading very fluently. She is developing stronger word attack skills such as using phonics to sound out unfamiliar words. Primani is beginning to use the stages of writing (rough draft, editing etc.). (Grade 5 Report, 2003)

This is accurate and supports my main strategy for improving my English literacy skills. As a passionate reader, I read many storybooks. Whilst I still preferred the Sinhalese storybooks we brought from Sri Lanka; a lack of new content meant that I was forced to read English books if I wanted to read new stories. So, I was able to familiarise myself more with the language. The added benefit was if I did not understand a specific word, I could deduce the meaning or move on without knowing the meaning because one word generally would not have a significant impact on the story. These factors also resulted in improvement of my comprehension skills because there was no need to understand every single word to read and understand a passage or story. I could now read effortlessly without worry. The more I read, the more I became familiar with the words and the English language.

In comparison, whilst science involved reading, it also involved remembering, applying the knowledge I learnt and creating content using that knowledge. I remember so clearly in Year 4 learning about the parts of the heart. My mother would copy diagrams of the heart and I would label an endless number of diagrams one after the other. This was the method that she had been taught when she was young and so she used this same method with me. Once again, I could label the parts of the heart perfectly with accurate spelling, but my limited English meant that I did not understand the movement of blood in the heart or the function of the heart itself. So, despite the amount of effort I put into learning the parts of the heart, I did not perform well in the tests and class participation as I could only demonstrate one aspect of the topic that was being taught. My lack of confidence in the class is reflected in a quote by my science teacher in Grade 4: "She speaks very softly in front of the class" (Grade 4 Report, 2002).

My experiences and reflections strengthen the importance that teachers need to remain open-minded and empathetic and consider their students' backgrounds. Whilst low marks may

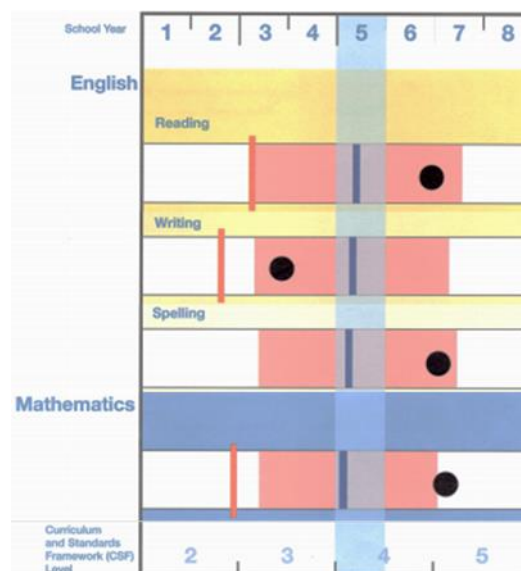
suggest that students are not putting in enough effort into their studies, teachers should take the time to investigate the students' background and circumstances. They should ensure that they address the root of the problem as opposed to the results. For example, as my English improved, my science marks continued to improve, and I felt more comfortable in classes. However, the amount of work I carried out did not vary significantly. Therefore, I attribute the improvement of my marks to my improvement in English. I began to understand what was being said during the class significantly more than when I first arrived in Canada. I remember still how sad and disillusioned I would be after working harder than my classmates but receiving lower scores. Teachers need to be aware of the disappointment that students feel when they put in the effort but do not reap the rewards due to language barriers. This also highlights the need to ensure that EAL students are studying effectively both at school and outside school.

### *Migrating to Australia – Primary School Memories*

I arrived in Australia after studying in Canada for 1 ½ years. I started school in Grade 5 at a school in Dandenong, a linguistically and culturally diverse suburb of Melbourne, Victoria, Australia, approximately 30 km south-east from the central business district. At this time, I was fluent enough to fit in with other students. Whilst I still had my accent, I was able to communicate and understand both teachers and students. With still some limitations in my English proficiency, the school and its staff were better equipped to address the needs of EAL students. There were many migrants in Dandenong and my school had many Sri Lankans with teachers who had more experience working with EAL students. My transition was very smooth compared to Canada. In terms of the content taught, the material in Grades 5 and 6 was not as complicated or challenging as the curriculum in Canada. Science was taught as a specific subject in Canada while my Australian experience placed more emphasis on basic maths and English. This meant that I could

develop my literacy skills through tasks such as making speeches, writing post cards, creating PowerPoint presentations, and helping make year books. Using these different methods to apply my English knowledge helped me to develop my reading and writing skills further than merely relying solely on reading. The greatest advantage of my learning experience in my Australian primary school were the different opportunities I received to apply my English knowledge. The modified tasks and modified assessments provided me with more opportunities to demonstrate and develop my knowledge (Allen & Park, 2011).

**Figure 2**  
*NAPLAN (Formerly AIM) Test Results for Grade 5*



*The Australian Curriculum Assessment and Reporting Authority (ACARA) (2003)*

The limitations of my literacy skills are evident in The National Assessment Program - Literacy and Numeracy (NAPLAN) test results presented in Figure 2 above. Formerly known as The Achievement Improvement Monitor (AIM), in 2008, the Australia-wide NAPLAN tests replaced the AIM program. As the largest and most significant national program, NAPLAN provides data on student learning in literacy and numeracy and this data is used to inform the development of strategies to improve literacy and numeracy skills.

In Figure 2 above, the emphasis I placed on my spelling is clear as my spelling, reading, and maths results were above average. As indicated by the black dot on the scale, I am at Year 7 level with reading, spelling, and high Year 7 level with mathematics. However, my writing is indicated I was achieving at Year 3 level. This highlights the challenges I faced in terms of writing and creating written pieces in comparison to memorising the spelling and deducing the meaning of unknown words. Nevertheless, this AIM test was carried out in August in Grade 5. It was only a brief time after I arrived in Australia. During my time in primary school in Australia, the multiple opportunities I had to practice my writing had significantly improved my writing skills.

### *Australia My Learning Journey Continues... Early Secondary School Years*

By the time I began secondary school I was confident enough in English to be comfortable in my classrooms. The difficulties I experienced in Canada started to resurface during subjects such as history, geography, and science. These were subjects that required me to understand the material and apply that knowledge by creating comprehensive meaningful pieces of writing. While English was challenging in terms of written expression, the subjects discussed above were more challenging. Despite my knowledge of the content, I would always lose marks on questions that included words such as discuss, explain, or analyse. These were the instructions and verbs that necessitated writing down my ideas and demonstrating my thinking by using the content that I was taught. In Year 7 science, I received the feedback that “She generally follows the correct format when writing her practical reports, but more practice linking the aim and conclusion and formulating a hypothesis would be useful” (Sacred Heart Girls' College, 2005). Feedback such as this demonstrates that while the content knowledge was challenging at times, the difficulties were prominent in my written expression of scientific content. It is evident that I had memorised correct structures to use but I was still lacking the knowledge to construct my own sentences. This can be

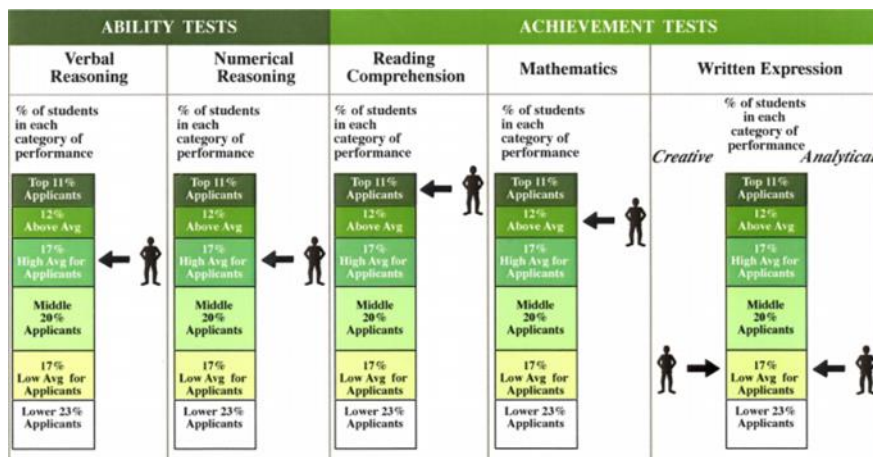
attributed to the avoidance phenomenon referred to by Yu (2017) in which a student is reluctant to explore terminology and content at a deeper level. Furthermore, a newer environment meant that I was once again involved in an unfamiliar culture. Because I did not have enough cultural capital in this field, I did not know how to communicate my ideas and how to express myself within this culture. So, I once again needed to incorporate a range of strategies to assimilate within the culture of academic language in history, geography, and science.

As I was proficient in English at that stage, I experimented more with the strategies I used to study science. One of my main methods was by improving my note taking. I had in the past relied on simply copying the notes from the textbook or the teacher's notes, I then started to create my own notes. This involved reading a certain chapter or page and writing down what I remembered. I would then make the connections with the content I remembered. This forced me to use my limited English and science knowledge to create pieces of writing using the content. As Watts-Taffe and Truscott (2000) note, I combined my writing with other forms of visual expression and diagrams to express my ideas and knowledge. This is also addressed in feedback from my English teacher: "Primani is encouraged to read widely to aid her comprehension and to help extend her vocabulary and also to include more written pieces in writing folio to develop her ability write effectively in different genres" (Year 7 English Report 2005).

Another challenging aspect of science was that it involved additional and subject specific vocabulary. I was still facing difficulty learning basic English vocabulary, having additional vocabulary to learn and comprehend put further strain on my learning. One of the methods that I relied on heavily during that time was to draw my own diagrams (Watts-Taffe & Truscott, 2000). Firstly, it helped me to picture the process or concept being taught. It also helped me to visually illustrate the diagram and use tools and my own edits to help me remember. For example, with

the digestive system, I would draw the person and the organs as I mapped the journey of food as it went through the system. To help me remember new terminology such as peristalsis, I would draw little marks on the oesophagus to represent the movement and label it as peristalsis. The key was to incorporate as much of the content knowledge as possible into the diagram. This also meant that I was understanding the content being taught as opposed to memorising it.

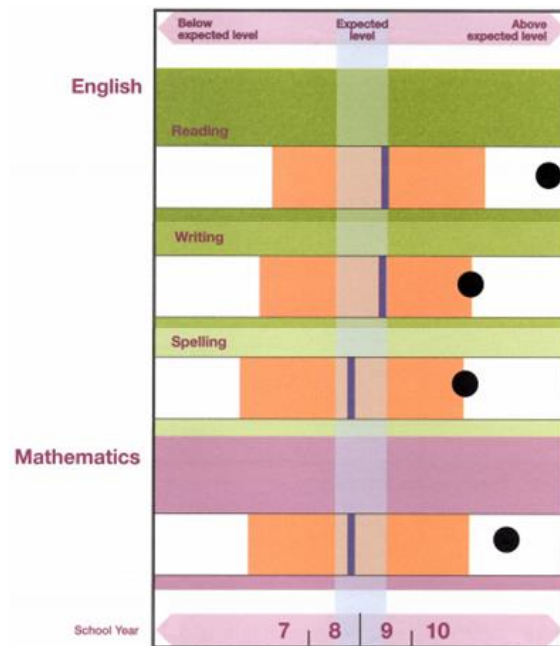
**Figure 3**  
*Ability and Achievement Tests*



*Australian Council for Educational Research (Australian Council for Educational Research (ACER) (2006)*

I was accepted into a selective entry school in Year 9; as seen in Figure 3, the results summary demonstrates that in comparison to my other results, my written expression was still lacking.

**Figure 4**  
*Reading versus Mathematics*



*NAPLAN (Formerly AIM) Test Results for Year 9 (The Australian Curriculum Assessment and Reporting Authority (ACARA) (2007)*

In my Australian Council for Educational Research (ACER) selective entry exam results, whilst all other sections were above the top 17% of applicants, the written expression percentage for both creative and analytical writing was at or below 17% of the applicants. This reveals how challenging it was for me to develop my written expression compared to other literacy skills such as verbal reasoning and reading comprehension despite the many years of immersion in English classrooms. Nevertheless, in comparison to the Australia wide cohort, my writing skills were above average as demonstrated by further NAPLAN (formerly AIM) results shown in Figure 4. At Year 9, my reading and mathematics were above the expected level. However, in comparison, the two dots for writing and spelling are at Year 10 level. While this is still a good score, it continues to demonstrate how challenging it was for me to improve my writing as opposed to my mathematics and reading.



### *My Senior Years... Learning Biology*

Based on the Victorian Certificate of Education, (VCE) examinations held at the completion of secondary school which qualify students for entry to university or further study, I did not qualify for EAL status and the EAL examination due to having left Sri Lanka 8 years before. The criteria for EAL eligibility states that students should “have been a resident in Australia or New Zealand or other predominantly English-speaking country for no more than seven years” (Victorian Curriculum and Assessment Authority, 2017). I was forced to compete at state level with students who had studied English as a first language.

#### **The Unusual Practice of Storytelling for Learning Science.**

I completed my final Biology VCE subject one year earlier than expected. I completed my other final year subjects of English, Mathematical Methods, Specialist Maths, Physics, and Chemistry in my final year of secondary school. As I continued to use the strategy of using visual representations to link and understand concepts, another method I relied on heavily during this time was storytelling. This entailed explaining a certain concept or a process as a story to a family member or friend. For example, in the case of DNA replication, I would tell the story of what happened to the strand of DNA and how the initiator latches on to the A-T rich segments and would separate the two strands as a very dramatic storytelling. At this point I was confident in English so I could use the English language to incorporate the knowledge I obtained to create my own story. My deep understanding was evident demonstrating how and why the process occurred. Furthermore, another benefit of storytelling was that sometimes I would have to tell it to my grandmother who was not fluent in English. So, I would use English terminology in English and say the rest of the story in Sinhalese. This unlikely and creative strategy helped to further consolidate my understanding of scientific concepts.

## Australian University – Bachelor of Biomedical Science

I believe, the various techniques I utilised were fairly effective as I received a study score of 41 out of 50 for Biology. Furthermore, I went on to complete a bachelor's degree in Biomedical Science. In terms of learning, I continued to use strategies that heavily relied on visual, auditory, and kinaesthetic strategies. Some of these included discussing and explaining various concepts in a hybrid of English and Sinhalese and making posters and summary charts which I hung up around my room. The advantages of mixing the range of senses during learning has been explored extensively in a variety of studies (Anastopoulou et al., 2011; Husty & Jackson, 2008; Moayyeri, 2015). I remember clearly that it was during these years I did not feel any disadvantage as a result of my previously limited English.

I worked part time as a private tutor during my bachelor's degree. I tutored and taught maths and science to high school students. Most of my students were either Sinhalese or from non-English speaking backgrounds. They came to me because they had difficulty understanding certain content discussed in class. I believe my background as an EAL student helped me to identify with them. Many of the techniques that I utilised and continue to utilise are strategies that I used when I was a student. One such strategy promoting differential learning for my students involved structuring multiple methods of learning. For example, I would close the book and ask a student to tell me the story of the food bolus as it goes down the digestive system or I would create an empty table and ask the students to fill out the information in the table to create their own set of notes. Similarly, the community centre I volunteered at carried out a homework club program where students could come and receive extra help for any subject. There were many migrant and refugee children who used the resources to receive the additional help. I continued to

share my strategies with EAL students during these experiences. The rewarding experiences during this time motivated me to pursue teaching as a career.

### From Learning to Teaching – Australian Master’s Degree in Teaching

One of the most satisfying experiences during my master’s degree as a pre-service teacher was understanding the theoretical frameworks behind the various strategies that I had used as a student. Learning about the use of differential learning, incorporating learning styles and paradigms such as constructivism showed me that there was a reason and support for the strategies that I had utilised. I felt at that point that I had come full circle, what I had instinctively done to survive, understand, and ultimately thrive as a learner, now had a name!

During my school placements, I realised that I tended to empathise a great deal with students from non-English speaking backgrounds. I believe that proved to be advantageous for me. During one of my placements, I realised there were a group of boys from diverse backgrounds sitting at the far back who tended to be more disruptive. So, after I had assigned them a task, I was walking around, and one boy was being more disruptive. When I asked him why he was not doing the assigned task he complained, “but I don’t know what to do Miss,” so I sat with the student and explained what he had to do, which was to complete a table with the functions of the cell organelles and write down an example of something in real life which performs the purpose. As I was going through it, I could see the student getting more animated and volunteering information. Working together, the group came up with very creative examples to remember the functions of the cell organelle. Therefore, while it is easy to dismiss the student and give them the same instructions, having experienced the challenges of not understanding the teacher, I tended to empathise more with EAL students. This was an example of how providing that additional help to make up for the language barrier can have a significantly positive impact on students.

## My Ultimate Challenge - Research

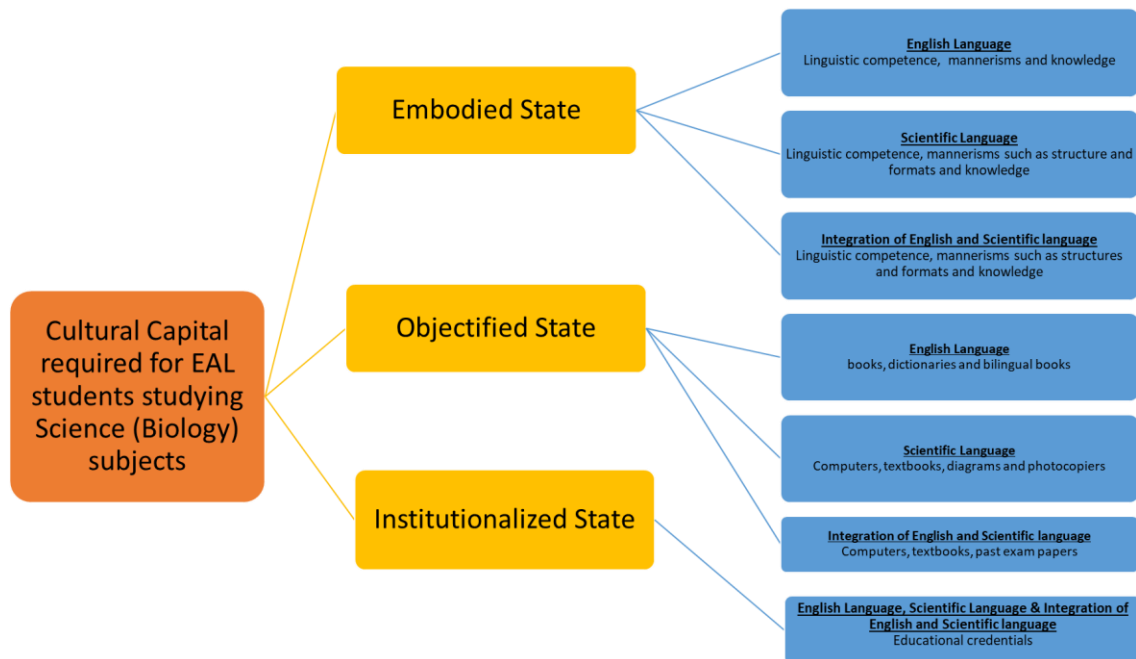
As I carry out my research on methods to support EAL students, I continue to learn about diverse strategies that can be used to support EAL students. I am now truly grateful that I have had first-hand experience of being an EAL student. I understand more about the EAL students' point of view. I can impart the lessons I learnt due to the challenges I faced and the strategies I used. Overall, my philosophy for any student and especially a student learning a science subject, is "I don't want you to memorise, I want you to understand."

## Discussion of My Findings

In this section, I discuss the overall themes I discovered as I collected and generated my data. As the data were presented in a chronological order, the elaboration on the various strategies were provided simultaneously within the research. However, my inquiry was how the advantages and disadvantages I experienced can be classified and how from these I could generate an overall framework that could be used for supporting teachers, students, and parents. For this purpose, I developed a framework using Bourdieu's cultural capital as seen below in Figure 4. In the following section I will discuss how my reflections and experiences were understood in terms of cultural capital and how this was applicable within the cultures of language, science, and the integration of language and science.

**Figure 5**

*The Framework for Analysis of Cultural Capital of EAL Students Studying Science*



Pierre Bourdieu states that an individual and their family's background is associated with a certain number of resources. He calls these resources a form of capital (Bourdieu, 1986). This is similar to economic capital which refers to an individual's economic resources and social capital which refers to the individual's social networks and connection. Gaddis (2013) refers to Bourdieu's metaphor of life as a game. In that context, the cultural capital refers to the resources that the individual has that can be used in the game and habitus is the individual's disposition that refers to their feel for the game. Therefore, if an individual possesses cultural capital, they know the rules of the game.

Bourdieu states that cultural capital can be inherited by the children from their parents. This can occur by being exposed to the parents' capital or deliberately through parents (Cheung & Robert, 2003). This cultural capital is embedded in the individual habitus as stated by Bourdieu. The habitus includes aspects such as the individual's knowledge, language, and mannerisms. The various cultural socialisation advantages provided by the parents leaves their children with a

certain level of cultural capital (Kraaykamp & Van Eijck, 2010). To study the effects of how my culture affected my learning, it was important to be aware of how much and what types of cultural capital I possessed.

Research has also demonstrated that academic achievement and occupational attainment are greatly influenced by people's family of origin and their parents' educational experiences (Tramonte & Willms, 2010). In relation to education, the authors state how students who possess a higher level of cultural capital better meet school standards; they are accepted into college and achieve a high level of education. The authors argue this is because schools inadvertently select for linguistic structures, authority patterns and types of curricula. Students from high SES backgrounds would have been brought up to be familiar with these expected factors. Therefore, they feel comfortable at school. This is evident in my experience as a student. Due to my parents' completion of higher education, I was aware of the structures and patterns involved in the path to higher education. In comparison, parents of students from low Socio-economic status (SES) would not have the skills, habits, and knowledge needed to fit into this cultural construct.

Therefore, I have expanded my definition to match with the definition of relational cultural capital as described by Tramonte and Willms (2010) to analyse the themes that emerged in my journey as an EAL student. The authors define relational cultural capital as the cultural capital that is present in the interactions between the parents and children such as discussions between parents and children about social, cultural matters, and school activities. As my interactions with my parents played a significant part in my educational journey, these factors have been included in my definition of cultural capital. Some examples include me explaining content to my parents, discussing various aspects of the tasks to my parents and discussions on where I lost marks. Even discussions in which I came home and complained about the homework can be considered a

discussion which helped my parents follow my progress in school. In relation to Figure 5, these factors and discussions will be included in the embodied state because the relational cultural capital links to the embodied manifestation where the capital comes from within the individual and within the social interactions passed down from parents. These attributes can then be used to interact in society and achieve success.

### *Emergent Theme 1: Embodied State*

#### Language as Cultural Capital.

I have considered language as cultural capital and analysed it with respect to the three manifestations put forward by Bourdieu (1986). The first manifestation I consider is the embodied state of cultural capital. As discussed by Kraaykamp and Van Eijck (2010) the embodied state refers to the cultural capital in the form of long-lasting dispositions of the mind and body. The authors state that embodied cultural capital is associated with the person's body, which includes the brain. It requires a lifelong process and it take place unconsciously. So, Bourdieu theorizes that embodied cultural capital is external wealth that is tied to the person's body including their brain or cognitive abilities.

As evidenced by this, my initial English knowledge was influenced by my parents. My limitations in English and my accent which were passed on through my parents affected how I socialised and how confident I was. The development of this aspect of cultural capital was only possible through increased socialization with my peers and participation in groups. Therefore, in terms of supporting the development of embodied state of cultural capital for English language, teachers should encourage students to work with other students and communicate with other groups.

Cheung and Robert (2003) note that cultural capital can be passed down to children by being exposed to their parents' cultural capital or actively by parents. In addition to the limited English, I was exposed to with my parents, they used their limited cultural capital to actively invest in transmitting their cultural capital to me. For example, they used methods that they had used when they were young such as rote learning and focusing on vocabulary as discussed in the results. They used private tutoring for English from a young age to support the development of my English literacy skills. It is evident that other migrants carry out similar activities to support their children when they become aware of the lack of cultural capital in the area. For example, a study by Jamal Al-deen and Windle (2015) discusses how parents will pay for private tutoring and use various connections or take them to storytelling programs at the local library to promote higher levels of cultural capital in their children.

However, the limitation was that some of these strategies such as my rote learning of spelling words, were not completely compatible with the cultural capital of the language that was utilized in Canada and Australia. This is described as devaluing or conversion of capital under changed circumstances (Jamal Al-deen & Windle, 2015). The limitations of memorising vocabulary were not evident until I was in Canada, and I had to apply the words I had memorised. There were also colloquial words such as "champers" (meaning champagne) in Australia, which I was unaware of, and which could not be explicitly taught. Terms such as these were learnt through lived experiences. Nevertheless, I was fortunate to possess a medium level of cultural capital. While my parents were not fluent English speakers, they were able to communicate in that language and were proficient enough to pass it down to me. Supporting EAL students to develop their English language skills at the embodied state, involves encouraging them to talk to other students, so they



can apply the theoretical and rote-learned knowledge they to carry out social networking which will assist them in acquiring more cultural capital.

#### Scientific Language as Cultural Capital.

In terms of the embodied state, my mother was able to actively transmit her cultural capital in science to me using various techniques that she had utilized when she was young. For example, she used copies of the heart to teach me the various parts of the heart and encouraged me to annotate diagrams as a strategy supported by research (Carpenter et al., 2016). I built my capital in science by continuing to learn the terminology and identifying the formats and structures of the writing involved in science. One such example is how I start the sentence with the word, that, when I am composing a hypothesis. In terms of support for students, one should acknowledge that scientific terminology itself is also an important factor in scientific literacy as Robinson (2005) states, “to carry out effective discourse about a subject area, one must know approximately 95% of the words involved” (p. 428).

#### Language and Science.

In terms of integrating both science and English as a cultural capital, my parents faced difficulties incorporating the two. The embodied state included the ability to construct sentences using a knowledge of structures and then format sentences. My lack of fluency in English meant that I was unable to demonstrate my scientific knowledge. While I was provided with sample structures that I could use to follow a standard template, my limited language proficiency meant that I had limited fluency in my own ideas and responses. As discussed previously, schools are conditioned to accept similar linguistic structures and my capital in regard to this area was significantly lower due to my limited Language proficiency.

Methods I used during my journey of integrating science and English were creating flash cards (Aronin & Haynes-Smith, 2013), using a different vernacular to convey learned content (Brown & Spang, 2008) and accessing my material early so I could prepare with less stress (Safford & Costley, 2008). Similarly, strategies I used to support my own students include activity booklets (McCallum & Miller, 2013) and multisensory strategies (Husty & Jackson, 2008). While this is only a brief overview, such strategies focus on developing the scientific terminology that is essential when considering scientific language as cultural capital. My strategies for English language in conjunction with strategies for science subjects to develop cultural capital, integrated both science and English simultaneously. Additionally, I attempted to provide more context to my scientific knowledge by using double talk which is a mix of vernacular language and scientific language used by both teachers and students to support their biology learning (Brown & Spang, 2008). As a student, I also incorporated the two cultural capita in my studying by constructing stories about the science concepts in English (Banister & Ryan, 2001) and Sinhalese (Horton, 2013). Thus, it is evident that while some strategies within the embodied state are specifically relevant to English and science, there are other strategies that can be used to incorporate both. Whilst the richest learning will be provided within the integration of language and science, this does not diminish the advantages of support that are mostly isolated to language and science separately.

### *Emergent Theme 2: Objectified State*

In terms of the objectified state, Bourdieu (1986) refers to objects and media such as writings, and instruments which can be transmitted in terms of the material. However, while the objects themselves can be easily transmitted, the cultural capital aspect that involves the skill to appreciate and utilize these materials cannot be immediately transmitted (Kraaykamp & Van Eijck, 2010).

### Language as Cultural Capital.

In terms of language, some examples of my own level of cultural capital included the access to dictionaries and bilingual books which allowed me to learn the additional language in conjunction with my first language. My parents were able to offer this aspect of cultural capital through passive and active transmission. Passive transmission took place when my parents let me observe them on their computers. Active transmission took place when my mother encouraged touch typing so I did not need to look at the keyboard when I typed. Resources such as these meant that I was able to fit into the culture I was in and have a higher chance of academic success. Students who lack such capital must be considered and addressed by teachers. Successful scaffolding strategies could be ensuring that any student who was literate in another language had access to a dictionary and the knowledge of how to use it (Safford & Costley, 2008). Similarly, it would be beneficial to allow students to translate and have resources that can facilitate the translation between different languages such as use of bilingual books (Miller, 2009). Finally, computer literacy is also an important factor in learning English and supporting the learning of English so while Information technology (IT) will be a subject area in primary school, teachers should ensure that students are familiar with computers and provide extra support if they do not have that capital.

### Scientific Language as Cultural Capital.

In scientific language, objectified manifestation of cultural capital consisted of computers, textbooks, diagrams, and photocopiers. While these resources are accessible to anyone who can purchase these objects, students should be aware of how to utilize the textbook effectively. This means answering all questions and making short notes which will support them in the future. As discussed earlier, computers can be daunting at first but supportive for a student who is more

familiar with them. In addition to the aspects of language discussed previously, scientific language means that students should be able to obtain the required knowledge from computers. This can include research skills with emphasis on the ability to locate relevant accurate information. Furthermore, throughout my life, I used a range of tools on computers such as videos about different biology topics and online quizzes as well as flash cards to help support my learning. The advantage with these tools was that I could work through them at my own pace in addition to revisiting whenever required. This knowledge was passed on from my mother who used to search key words on Google. While we were novices when we began, we continued to explore and utilise the tools available on the web. However, the foundation for my exploration was passed on from my parent. As a science teacher, I spend a significant amount of time teaching my students how to locate reliable websites and how to identify the key words in their topic. This allows them to use technology to scaffold their own content learning in addition to science textbooks and other resources (Brunsell & Horejsi, 2012).

#### Language and Science.

While there are significant advantages of utilizing computers and textbooks, one of the techniques I relied heavily on during Years 11 and 12 biology was the use of past papers for my VCE examinations and sample solutions. This is applicable heavily within language and science because by understanding the expected format and structures of the answers, I was able to modify my answers and adapt my cultural capital to align with the cultural expected by the school and The Victorian Curriculum and Assessment Authority (VCAA). Whilst there was a certain level of rote learning involved, I would classify this strategy as developing the objectified state of my cultural capital because the resource of past papers is accessible and transferable to anyone. However, the manner in which this was utilized was passed on to me from my parents and

developed over my lifetime by myself. Instead of memorising sample answers, I read them and understood the expected structures and formats. Following that I modified my answers to conform with the cultural capital expected by VCAA and assessors. Thus, this demonstrates how I was able to draw upon the cultural capital passed on by my parents to meet the institutionalized aspect of cultural capital where schools and assessment boards favour students who have similar academic language and social language.

### *Emergent Theme 3: Institutionalized State*

Institutionalized cultural capital refers to the educational credentials that are awarded as a result of the objectified and embodied cultural capital that individuals have obtained. Therefore, my struggle with institutionalized capital is evident in my low report scores and comments. Empirical research has demonstrated that students who possess cultural capital are seen as more academically gifted by teachers and other gatekeepers of schools and institutions (Dumais et al., 2012). Therefore, students should be provided with opportunities to demonstrate their cultural capital at an institutionalized level with inclusive teaching models and programs (Angelo, 2013). Comparing the assessment feedback that was provided by my different schools, it was evident that my Australian school was better suited to support EAL learners as it provided other methods for me to demonstrate my knowledge in comparison to my school in Canada. Schools need to take steps to account for the lack of institutionalized cultural capital in students. This can be done by having a wide range of assessments available to students as suggested by Allen and Park (2011), this allows for multiple opportunities to demonstrate their knowledge and obtain legitimate academic credentials.

In terms of institutionalized capital, it was evident that one cannot obtain enough capital in terms of scientific language without capital in English as well. This is because one needs to express

themselves in English to obtain the formal credentials as part of institutionalized cultural capital. In terms of capita, it is because the environment influences how the capital is recognised (Jamal Al-deen Windle, 2015). If one cannot demonstrate their cultural capital due to a language barrier, they will be found lacking in cultural capital. Despite my lack of cultural capital in English and not science, this lack of capital in English overshadowed the capital available in science.

Overall, in terms of the embodied state, as stated by Bourdieu (1986) the accumulation of cultural capital in its embodied state requires time and labour. As the years have progressed, I have continued to develop my language skills and have reached a level that is acceptable in my environment. In terms of institutionalized state, the ongoing commonality is that EAL students or mainstream students need opportunities to demonstrate their knowledge. Students need to be provided with modified work and opportunities which will allow them to demonstrate their knowledge despite their struggles in language. It is important that teachers and schools are aware of and account for students' lack of cultural capital in the institutionalized state and compensate for it by providing additional resources and opportunities. EAL students require time to develop their cultural capital in English language, scientific language, and the integration of both these. The use of strategies I have painstakingly revisited, remembered, described, and evaluated in this paper together with targeted support from teachers can be used to accelerate, process, and accumulate cultural capital across dual and diverse cultures.

### Further Study

My analysis of the emergent themes uncovered were not fully explored as I focused on the academic aspects of my journey because they relate to the links, I make to English language learning and the learning of science subjects. However, research can be further carried out on how students inherit parents' attitudes of cultural capital involving English language, science, and the

integration of both science and English. This includes views of different cultural capital and how shortcomings are addressed.

## Conclusion

Whilst the strategies, challenges, and issues raised in this autoethnography may be similar to strategies and issues discussed elsewhere, this study demonstrates that when supporting EAL students' learning in the sciences, there are three major manifestations of Bourdieu's (1974) cultural capital that can be considered and addressed. These are embodied state, objectified state, and institutionalized state. Within each of these, support should accommodate, language, scientific language and the integration of English and science. By addressing all three cultures across all three manifestations, this paper advocates that teachers can provide point of need support to EAL students studying Biology and subjects in the sciences.

## Chapter 5 Summary

How have my experiences as an EAL biology student influenced how I understand and appreciate biology learning by EAL students as a teacher?

Mapping a Language(s) journey in science; from learning Biology to teaching Biology: An Autoethnography.	<b>Three cultures</b>
	Science
	EAL
	Integration of Science & EAL
	<b>Manifestations</b>
	Embodied: Parents support and the strategies that were passed on
Objectified: Tools that were used to support my learning	
Institutionalised: How I had to navigate to obtain the academic credentials based on the language and science knowledge	

■ Objectified Manifestation    ■ Embodied Manifestation    ■ Institutionalised Manifestation

*Note:* Key findings are colour coded according to Bourdieu's cultural capital manifestations (1986).

### *Researcher Perspective*

This article initially framed me as the researcher and provided an overview of my perspective as a former student, mainstream science teacher and a researcher. In addition to exploring the formation of my identify as an EAL science student, it allowed me to explore the range of support I received and where I received my support from. This in turn helped me to identify how I relied on my background, parents support and tools. Additionally, it helped identify how all this was used to achieve my school credentials. Considering these aspects helped me see the links between my experiences and the overarching theoretical framework, Bourdieu's cultural capital.

### *The Different Cultures and Manifestations of Cultural Capital*

Separating the three cultures of science, EAL and integration of science, and EAL was used identify which cultures required further support, which cultures had the biggest impact and how the various cultures contributed to each other. It also illuminated where the various strategies overlapped and where there were more distinct differences in the strategies used. For example, whilst a strategy such as rote learning was helpful in the culture of science, this was not as beneficial in the cultures involving language because the cultural expectations relied on the individual adapting the terminology and using it in a range of different contexts. For the purpose of this chapter, it was beneficial to see that while there was considerable overlaps and relationships between the three cultures, there were also some distinct differences.

Using an autoethnography method in this chapter helped me to understand more in-depth aspects of my life that contributed to my strategies. Identifying the various support provided within each manifestation using Bourdieu as the initial framework allowed me to explore the



range of my capital and how I used it. The findings of this chapter demonstrated how the support I received and the strategies I used were manifestations of cultural capital. It also demonstrated how there were stakeholders and parties that were involved in my learning.

The broadness and all-encompassing nature of Bourdieu's cultural capital (Bourdieu, 1986) allowed a holistic picture of how support can be provided to future EAL students:

- Embodied: Using the culture and support at home
- Objectified: Using the tools and resources
- Institutionalised: Meeting educational credentials

This analysis enabled me to set up the framework for this thesis and to see how important it is that support is provided across each of the manifestations to support EAL students in all aspects of learning.

Studying the cultures within each manifestation also allowed me to observe the priorities of the different cultures, and the separation of cultures in this chapter allowed me to study and identify the focus for each. For example, in language as a cultural capital, there was significantly more focus on the embodied state. This supports the thinking that a significant amount of language learning is framed and supported based on parents' contributions and scaffolding the knowledge that students build from their cultures and backgrounds. As it was discussed in the chapter, a lot of my communication was built in conjunction with my family. While I had support from my teachers and had to demonstrate my language ability at an institutionalised level, this would not have been possible without my supportive home background to develop communication skills in English. Furthermore, it should be appreciated that regardless of parents' language ability, there is potential to incorporate them in the strategies to support students' language development.

Comparing all three cultures, the data indicated that there was fairly equal reliance on objectified manifestation. This could be accounted for by the idea that every culture relies on various tools that can build capital within that culture. Whilst there was some overlap within the different cultures, there were distinct differences in the focus of objectified manifestations. Whilst I endeavoured to demonstrate how an institutionalised state manifested across the different cultures, when completing the research, it was evident that there was a significant amount of overlap across the three cultures. It became evident that to demonstrate science knowledge, one needs to be proficient in the language of communication. Similarly, one cannot achieve the institutionalised credentials within a content area by solely relying on language ability. This needs the capital in science culture as well.

Whilst the overall context of EAL students studying biology in mainstream classes is important, the individual strategies referred to and discussed within the manifestations also continue to tie in with the various learning paradigms that were discussed in the literature review chapter. For example, comments from the teacher about self-correcting using pictures and contextual cues ties in with Krashen's monitoring hypothesis (Krashen, 1988). Similarly, the building of vocabulary knowledge and use of storytelling to verbally describe my science knowledge ties in with the benefits of science and language learning, such as verbal description of science for learning language development. Additionally, building on Sinhalese sentences for English knowledge is aligned with the input theory, as the analysis shows that I gradually increased through levels of difficulty.

After Identifying the various methods of support that I utilised and the avenues that made it possible, it was important to understand the overall picture of this context. This entailed looking at the overall guidelines that frame how science is taught in mainstream classes and dictates the

number of objectified manifestations that are available from a school perspective, as well as how teachers can provide the necessary support. To enable a teacher to provide the necessary support, they must be well informed about the policies and the available documents. To address these concerns, the next chapter covers a policy analysis using Victoria as a case and includes teacher perspectives, interpretations, and feedback to explore the understanding of policies by mainstream biology teachers.

## Chapter 6: Policy Review

**Title:** Great divide; Exploring the chasm between Victorian EAL policies in schools and teacher practices using Bronfenbrenner’s ecological lens.

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**Abstract:**

What is the current landscape of teaching English as an Additional Language (EAL) in Victoria? A review of policy in Victoria hopes to place a perspective on this crucial area. The most recent report from the Department of Education and Training (Victoria) states that in 2018, 32% of students in Victoria were from backgrounds other than English, and 12% of students were English as an additional language (EAL) learners. The current Victorian Department of Education and Training’s (DET) Strategic Plan states that one of its goals over the next ten years is to have a 33 per cent increase in the proportion of 15-year-olds reaching the highest levels of achievement in scientific literacy. These statistics highlight the need to support EAL students with their mainstream subjects, such as science. A study by the Authors found a gap in teachers' knowledge regarding what was available to support EAL students. This paper explores this gap by using Bronfenbrenner’s ecological systems theory to highlight current policy that impacts the teaching of EAL students and how mainstream teachers interact with and implement such policies. The findings have implications for policymakers, administrative staff and teachers. The study reveals that effective policy implementation occurs within the mesosystem where students'

microsystems, such as administration staff, teachers, parents and students, collaborate to implement the policy of the macrosystem.

**Keywords:** EAL, LBOTE, policy review, science teaching, Bourdieu, teaching strategies, Ecological Systems

**Statements and Declarations:**

The authors did not receive funds or grants for conducting this study. The authors have no competing interests to declare relevant to this article's content.

## 6.1 Introduction

What is the current landscape of teaching English as an Additional Language (EAL) in Victoria? The most recent report from the Department of Education and Training (Victoria) states that in 2018, 32% of students in Victoria were from backgrounds other than English, and 12% of students were English as an additional language (EAL) learners (Department of Education and Training, 2018b; State Government of Victoria, 2019b). These statistics highlight the significantly high percentage of Victorian students from EAL backgrounds and, thus, the need for effective policies to support them. A pilot study by the (Fernando & Cooper, 2017) revealed a gap in teachers' knowledge regarding supporting EAL students. This case study of policies in Victoria will further elaborate on this crucial area and explore what is currently in place and teachers' views on it.

The high percentage of EAL learners in Victoria highlights the need to view important education concerns, government goals and targets against the backdrop of policies that address EAL students' needs. One aspect of this is the gap in knowledge about what support is available and what policies are in place. The other aspect is the findings around teachers' lack of confidence (Schutz & Lee, 2014; Zeegers & McKinnon, 2012) in teaching EAL students. Current research

already reveals the need to provide professional support for teachers (Heineke, 2014). However, most research focuses on English teachers (Hult, 2018) or bilingual teachers (Zúñiga et al., 2019). The identified paucity in research around teacher practices and EAL policy in Victorian schools inspired this research.

Research reveals that further support needs to be provided for teachers to act as policy interpreters and implementers. Some support tools include various coursework and involving teachers in policymaking processes (Chang-Bacon, 2022). This study aims to look at these concerns through the perspective of mainstream biology teachers. Thus, by using a small case study in the context of Victoria, Australia, this paper highlights and includes mainstream subject teachers' perspectives of current policies that are in place in Victoria with the intention of offering insights to assist similar international and Australian contexts and position the voices of mainstream teachers alongside policies that support EAL learners in schools.

To address this aim, the authors used the research questions below, paralleling Bronfenbrenner's ecological system to highlight the strategic perspective of the questions (Bronfenbrenner, 1976):

- What policies are currently in place to support EAL students in secondary schools in Victoria? (Macro)
- How do teachers in Victorian schools view the implementations of such policies? (Micro and Meso)
- How do the policies and the teacher views contribute to an understanding of classroom practice?

The research questions were designed such that the research initially involved the exploration of the available supports in terms of policy and policy documents. This was followed

by obtaining the teachers' views and assessing which policies and documents were known to the teachers and their views on the implementation of the various policies. The discussion section was then used to explore how to benefit classroom practice based on teacher views and the policies available.

## 6.2 Theoretical Framework

Bronfenbrenner's ecological systems theory views child development as a complex system of relationships affected by multiple levels of the surrounding environment, from immediate family and school settings to broad cultural values, laws, and customs (Bronfenbrenner, 1976). This framework is used to demonstrate how different environments interacted within the policies and how it was interpreted by teachers. The layers align with how the data illustrate different environments and stakeholders culminating in providing better support for EAL students.

To study a child's development then, we must look not only at the child and their immediate environment (micro) but also at the interaction of the larger environment as well. These are the policies that are in place (macro). Bronfenbrenner divided the person's environment into five different systems: the microsystem, the mesosystem, the exosystem, the macrosystem, and the chronosystem as seen in **Error! Reference source not found..** For the purpose of this study, only the macrosystem, mesosystem and microsystem of the student's environment are used to study the data. The microsystem is the most influential level of the ecological systems theory. It is the most immediate environmental setting containing the stakeholders involved in developing the child, such as family, teachers, school, and child. The mesosystem consists of the interactions between the different microsystems of the child. The macrosystem is the cultural place that student resides in, and it is framed by the policies that are in place. This study uses these systems to identify the various policies in place to support EAL students in their classes and

look at the interactions of the various microsystems with the policies. Thus, this article discusses how Bronfenbrenner's ecological systems theory has implications for educational practice and for supporting EAL students.

### *6.2.1 Definition of Support*

When addressing the research questions, the definition of support has been derived from a range of studies. The study by Shah (2018) adapted four different types of support: Appraisal support (providing guidelines), emotional (individuals are respected), informational support (providing relevant/required information) and instrumental support (directly assisting with work-related tasks). This definition was coupled with the theory of organisational development by Schein (2003), which incorporates environmental, instructional, and technical support into the definition of support. These various definitions of support are considered to define support as intentional actions and behaviours that individuals employ to assist other individuals. Therefore, this article focusses on various policies that are in place to ensure that EAL students are assisted through multiple forms of support by teachers, schools, and governments.

## **6.3 Methodology**

### *6.3.1 Case Study*

This article uses Victoria as a case to study what policies are currently in place to support EAL students and study how they compare with teachers' views. The case study methodology is used to address the purpose of this study, as it provides the context for policy implementation. Pal (2005) describes case studies as a backbone of policy analysis and research. This is particularly true in this study as supporting EAL programs and students is very context-based and dependent on the school it is implemented in. This aligns with Robert K. Yin (2014), who describes a case study as a preferred method when studying a contemporary phenomenon within a real-life context. In this



study, the contemporary phenomenon is the need to provide EAL students with necessary classroom support. The real-life context is Victoria and its schools, within which a single-case study was selected. When using single case studies, Yin (2014) emphasises the need to define the case clearly and establish clear boundaries. The two schools selected in this case study are used as examples of schools with high EAL populations in Victoria. The findings of this research can then be used to inform practices of other states and similar schools. The boundaries for the case are as follows:

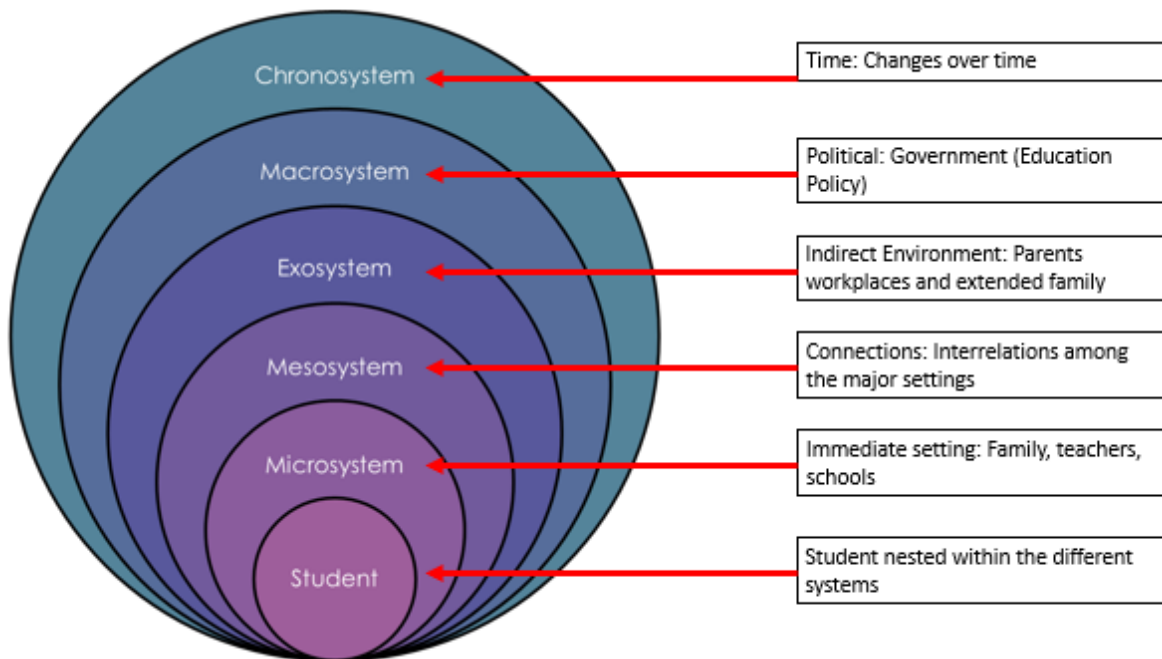
- Public school in Southeast Victoria
- Schools with over 70% of students from Language Backgrounds Other than English (LBOTE)
- Mainstream classes with EAL students
- Mainstream teachers

Both Yin (2014) and Stake (1995) emphasise the need to ensure that a case is viewed as a bounded system. This is because various aspects contribute to each other when a program is being evaluated. As such, various aspects of the policies and their implementation will be reviewed at the various levels of implementation.

This study highlights the active voices of a small number of teachers and their understanding of current EAL policies. Vidovich (2001) argues that the definition of education policy should be broadened to include the practice within schools and the classroom. They posit that teachers should be considered policymakers as they are actively involved in how education policy is constructed and interpreted in schools and classrooms. This leads to the rationale and the need to include teachers' perspectives on policies and their implementations in education policy research. This supports the incorporation of teachers' views in this study. Furthermore, (Cibulka,

1994) argues that it should be recognised that implementers such as teachers have an explicit policy role as opposed to a technical one. Therefore, while we are aware that policy construction is completed at the macro level, a significant portion of the policies are implemented at a micro level. Thus, research supports the need to “incorporate analysis of policy practices, effects and consequences at the micro-level” (Cibulka, 1994, p. 111). This links to the three research questions that guided this study to consider policy at the different levels, as a single case study of Victoria and EAL policies in Victoria, conducted by looking at macro-, meso- and micro-systems (Boeren, 2019).

**Figure 1** *Different Levels of Policy Study (Boeren, 2019)*



### 6.3.2 *Macrosystem – Policy – Document Analysis*

Some research has interpreted Bronfenbrenner's ecological systems theory as “microsystems (i.e., special education teachers, paraprofessionals, and peers); mesosystems (i.e., Individualized Education Program [IEP] teams); exosystems (i.e., teacher education); macrosystems (i.e., policy), and chronosystems (i.e., school transitions)” (Ruppar et al., 2017, p. 2).

While there is an overlap between the definition of macrosystem and exosystem, this study uses the definitions used by Mahlo (2013) and Hung et al. (2016), where policy decisions about education are classified under the macrosystem. The macrosystem is a culture or society that frames the structures and relationships among the various parties, including the regulating government. The regulating government has been selected as the Victorian Department of Education and Training because this case study looks at Victoria in the context of EAL support policies. Furthermore, the study focuses on Victorian policies because each state government implements the education policies in Australia. A document analysis was completed to identify the available policies in terms of EAL support.

To identify the relevant policies, an initial search for policies was conducted using the school policy and advisory guide of the Department of Education and Training (DET). The A-Z index in the Guide (Department of Education and Training, 2019e) contains a list of all the governance and operational policies for Victorian government schools. Each policy was assessed for any relevance to EAL support. Three policies were identified as policies related to EAL students, and the school census policy was identified as being used to inform the three main policies.

These are

- Assessment and Reporting for English as an Additional Language (Department of Education and Training, 2019a)
- English as an Additional Language Index Funding (Department of Education and Training, 2019c)
- EAL Provision for Newly Arrived Students (Department of Education and Training, 2019b)
- School Census policy (Department of Education and Training, 2019d)

Further supporting documents that were published by the DET (Victoria) were also identified:

- The EAL handbook (Department of Education and Training, 2015)
- Victorian Curriculum F-10 EAL 2020 Reporting Tool (Department of Education and Training, 2020b)
- No English – don't panic (McDougall et al., 2014)
- Beginning ESL – support material for primary new arrivals (Astbury et al., 2016)

Jie's (2016) framework was selected as an organising structure because it distinguishes between evaluating systems and resource allocation. Key ideas from each policy were highlighted and noted separately to identify and analyse how the policies in the document analysis aligned with the structure. Following this, common goals and purposes of the policies were used to determine which of Jie (2016) frameworks these policies aligned with. The definitions for the framework and how they aligned with the policies are demonstrated in Table 1 on page 171 and 172.

**Table 1** *Policies Addressed in the Discussion*

Type of policy	Victorian Government Policy	Framework (Jie, 2016)	Areas Addressed by the Policy and its Implementation
<b>System-level policies</b>	School Census policy (Department of Education and Training, 2019d)	System-level policies that monitor and evaluate systems and operations. These include assessment policies and policies regulating curricular and performance standards.	Monitoring and evaluation
	Assessment and Reporting for English as an Additional Language (Department of Education and Training, 2019a)		Assessment Criteria Intensive programs Sharing and communication of student information and diagnoses across the transition
<b>Resource allocation policies</b>	English as an Additional Language Index Funding (Department of Education and Training, 2019c)	Resource allocation refers to how resources are determined and allocated within an education system. It includes funding Eligibility and classifications, policies on Professional development programs that are available for the range of stakeholders involved, and other materials such as textbooks and teaching resources.	Funding
			Professional development and training of teachers for diversity
			Available resources and tools

<b>Teaching and learning policies</b>	EAL Provision for Newly Arrived Students (Department of Education and Training, 2019b)	Teaching and learning policies relate to specific school and classroom level practices. The policies address classroom management, support for students, professional collaboration, and programs to support students' interest and motivation in school.	Whole school approach
			Ensuring positive learning environments
			Pedagogy/Teaching strategies
			Access to research and good practice examples
			Parental and community involvement

### 6.3.3 Micro – School data

Two schools were selected as examples for the case study. As shown below in Table 2, both schools had a high percentage of students from language backgrounds other than English (LBOTE) and had similar school profiles.

**Table 2** *Participating School Profiles*

School code	School 1	School 2
% Of students from Language Backgrounds other than English	81	70
School Sector:	Government	
School Type:	Secondary	
Year Range:	7 – 12	
Location:	Major Cities	
Teaching staff:	92	104
School ICSEA percentile	24*	12**

*Note.* Data obtained from the MySchool website ((Australian Curriculum Assessment and Reporting Authority (ACARA), 2020).

\*This means that this school is more educationally advantaged than 24% of schools in Australia and more educationally disadvantaged than 76% of schools in Australia.

\*\*This means that this school is more educationally advantaged than 12% of schools in Australia and more educationally disadvantaged than 88% of schools in Australia.

### 6.3.4 Micro – Semi-Structured Interviews

Data collection for the teachers was completed using semi-structured interviews. Table 3 provides some details on the teachers who participated in this study. Note that pseudonyms have replaced participant names.

**Table 3** Profiles of Teachers Interviewed

Name	Gender	School	Number of Years Teaching	Number of Years Teaching Biology	Number of interviews carried out	Year of interview(s)	Language-Teaching Experience?	Teacher Education
<b>Michelle</b>	Female	School 1	3	3	3	2019/2020	No	Australia
<b>Amber</b>	Female	School 1	3	3	3	2019/2020	No	Australia
<b>Ryan</b>	Male	School 2	12	11	1	2021	No	Australia
<b>Jane</b>	Female	School 2	7	6	1	2021	No	Australia

All four teachers taught Victorian Certificate of Education (VCE) biology to Year 12 students (age 16–18 years) at schools with a high percentage of EAL students. In Victoria, Australia, VCE comprises of the two final years of secondary education. The teachers all agreed to meet the researcher for semi-structured interviews lasting between 45 to 60 minutes. The interviews took place throughout the year, and teachers were asked about how they catered to EAL students in their biology classes and how they viewed the current tools and resources that were available to them. These interviews were audio-recorded, and transcripts were created for each participant.

Their views on the support available to EAL students and how policies facilitated their practices were identified using the transcripts. Teachers' responses were categorised using the same headings identified in Table 1. The coded sections for each area were collated and analysed to determine points of comparison and divergence between the teachers' perceptions of policies and the intended policy outcomes. This was used to address the research questions at the various Bronfenbrenner levels, and then the results from three levels were used to synergise and discuss how the policies and teacher views link to classroom practice.

### 6.3.5 Data Presentation

The data in the findings section below are grouped in line with the common themes identified in the policies at the macro levels. These headings were defined in the table and grouped according to the various policies, such as system level, resource allocation and teaching and learning, as proposed by Jie (2016). Within each of the themes identified in the policy, the teacher interpretation and implementation are discussed. This is summarised in Table 4 below. Thus, the microsystems and how it interacts is presented by nesting the teacher feedback within the macrosystem of policy.

**Table 4** Summary of Findings, as Presented as Subheadings within the Policy Types (Bolded)

<b>System-Level Policies</b>
Monitoring and evaluation
<b>Resource Allocation Policies</b>
Necessary Tools
Professional Development and training
<b>Teaching and learning</b>
Whole School approach
positive learning environments
Promoting the Mother Tongue
Parental Community Involvement
Classroom Support



## 6.4 Findings

### 6.4.1 System Level Policies

#### Monitoring and Evaluation.

As policies are implemented across various levels, the issues being addressed, and the effects of the policy must be monitored and evaluated regularly. The Victorian Government achieves this by including the EAL survey as part of the annual mid-year supplementary census (Department of Education and Training, 2019d). Implementing the school census policy provides information about EAL programs operating in government schools in Victoria and a profile of the students at those schools. This data is used to determine fund allocations and ensure that students in need receive the necessary monetary support. In terms of evaluating the effectiveness of the programs, the *EAL Handbook* suggests that principals use the EAL achievement reports from school information portals to review the students' progress (Department of Education and Training, 2015). Similarly, student progress is reviewed in relation to the Victorian Curriculum F-10 EAL reporting resource (Department of Education and Training, 2020b). This resource assesses within three language modes:

- Speaking and Listening
- Reading and Viewing
- Writing

Each language mode can take three pathways:

- A: Early immersion (Foundation–Year 2)
- B: Mid immersion (Years 3–8)
- C: Late immersion (Years 7–10)

The website contains examples of students work and suggestions on the pathway progressions. However, the webpages state that:

Teachers of other learning areas, for example, Science or Art teachers, are not expected to use the EAL curriculum for assessment and reporting purposes. EAL-informed teaching practices should be in place to support learners in all subject areas. (Department of Education and Training, 2020b)

The lack of expectations from mainstream teachers results in them lacking the knowledge of the current systems to monitor students' language progression. There are also a range of other assessments that are in place to support funding for EAL students, such as Australian Council for Educational Research (ACER) tests. Whilst these were effective methods of monitoring and evaluating for necessary monetary support, teachers in the interviews reflected on how these were undertaken in the English domain. They argued that mainstream teachers could also use the data to support their practice. One teacher discussed how they could use previous data from students' progress reports to ensure that they catered to the students' appropriate level and were aware of their prior knowledge.

There's a decent amount [of data] that's available so I can get their ACER comprehension. We can do spelling like there's a BERT spelling test, the South Australian spelling test that we can get available to us, and we get their EAL level. So, even if they've just moved from the language school, we can get their language school report. It will tell me, particularly for science, what content they covered in their science unit class. So, I can go, okay, this is the bit that they've got previous knowledge on, we can build on from that type of thing, look at their S levels, and pull up students' previous reports from teachers. (Jane)

This demonstrates how the data required for the macro-level policy implementation can be used at an individual micro level to provide a significant advantage to EAL students. However, there were concerns that this may not be available to all mainstream teachers: "... this isn't necessarily available to all teachers; this is more available to me because I used to be in student management, and I'm currently in the leadership team" (Jane).

Thus, there is a need to ensure that the various monitoring and evaluation data are available to the policymakers, but it should also be open to teachers. This can be especially helpful in addressing some concerns by other teachers in non-leadership roles who were disappointed in the lack of information conveyed to them during transfers from language schools: "We get so little information" (Amber). The concern that, sometimes, all the relevant data is not available or not conveyed in terms of student background was raised by four of the interviewed teachers (Ryan, Amber, Jane and Michelle). While students' confidentiality is important, research shows an association between trauma exposure and academic achievement (Boyraz et al., 2013). This is especially relevant for students who have migrated, who may have experienced psychological trauma, and may be exposed to discrimination following the migration (Walker & Zuberi, 2020). "...their personal circumstances we weren't really aware of them until they [students] told us. It gave you an understanding and a context as to why they might be struggling with a particular assessment or homework task" (Ryan).

This quote highlights the need to consider students' background, history, and academic performance in monitoring and evaluating students. Therefore, while the Victorian survey results have a comparison between EAL students and mainstream students, a further breakdown could be beneficial to provide more targeted support similar to the Netherlands, which takes into account the situation and performance of various groups and compares these with mainstream students

(Herweijer, 2009). This will provide more specific information about where targeted support should be provided.

They've done some new training and things like that, and a part of the new curriculum is that they're wanting all teachers to know the EAL curriculum and what they're doing and what they should be able to do and things like that... So, I think that would be useful. I think every teacher should have samples of student work at different levels regardless. (Jane)

Jane raised concerns about how different teachers measure students at different levels, thus highlighting the need to have sample work at specific levels. While this is available across different mainstream subjects, teachers do not have enough evidence and samples of EAL students' expectations in mainstream classes. The discrepancy in marking can lead to misunderstanding students' actual level and hinder them from receiving necessary support. Thus, while assessment and monitoring of EAL students are done well in Victorian schools, further samples of work can assist the teacher in ensuring that all students are assessed against the same standards and expectations. The samples will allow teachers to monitor students' progress and respond accordingly in conjunction with the EAL assessment tool. Ireland has a similar structure to Victoria's EAL assessment continuum. In addition to the expected standards (Murtagh & Francis, 2012), Ireland's documents (Murtagh et al., 2012) also contain assessment samples that students must complete to obtain a certain level. A similar version in Victorian schools in relation to EAL students' work will support teachers to better determine if their students meet the criteria for a specific standard.

The Victorian Government has a range of policies to monitor and evaluate students' progress and whilst there is a range of documents and policies in place, interviews with the

teachers indicate lack of knowledge and exposure to these resources. There were concerns raised by the teachers in regard to communicating the data effectively with the teachers and ensuring that the relevant information is obtained from the student. Interview data also raised the issue of lacking sample documents. Having a sample standard for a particular work can reduce the variation in marking between various teachers and ensure that students receive the appropriate support.

#### *6.4.2 Resource Allocation Policies*

##### How Do We Ensure Necessary Tools are Available to Support EAL Students?

The funding for EAL students and their support is determined by the English as an Additional Language Index Funding policy (Department of Education and Training, 2019c). In Victoria, schools are allocated EAL index funding through the Student Resource Package (SRP). The SRP consists of student-based financing, school-based funding, and other targeted initiatives. The corrected classification is allocated by the school census policy (Department of Education and Training, 2019d)

The funds are allocated to:

- Student based funding (90% of SRP)
  - Core student allocation
  - Equity funding (12.4%)
- School-based funding
- Targeted initiatives

EAL funding is classified under equity funding in student-based funding. This is further differentiated into EAL program funding and EAL contingency funding. EAL program funding is based on an index that is calculated based on the number of students who

- come from a language background other than English
- speak a language other than English at home as their main language
- have been enrolled in an Australian school for less than five years
- attract student resource package (SRP) funding

In addition to taking these factors into account, there are also weightings applied to the different densities of student family occupations. This demonstrates how the funding policy attempts to include a wider range of factors. Additional factors that could be considered are students' socioeconomic backgrounds from disadvantaged areas and backgrounds. Belgium has similar weighted indicators, which also consider the low socioeconomic status and low performance (living in an area where a high level of grade repetition is observed) (Arnot et al., 2014). Similarly, the eligibility profile should be expanded to include Australian born students. Whilst the student may have been born in Australia, if their family is not fluent in English, they are less likely to be exposed to English at home. Canada, as an example, explicitly states that foreign or Canadian-born students are eligible (Hutchinson, 2018).

The Victorian eligibility policy for EAL attempts to consider a range of factors. EAL contingency funding is provided to schools with a significant increase in their EAL student population during a school year; these schools can apply to receive further funding. In 2018, 552 eligible campuses of mainstream schools were provided with EAL index funding to provide an EAL program. Contingency funding was also allocated to 12 primary schools, 6 secondary schools and 1 P-12 College to support EAL students enrolled since the August 2017 census (Department of Education and Training, 2018b). Although 31% of all students in mainstream government schools are from a language background other than English (LBOTE), only 12% of all students were eligible to receive EAL index funding based on the criteria discussed above.

This gap between the percentage of LBOTE and EAL students highlights the need to appreciate the heterogeneity of EAL students. Heterogeneity refers to the diverse range of characteristics in an EAL student. This could be varying types of schooling, amount of time and language of schooling. A student could have had more than five years of schooling in Australia but still lack fluency in English due to a lack of exposure to English outside school. This highlights the importance of considering a definition inclusive of all EAL students and considers the variety of factors affecting this classification. The Organisation for Economic Co-Operation and Development (OECD) (2010) raises the concern that the one size fits all policy may not address all immigrant student needs, especially those most at risk. As discussed above, this is reflected in the discrepancy between the percentage of LBOTE students and students classified for EAL index funding. The quote by Jane below refers to how funds can support students classified for the EAL index funding and other students who have similar concerns but do not meet the criteria.

... for a short period of time, we had a specifically employed biology EAL tutor, and they would run after school classes, and when year 12s had free periods, so they had a little bit of extra funding available, and they wanted to see how that would go. (Jane)

This strategy was used primarily to support EAL students, but the support was not exclusive to EAL students under the classifications. This ensures that all EAL students that require further assistance can receive it despite their inability to meet the specific criteria of EAL classification. This allows for schools at the micro level to broaden the definition of EAL students and address the heterogeneity of EAL students. Thus, more students facing challenges due to language can receive the necessary support from a qualified tutor trained to support language learning and the subject.

Australia ranks fourth among the OECD countries for lower secondary and upper secondary education when it comes to allocating funding support (Organisation for Economic Co-Operation and Development (OECD), 2021). The allocation of funds has been divided to cater to the needs of a variety of students and ensure that there are sufficient funds for the students who meet the Department of Education and Training 's criteria for EAL. However, there is a need to cater to students who require language support despite not meeting the criteria. Jane's example reflects how some funds can be used to support EAL students whilst including others who have similar needs but miss out on the criteria. The example also highlights the advantage of having subject teachers and tutors trained in language learning.

#### Professional Development and Training for EAL Teachers.

“Even at Uni they don’t teach you how to structure different tasks and content for EAL students” (Michelle).

There is a significant advantage to mainstream subject teachers being trained in language learning, which can be facilitated by professional development for teachers and is addressed in the English as an Additional Language Index Funding policy (Department of Education and Training, 2019d) as an incentive for professional development involving EAL support. The funding policy recommends prioritising teachers with a post-graduate EAL qualification and teachers who have experience teaching EAL or attended EAL professional learning courses. This provides further incentive for teachers to carry out professional learning in EAL support. However, whilst the policy recommends considering the professional learning needs of staff, there is no explicit allocation for professional learning. Similarly, there is no vetting process to ensure that appropriate hiring of teachers is being carried out in relation to prioritising teachers with EAL expertise.



Compared to areas of countries with the same demographics, Victoria is on par in terms of professional development. All schools have EAL specialist teachers that support mainstream classes. Whilst this is the expectation, the reality is affected by the availability of EAL specialists and timetabling. Nevertheless, there is an expectation in the policy that qualified EAL support is available for all mainstream teachers.

The interview data indicates that experienced teachers appreciate how the further training in language teaching supports them in their teaching subjects, such as science and biology. “It was really, really good. It was really good. It taught us like decoding language, the lexis of language. It really focussed on the meanings behind words and sentence construction” (Jane). This statement by Jane highlights how the language training has helped them gain a deeper knowledge of their subject and provided students with a more substantial foundation of the content knowledge. This is supported in the study by Hansen-Thomas and Grosso Richins (2015), who found that maths and science teachers who were trained in EAL were able to provide a better foundation for their learning. Similarly, Weinburgh et al. (2014) obtained data showing students could construct a more sophisticated understanding of the subjects and communicate their knowledge when taught by teachers trained in English Language Learning (ELL).

That's largely been the support the school has provided. Um, obviously, there's been along the way ah internal and external professional development. Um, literacy for learning, for example, on how to support not only EAL students, but also low literacy students with um decomposing texts, ah understanding genre, things like that. (Ryan)

As discussed previously, all LBOTE who need additional support do not meet the EAL requirements of the department of education and Training. The quote by Ryan highlights how

professional training in English Language Learning can support many students in addition to EAL students, especially LBOTE student who require additional support. The quotes from Jane and Ryan highlight the advantages to all students when the teacher is EAL trained. Various comparable countries have used methods to promote teachers' professional development.

Canada does not have provisions specific to EAL professional development (Hutchinson, 2018). In New York (USA), it is compulsory to complete at least 26 hours of EAL-specific professional development (Hutchinson, 2018), and New Zealand provides scholarships for specialist studies of EAL education in higher education institutions (New Zealand Government - Ministry of Education, 2020). Norway has made it compulsory to complete multicultural teaching as a part of any teaching degree (Green & Whitsed, 2015). A softer approach may be to provide an incentive similar to Denmark, where the formal qualifications of multicultural teaching lead to higher salary eligibility (Danish Ministry of Education, 2008). Incorporating some of these strategies may encourage more teachers to use professional development to build on skills that can help support EAL students.

#### *6.4.3 Teaching and Learning Policies*

##### *A Whole-School Approach.*

The *EAL Handbook* provided by the Department of Education and Training (Victoria) states that schools should consider a whole-school approach to EAL programming and provision, including EAL policy development (Department of Education and Training, 2015). The Handbook summarises all the staff who should be involved in developing a school's EAL program. In Victoria, guidelines for managing cultural and linguistic diversity have been prepared for school principals, all leadership roles and administration staff, in addition to mainstream and EAL specialist teachers. The *EAL Handbook* ensures that every role contributes to support EAL students. These roles

consist of a Leadership team, curriculum or literacy leaders, EAL specialists, classroom or subject teachers, Multicultural Education Aides (MEAs), Professional learning coordinators, Transition coordinators, Librarians, Resources coordinators and Careers practitioners. Each of these positions are discussed and their roles in EAL students' journey is described in the EAL handbook (Department of Education and Training, 2015).

The approach to whole-school policy in relation to EAL students should begin with the smooth transition into the school. This begins with enrolment for new arrivals. Government publications such as *No English Don't Panic* (McDougall et al., 2014) provide a sample enrolment form that considers various factors while being culturally sensitive. Other countries, such as the United States, have a "newcomer schools' program" that consists of its own curriculum (Short, 2002). In addition to language education, curricula include activities that promote cultural knowledge and skills development. While Victoria has language school programs, the following quote from the teacher reveals the need for more individual and well-rounded transition programs for EAL students in mainstream classes.

"Former teachers, um yeah, you can speak to them. Our MEA staff are excellent, um, but again, there's probably not enough opportunities to talk to them about students" (Ryan).

The data from teachers presents some concerns in relation to the practice of whole-school approaches. As suggested by the data, while the policies encourage communication within the whole school and staff, teacher feedback indicates that this could be challenging. The previous quote by Ryan also introduces the idea of utilising former teachers. Research has been conducted in relation to maintaining a mentoring continuum (Morrissey & Nolan, 2015) and revealed that it could reduce teacher attrition and improve student outcomes. Less research has been conducted in relation to utilising former teachers as mentors in Australia. However, studies in America reveal

that having motivated retired teachers as mentors can significantly benefit teachers and students (Berg & Conway, 2020; DeCesare et al., 2017). Former teachers could have advice and strategies that can be utilised to support current teachers to better support EAL students in mainstream subjects. Furthermore, participating teachers praised the multicultural education aides' (MEAs) work, but the lack of time and opportunity to work with MEAs was highlighted as a major concern.

“No one comes into the room or anything” (Amber).

“Even students with additional needs in general at VCE level don't have that much ES support, no” (Michelle).

Compounding this problem is that while support was provided for students during the middle years of secondary school, support decreased for mainstream subjects at VCE levels. This can also be attributed to the criteria of EAL funding, which does not provide funding for students who have studied in Australia for over five years, resulting in some students not receiving any support during a crucial period in their education. This further emphasises the need to expand the definition of EAL and ensure that students who require support due to language challenges actually get the support they need when they need it. Thus, while whole school approaches are prescribed in the policies in the macrosystems, the teachers' perspective of the microsystem applications reveals challenges in the implementation. The data from the four teachers reveal difficulties which include a lack of opportunity to interact with the relevant staff members such as support staff allocated to the students, especially during mainstream classes. This can be attributed to the five-year limit on students receiving EAL funding, which does not provide ongoing support.

## Ensuring Positive Learning Environments for Diverse Students.

An essential aspect of providing a positive learning environment and climate for diverse students is ongoing language support programs for EAL students. This is addressed in the English as an Additional language index funding policy (State Government of Victoria, 2019a), which states that principals must provide programs with English language support and assign qualified EAL teachers to conduct those programs. While the website page for the policy does not provide further elaboration, other government documents, such as *No English 2* (Saker et al., 2014) and *Beginning ESL* (Astbury et al., 2016), provide clarifications and examples of how teachers can provide EAL and diverse students with positive learning environments. These documents provide instructions on how students can be integrated into the class through various activities. Some examples include giving specific jobs or responsibilities, such as lunch monitor or sports equipment manager. The rationale is that the student will develop a sense of belonging and socialise with their peers. The *Beginning ESL* document teaches ten units that help the students participate in class (Astbury et al., 2016). *No English 2* states how group work and peer tutoring can be significantly effective learning tools (Saker et al., 2014). While other countries have a variety of handbooks, Victoria has a range of publications that provide more specific advice and instructions to ensure that EAL and diverse students have a positive learning environment. However, a common concern continues to be that the amount of support in non-EAL classes is limited, as supported in the following quote from Jane.

“So, we've had the pockets of extra stuff, but generally speaking; there's not like a massive amount of support for people who are teaching EAL students in non-EAL classes” (Jane).

### Promoting the Mother Tongue.

Another aspect of supporting an EAL student is promoting their mother tongue. Victoria offers students the option to take an additional language in secondary education, which values and validates EAL students' mother tongue proficiency (Victorian Curriculum and Assessment Authority (VCAA), 2021). This has been identified as having a significant benefit for multilingual students (Dabrowski, 2014) as it allows the retention of students' primary language but also supports language development in both languages. At a micro level, the number of languages that schools can offer is limited by the number of students interested in that subject, staff available and a range of other factors. Nevertheless, the policy has been designed to engage with learning pedagogy and utilise students' additional languages from a macro level. This means that students who progress through to VCE can use English and additional languages to communicate their content knowledge with each other.

A girl in Year 11 last year struggling with a School Assessed Coursework (SAC), and she, it was really beyond her, the level of literacy... I called in, we've got a language centre here, so there are people available often who can help, and so I called in Saiyid who could speak Farsi, and he actually translated the SAC. (Amber)

This reveals how teachers have utilised the language and support staff in their current practice. This is limited by the number of languages various staff members speak. Furthermore, as a VCE assessment, only limited support can be provided during the assessment because the student's individual ability and knowledge need to be assessed. However, this translation method can significantly benefit the students during language-focused lessons. The other method of utilising the mother tongue at a microsystem level was encouraging students to use the language in class.

... it depends on how many students EAL students we have in the class. I mean, most of our EAL students are Afghan, so they, they will typically converse in Dari if they're all sitting together... but it depends again; if there's one or two in the class, then probably not as much, but when there's a larger group, they typically sit together, and they do converse yeah, in Dari. (Ryan)

So, typically, I think a lot of it is just their conversational language. It's not about the content specifically, and I don't know as well how much biology sort of translates, how well it translates as well, you know, having no knowledge of the language myself. (Ryan)

These quotes from Ryan demonstrate that while the policy intends to foster communication of the content and knowledge of subjects in an alternate language, it may be used for more recreational use instead of educational purposes. This highlights the discrepancy between the intentions of policies at the macro level and the results at a micro level. Further training may be needed, and further scaffolding should be provided for students so they may be able to utilise other languages to improve their knowledge.

Similar programs are run in the Netherlands (European Commission, 2008) and Sweden (Swedish Ministry of Education and Research, 2008), where students' native language is supported and nurtured. Promoting mother tongues also links students' cultural backgrounds at home and school, which benefits the student's attitude towards school and provides an academic advantage (Brind et al., 2008). However, implementing this process in a classroom setting is challenging. Nevertheless, more support needs to be in place to promote the students' primary knowledge.

## Parental and Community Involvement.

Communication with parents is prioritised in the EAL provisions for the Newly Arrived Students policy (Department of Education and Training, 2019d), which explicitly states that principals or delegates must tell parents or guardians of the student's transition process to mainstream schools. The need for parental and community involvement is highlighted in a variety of research (Jeynes, 2007; Nusche, 2009).

In line with this, the Supporting EAL transition web page has a specific section for communication with families (Victorian Curriculum and Assessment Authority (VCAA), 2017a). Similarly, the *No English* book (McDougall et al., 2014) discusses how teachers can provide a tour of the classroom accompanied by an interpreter to form connections with the parents. The *Beginning ESL* document suggests more ongoing advice, such as keeping a journal to maintain communication between the parents, obtain information about prior learning and provide the parents with the opportunity to ask the teacher any questions (Astbury et al., 2016). The book also recommends that students unfamiliar with English use their first language to write in the journal. This fosters connections between students, parents, and teachers in addition to celebrating their first language knowledge. An EAL student can significantly benefit from improved communications between their parents and teachers.

But I do wonder how much support is given to the parents of our EAL to understand schooling in Australia. Because honestly, I don't think they know anything about it at all. So, I could say your kid's getting a C, which is perfectly fine, they're at the standard, they're where we expect them to be, they're doing a really great job, but those parents are like, no, it's not good enough. (Jane)



As given in Jane's response above, concerns were raised by all four of the teachers about how informed the parents are about schooling in Australia. Whilst MEA aides can provide translated conversations with parents, this requires planning. The inability to communicate with the parent when required can have detrimental impacts on parents' knowledge of their children's progress. Furthermore, many parents will not understand the various paths and some of the structures to support their students. Thus, they will not be able to adequately support and understand the expectations and standards at the level of VCE subjects. This concern can only be addressed by providing parents with more opportunities to be involved at school.

A policy in the United States ensures that schools receiving federal funding must spend a portion of the money on parent participation programs. Norway has a framework that requires kindergartens to actively support children using their first language, simultaneously promoting Norwegian language skills (Norwegian Ministry of Education and Research, 2008). This model invites parents to stay with their children during the day and participate in activities. While this is not feasible in high school settings, multicultural days can be expanded to allow parents to participate in activities and form connections. In Austria, a parent can learn German with their children so both are learning the language together (Özbabacan, 2009). Schools in Ireland offer English language classes to immigrant parents (Smyth et al., 2009). In Victoria, an afterschool program that could provide a short language learning course on a weekly basis could help foster language learning for both parents and students.

#### **Classroom Support.**

The pedagogy supporting EAL is covered by a variety of documents, including the EAL/D overview document, which extensively discusses factors involved in students' learning in relation to English (Australian Curriculum Assessment and Reporting Authority (ACARA), 2014). In terms of

providing support relevant to the pedagogy for teaching EAL, the documents provide a comprehensive continuum of how English learning develops. Having this knowledge can support teachers in addressing the relevant point of need of the EAL students depending on the student's level of English learning.

A range of documents available for pedagogy includes documents that suggest integrating language learning and content learning, focusing on academic language and examples of explicit strategies. Several countries have also developed policies that promote language and content learning integration. The United Kingdom focuses on placing specialist EAL teachers with mainstream teachers to provide classroom support (Leung, 2016). Similarly, many schools in Denmark have a specific language centre that provides lessons, language support resources and specialist teachers (Danish Ministry of Education, 2008). Victoria can benefit from similar policies and infrastructure. Nevertheless, the Victorian Department of Education and Training offers a range of documents used to provide classroom support.

## 6.5 Discussion

### *6.5.1 Difference in Definition*

It was evident that across a range of the themes addressed at a policy level, there were a lot of discrepancies between the policy and its practice at the micro level. One of the discrepancies was the difference in the definition of students who were identified as LBOTE and students receiving EAL index funding, as discussed in the resource allocation section above. The effect of this was evident throughout a range of other identified themes, such as providing a whole-school approach and ensuring a positive learning environment. It was apparent that many challenges in implementing these policy areas were due to the lack of resources, staffing, and funding. Thus,

there is a need to expand the definition of EAL students to ensure that students who require necessary support are provided with it despite studying in Australia for over five years.

### *6.5.2 Lack of Communication and Transparency*

Another major discrepancy was communication between the various parties involved in the EAL students' journey. For example, while monitoring and evaluating students regularly was beneficial, the teacher data emphasised the need to communicate the data with teachers and other staff who worked with the students. Thus, supporting the idea that data should be used for reporting and funding and teacher knowledge and preparation.

### *6.5.3 Further Training Required*

It was evident that teachers with more experience were flexible about implementing the policy and more confident, similar to teachers with more professional development. Thus, another suggestion that was brought up was the use of retired teachers and MEA staff to provide more opportunities for LBOTE and EAL students. A range of training can be completed under mentoring programs that can benefit less experienced teachers catering to LBOTE and EAL students in their mainstream classes.

The major discrepancies identified between the policies and teacher practice was that teacher practice expanded on the definition and intentions of the policies. It also required the involvement of more parties than themselves. For example, some strategies that teachers utilised included the use of MEA staff, parents and students. Thus, it is clear that while the macrosystem will produce a range of policies with various target areas and the various microsystems will be used to support students, a significant portion of effective teaching practices take place within the mesosystem where there are interactions of various microsystems.

## 6.6 Conclusion

This article signals that while EAL policy intentions are clear at a macro level, the implementations will vary due to schools' available resources at a meso level and teacher knowledge/students' participation at a micro-level.

### **What policies are currently in place to support EAL students in secondary schools in Victoria? (Macro)**

The policies currently in place in Victoria to support EAL students were identified. Key themes within the policies, such as monitoring and evaluation, resource allocation, professional development and teaching-learning policies, were used as sub-headings for the results. International comparisons demonstrate that Victoria has many practices to support EAL students within these themes. They included interactions of various parties within the student's microsystem, such as teachers, parents, and non-teaching staff.

### **How do teachers in Victorian schools view the implementations of such policies? (Micro and Meso)**

The teacher implementations of the practice were then discussed and analysed within the themes identified in the policies. This revealed that, while Victoria has a range of policies available to support EAL students, most teachers were not confident in their knowledge of the policies and the data required to implement them. It was evident more support is needed in addition to currently available support. While many teachers build on the available policies to implement a range of strategies, this was more common in the two experienced teachers. They used their knowledge and experience to extend the policies to ensure that more students were supported under the policies. Thus, this highlighted the need to provide more support to teachers for policy

implementation, more communication for EAL students and, finally, the modifications implemented by teachers highlight the need to involve teachers in policymaking.

**How do the policies and the teacher views contribute to an understanding of classroom practice?**

While the headings were used to identify common themes addressed by the policies at a macrosystem level, the interviews with the teachers were used to compare how the teachers viewed the implementation of the policies and how the two systems contributed to the understanding of classroom practice. It was evident that more time and resources needed to be provided for the interactions of the microsystems, such as between mainstream teachers, MEA staff, administration staff, parents, and students. Under the definitions of Bronfenbrenner's ecological model, these interactions make up the students' mesosystem. This article highlights the need to provide further support within the students' mesosystem to facilitate the effective policy implementation by teachers to deliver better outcomes for EAL students' science literacy.

## Chapter 6 Summary

**What policies and support materials are provided by the government of Victoria to support teaching biology to EAL students, and how are these interpreted by mainstream teachers to support EAL students in secondary schools in Victoria?**

Great divide; Exploring the chasm between Victorian EAL policies in schools and teacher practices using Bronfenbrenner's ecological lens.	<b>System-Level Policies</b>
	Monitoring and evaluation
	<b>Resource Allocation Policies</b>
	Tools
	Professional development and training
	<b>Teaching and Learning policies</b>
	Whole School approach
	Ensuring positive learning environments for diverse students
	Promoting the Mother Tongue
	Parental Community Involvement
Classroom Support	

*Note:* Key findings are colour coded according to Bourdieu's cultural capital manifestations (1986).

■ Objectified Manifestation    ■ Embodied Manifestation    ■ Institutionalised Manifestation

Whereas Chapter 5 looked at what support was provided and how a student supported themselves as an EAL student studying biology, this chapter looked at how the government facilitates and provides support for EAL students and mainstream teachers to support EAL students. Despite the initial objective being to focus on teaching biology, there were no explicit policies to support mainstream biology teachers. Therefore, policies that supported mainstream teachers in content classes was considered as the policies that were relevant to my research question. The ecological framework allowed me to focus on the policy as a whole and then focus separately on the individual stakeholders that were involved in the EAL students' journey, such as family and parents.

### *Macrosystem*

The research question “What policies and support materials are provided by the government of Victoria to support teaching biology to EAL students, and how are these interpreted by mainstream teachers to support EAL students in secondary schools in Victoria?” allowed another perspective to be presented in my research. Whilst I considered various strategies and used various aspects of my cultural capital during my journey as a student, the macro perspective allowed me to see how the government provided supporting tools to enable mainstream teachers in supporting EAL students. By grouping the policies according to the framework by Jie (2016), it allowed a closer look at the various stages of the policies and the various points at which they were implemented. These areas were system level policies, resource allocation policies and teaching and learning policies. Within the same grouping, analysis of teachers’ perspectives and interpretations were completed to explore how mesosystems and microsystems function within the macrosystems.

### *Microsystem and Mesosystem*

The analysis of microsystem and mesosystem within each of the macrosystems allowed me to analyse teachers’ roles and actions within each of the policy types. This demonstrated which policies were being used, which policies needed to be communicated and the concerns teachers had about them. It also allowed me to showcase how mainstream teachers are utilising the various policies to provide the maximum amount of support for EAL students in their mainstream biology classes.

As I completed this chapter, my initial intention was to understand how the policies as a macrosystem affected EAL students. However, it was evident that while the macrosystem of policies provided a basic structure and framework to provide the support, the mesosystem and

microsystem substantially enhanced the effects of the macrosystem. For example, whilst monitoring and evaluation was implemented by the policies, it was the teacher's interpretation and use of the data that further benefited the students. Thus, the more effective results were based on the interactions within the mesosystem where there were interactions within the various microsystems (teachers and parents) or with microsystem and macrosystem (teachers and policies). It became evident that whilst there are a range of policies in place to support EAL students in their biology learning, it was the teachers' interpretation of the policies that provided significantly more benefit for the students. This links with the teachers' perspectives and feedback on their experience in biology classes and how they cater for EAL students.

The next chapter contains the third publication for this thesis. It is a case study of teaching practice to explore how teachers utilise EAL students' experiences and backgrounds to help them achieve success and meet the system requirements of VCE. This chapter explores the on-the-ground practice that is implemented as teachers work with students to promote success in their VCE biology learning.



## Chapter 7: Case Study of Teaching Practice

### Teachers supporting EAL learners in mainstream biology classrooms: understanding learners and the system is the path to success

#### Abstract

English as an Additional Language (EAL) students can face additional challenges in learning in mainstream classrooms, especially in subjects such as biology, where there can be significant language demands. This article considers how experienced mainstream teachers support EAL students in their biology classes. Four biology teachers working at schools in low-socioeconomic areas with high proportions of EAL students were interviewed. The data from these interviews were analysed to identify strategies these four teachers used to support EAL students in mainstream biology classes. Funds of knowledge are used as a mechanism to present key findings and identify common themes and areas that can be extended to provide better support for EAL students. Findings presented in this paper signal the importance of celebrating students' successes, the need to ensure self-sustaining activities and strategies, and how various support can be especially beneficial for EAL students studying in mainstream biology classes.

**Keywords:** EAL learning in mainstream classrooms, EAL students in biology, strategies for supporting EAL learners in mainstream classrooms.

#### 7.1 Introduction

Migration statistics reveal that there were 281 million international migrants, which made up 3.6% of the world's population in 2020 (International Organization for Migration, 2020). Thus, there are students worldwide who will have limited proficiency in the language spoken in their classrooms at school. Data reveals that in 2020, there was a total of 218,741 students from a language background other than English in Victoria (Department of Education and Training,

2021a). In 2018, in Victorian government schools, 27% of students were from a language background other than English (LBOTE), and 13% were English as an Additional Language (EAL) learners (Vic DET 2018). The percentage reveals that many students in Victorian schools may need further support to learn effectively due to a lack of language proficiency.

Some subjects, such as biology, present additional challenges for EAL students at the VCE level due to the time constraints, amount of content and the literacy level required to communicate the knowledge. Through various training opportunities and experience, some teachers can provide significant support for EAL students. While the need to support EAL students has been well researched, it is evident that further support needs to be provided to ensure that EAL students are successful in their mainstream classes (Hammond, 2012; Tangen & Spooner-Lane, 2008). This article focuses on identifying strategies that have proved successful for mainstream teachers supporting EAL students in biology classes in Victoria, Australia. However, the findings are applicable to teachers and students in other subjects and contexts too. The study was guided by the overarching research question, how are mainstream biology teachers supporting EAL students in their mainstream biology classes?

This paper provides an overview of challenges that EAL students must navigate when learning biology in mainstream classes. It addresses the various dispositions (Baker, 2005) students possess (related to learning and revising) in terms of funds of knowledge. The framework of funds of knowledge are used in the study to demonstrate the approach by students. The challenges of the context of VCE biology for EAL students are then discussed to emphasise the need to know the system to ensure that students can succeed in it. Following this, teachers' tools are identified based on the educational perspective. Finally, the overall discussion demonstrates

how teaching strategies and tools can use students' funds of knowledge to provide students with a richer and more supported learning experience.

## 7.2 Literature Review

### 7.2.1 Funds of Knowledge

The term funds of knowledge (FoK) refers to the various skills and knowledge that an individual has developed to function in their culture. Moll et al. (1992) expanded the model to posit that integrating students' FoK into classroom activities can provide them with a richer and more scaffolded learning experience. A range of studies that have used and studied FoK approached funds as developed primarily through discourse. Some examples of such discourse involve conversations between the teacher and student, and integrating and incorporating students' cultural experiences and funds into the lesson (Moje et al., 2004). It has also been found to support science literacy and content knowledge (Barton & Tan, 2009; Upadhyay, 2006). The incorporation process observed in these studies required teachers to draw on various students' individual experiences in their content subjects, while other studies have expanded the definition of FoK. One such study has expanded the definition of the term funds in research on adult numeracy learners (Baker & Rhodes, 2007) and includes the following in the definition of funds:

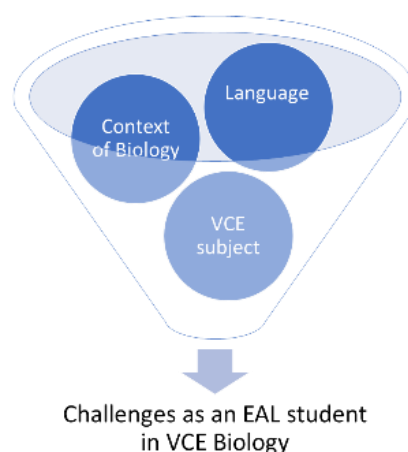
- Attitudes, dispositions, desires, values, beliefs, and social and cultural relations,
- Relationships with learning, teachers and mathematics itself (Baker, 2005, p. 16)

The data collected for this study demonstrated that the four participating mainstream teachers endeavoured to utilise students' skills, abilities, and traits instead of viewing students' differences as disadvantages. Therefore, the data aligned with a theoretical model that championed students' success rather than a deficit model highlighting their challenges. Further investigation reveals that the data aligns with the FoK model by Moll et al. (1992) and the

dispositions students have towards their learning. Learning disposition has been defined as a cultivated habit of mind of behavioural pattern during the learning process, including the person’s “characteristic, cognitive performance and action tendency of problem situation” (Lin & Tai, 2016, p. 1904). Whilst this study uses the definition by Lin and Tai (2016), it also approaches dispositions as a malleable entity that can be affected by outside factors. Despite the model of FoK being introduced by Vélez-Ibáñez and Greenberg (1992), Moll et al. (1992) extended the idea from anthropology to include application in education. The FoK model provides a scaffold for teachers to explore how to introduce and promote various dispositions among their students. Thus, allowing educators to see various dispositions of EAL as pedagogically viable assets. A range of studies have been undertaken to explore how FoK can support students in utilising their knowledge and provide more equitable and responsive education for students from any background. See, for example, Ashurst et al. (2014), Hiorth (2018) and Conteh (2015).

### 7.2.2 System Requirements

**Figure 1** System Requirements: Language and VCE Subject Requirements of Biology



In Australia, end-of-schooling assessment is delivered and monitored at state levels. The organisation responsible for providing curriculum and assessment programs for students in Victoria, Australia, is the Victorian Curriculum and Assessment Authority (VCAA). While there is a

range of pathways available for tertiary learning and employment, most students complete the Victorian Certificate of Education (VCE) to complete their secondary education satisfactorily. To receive the VCE certificate, students must complete a minimum of four subjects, including English, and receive a satisfactory completion for all. The student's grades and overall ranking determine which university courses they are eligible for and thus determine which opportunities the students receive. The higher the grade and rank of students, the more opportunities available for the students in their future. Biology is one subject that is available for VCE students.

### Language in Biology

Various aspects of language were suggested as points of need for EAL students; however, this links back to the heterozygotic nature of EAL students. Heterozygotic nature refers to variation in EAL students' knowledge and experiences. Depending on their background, previous schooling, parents' literacy levels, and socioeconomic status, students will have differing reading, writing, and speaking abilities. Yet, a common theme was that most students are more advanced in verbal language skills than written language. This is supported by research that stems from the work of Cummins (1981). He states that while basic interpersonal communicative skills (BICS) can develop within two years of immersion in the target language, it takes between five and seven years for a child to be working on a level with native speakers in regard to academic language. Academic language proficiency refers to cognitive academic language proficiency (CALP) (Cummins, 1981). Thus, students who are confident in BICS will not be as fluent in CALP. Difficulties arise for mainstream teachers when they are not able to quickly identify EAL students in their classes and, thus, are not aware of students who will require further scaffolding in terms of the language. Biology and science subjects consisting of terminology and sentence formats fall within CALP. This means that developing the CALP related to biology will take longer than the BICS

used in informal settings. The range of strategies discussed in the findings and discussion section and the crafting of the response section is intended to support EAL students in developing their CALP.

### Biology as a VCE Subject

Research is sparse regarding EAL students studying VCE subjects, particularly biology. A compounding concern is that studies have found that lower socioeconomic status (SES) areas will, on average, perform lower than high SES areas (Murphy, 2020). While all students can face challenges in their learning, EAL students often need more scaffolding and support to navigate the language. Barnes et al. (2019) describe how many teachers have found the experience of having EAL students in mainstream classes time-consuming, especially considering the limited time available for mainstream subjects. This is significantly more relevant in subjects such as biology due to the need to address the content knowledge and the ability to communicate it effectively. The added challenges of learning biology and science subjects in middle school years have been discussed by researchers such as McCallum and Miller (2013). They identify that EAL students need high levels of teacher scaffolding and emphasise the need to provide EAL students with opportunities to produce content by applying their skills and knowledge through new language structures. In the following sections, this article discusses how mainstream teachers are finding alternative avenues to provide extra time and individual support for their EAL students to compensate for the lack of time within the already full VCE biology program.

Since the COVID pandemic began, the department of education and Training (DET) in Victoria has incorporated a tutoring program within schools for students who have been significantly affected by remote learning or nominated by their teachers as requiring further

support. This program is one of many strategies and opportunities to support EAL students' learning in VCE biology.

### *7.2.3 Initiation-Response-Follow Up (IRF) Model*

This article uses the tri-fold discourse pattern, Initiation-Response-Follow up (IRF) model by Wells (1993), to present mainstream biology teachers' strategies to support EAL students. It merges the emergent ideas of the FoK approach with the system requirements of VCE biology to demonstrate how effective strategies are produced when students' FoK is utilised. The initiation aspect of this model consists of the teacher questioning, followed by students' responses and then the follow-up by the teacher. Whilst various models of the tri-fold discourse system were considered, the model by Wells (1993) was chosen for this article because they posit an open-ended dialogue within the follow up aspect of the model. Furthermore, they highlight the need for communication and dialogue where knowledge is co-constructed. Some examples of follow-up methods include remaining silent (Jaeger, 2019), reformulating or extending a child's response (Mercer, 2004), or asking open-ended follow up questions (Boyd & Markarian, 2015).

This article expands and builds on the stages to consider how such a model can be utilised in the context of EAL students studying biology subjects. Within these contexts, this article considers various aspects, such as:

- Initiation: EAL Students need to be able to understand the teacher's questioning – translation
- Response: How to encourage students to respond to teachers' questioning and respond to their content – communication, collaboration
- Follow up: Following up and multiple opportunities to apply the knowledge – craft, repetition, practice

The IRF model is not isolated just to the teacher discussion component in this article. It is used for the overall approach to supporting EAL students through their learning process.

### 7.3 Methodology

This paper uses a case study methodology aligned with Yin (2014) framework for a case study. Yazan (2015) defines a case study as an inquiry that addresses the how or why questions about the phenomenon of interest. This study considers the phenomenon as supporting EAL students in mainstream biology classes. To ensure that the study is not too broad, it is important to ensure that the context of the study is considered. Stake (1995) suggests using boundaries in the particular case to ensure that clear context is provided. Creswell (2009) suggests using time and place to bind a case. The boundaries for this study are set within Victorian schools in Australia and schools with low-socioeconomic demographics. The case study method was used because it allowed us to conduct an exploratory inquiry into how teachers currently support EAL students in their mainstream classes. This method of inquiry allowed for more elaboration within the different ideas discussed and allowed us to delve deeper into the introduced strategies—the research design allowed for the exploration of the phenomenon through the biology teachers’ perspectives.

#### *7.3.1 Participant Schools.*

Two schools with over 70% of students from language backgrounds other than English and with low-socioeconomic demographics were selected for the study. The profiles of the two schools are provided in Table 1.



**Table 1** *Participating School Profiles*

School code	School 1	School 2
% of students from Language Backgrounds other than English	81	70
School Sector:	Government	
School Type:	Secondary	
Year Range:	7 – 12	
Location:	Major Cities	
Teaching staff:	92	104
% of school population in the bottom quartile of the distribution of Socio-Educational Advantage (SEA) scale	52	64
School ICSEA percentile	24*	12**

*Note.* Data obtained from the MySchool website (Australian Curriculum Assessment and Reporting Authority (ACARA), 2020).

\*This means that this school is more educationally advantaged than 24% of schools in Australia and more educationally disadvantaged than 76% of schools in Australia.

\*\*This means that this school is more educationally advantaged than 12% of schools in Australia and more educationally disadvantaged than 88% of schools in Australia.

From each school, two mainstream biology teachers were invited for semi-structured interviews. Participants were purposively selected because they taught biology in mainstream classes at schools with a high percentage of LBOTE students. Teachers with a different number of years of experience were considered. However, both biology teachers at school one had the same number of years of experience and were both chosen for the study. All teachers were invited by approaching the school and obtaining contact details with teachers' and schools' permissions.

Ethical permission to carry out and publish this study was requested and granted by the Victorian Department of Education and Training and the University Human Research Ethics Committee.

### 7.3.2 Participant Teachers.

**Table 2** Profile of the Participating Teachers

Name	Gender	School	Number of Years Teaching	Number of Years Teaching Biology	Number of interviews carried out	Year of interview(s)	Language-Teaching Experience?	Teacher Education
<b>Michelle</b>	Female	School 1	3	3	3	2019/2020	No	Australia
<b>Amber</b>	Female	School 1	3	3	3	2019/2020	No	Australia
<b>Ryan</b>	Male	School 2	12	11	1	2021	No	Australia
<b>Jane</b>	Female	School 2	7	6	1	2021	No	Australia

### 7.3.3 Data Collection.

Semi-structured interviews were chosen to provide an opportunity for open-ended questioning and follow-up queries based on the teachers' responses, providing more insight into the context of the case and the phenomena being studied (Adams, 2015). Interviews consisted of face-to-face and virtual interviews and were audio-recorded with participants' permission for 45-60 minutes.

### 7.3.4 Data Analysis.

Thematic analysis was used to analyse the data, and the NVivo program was used to assist in the coding and grouping following the coding. As identified by the participant teachers, success traits in EAL students were classified under FoK. Similarly, skills for EAL students' success in VCE biology identified by the participant teachers emerged as themes that were the result of thematic analysis. Following the findings, overarching areas to target are highlighted, and FoK and the

Initiation-Response-Follow up (IRF) model present some possible methods to support EAL students in mainstream biology classes.

The article is framed by overarching themes that emerged after analysing data from interviews with the participating teachers. The emergent themes included utilising students' dispositions towards learning, meeting the requirements of VCE biology as an EAL student and utilising both those aspects to implement strategies that will benefit EAL students in mainstream biology classes. The findings and discussion are combined to present and explore each theme without interruption. The structure for the findings and discussion section is as follows:

- Funds of Knowledge
  - Work ethic
  - High Expectations
- System Requirements
  - Language In biology & biology as a VCE subject
    - Knowing the content
    - Understanding the question
    - Crafting the response
- Initiation, Response, Follow-up (IRF)model
  - Translations
  - Communication
  - Collaboration
  - Crafting → Repetition → Practice

## 7.4 Findings & Discussion

### 7.4.1 Funds of Knowledge

As FoK theory celebrates student success, it is crucial to identify different forms of evidence of success. During the examination year, teachers calculate a predictive grade based on students' current knowledge. It is calculated based on the students' School Assessed Coursework (SAC) scores. These indicative scores are used if the student is unable to complete the summative exam at the end of the year. As these scores are available to the teachers at the end of the year, it can be used as a growth indicator to demonstrate students' progress over the year. The following quote refers to Ryan's observations based on his students' predictive grades.

They (EAL students) are given a predictive grade, and when you compare it to the achieved grade, and very often our EAL students outperform quite substantially [compared to] their predicted grade. So, they're doing much better than what they were predicted to do based on their current [situation]. It's not easy, and not all students have the same barriers and obstacles, and it's typically the language that is the reason why they've got a lower predictive grade... So, that usually is a success. That to me is the highest level of success. (Ryan)

Each student has a different background, and it is important to identify and accommodate each student's different circumstances. Even though VCE subjects focus on summative assessments as opposed to formative assessments, the growth that students undergo during the learning process should be considered a success. The exams, study scores (total score for each subject including exam and School Assessed Coursework) and ATAR scores (ranking based on the total score of all subjects) will provide a summative score. When teachers measure their students'

success, they should consider their growth. The quote from Ryan refers to when students perform higher than the scores predicted by their teachers, which should be considered a success.

Many more opportunities can be provided for EAL students to feel a sense of achievement and success during classes. Some examples from literature that promotes the sense of achievement include providing modified work (Davison & Michell, 2014) that allows students to demonstrate their knowledge in an alternate form and not be limited by their literacy. Similarly, teachers can have individual conversations with students to allow students to elaborate and clarify their knowledge. Individual conversations also allow teachers to correct minor terminology and technical knowledge during a conversation, as suggested by the work (Creagh, 2019). While students need to communicate their biology knowledge to VCE standards, they should also be provided with alternative opportunities that are not as reliant on their English proficiency to provide them with more opportunities for growth and success.

#### Work Ethic.

There's been after-school sessions offered to students to go through exam questions related to the area focus that we've had that week. So, if we're focussing on enzymes that week, we'll do exam questions. And again, EAL students, for the majority of these sessions for ten years, have been the students attending regularly. It allows us to sit down at a table and talk through things and identify mistakes when they happen. And I guess it's highlighting the need to have that one-on-one support for those students. (Ryan)

One of the most prominent traits identified when discussing successful EAL students was their work ethic (Arshad et al., 2021). All four teachers discussed the amount of extra work completed during class time and outside class. Some critical strategies discussed here included

using after-school resources to get further assistance and receiving more targeted feedback in small groups.

Another method that enhances and encourages students' work ethic is an individual and quick turnaround with feedback on work to provide students with targeted feedback while the content is recent. EAL students require specifically targeted feedback because the language needs to be targeted toward them. The need for targeted feedback has been discussed by Hager (2020), who emphasises the need for timely and relevant feedback but also highlights the need to be aware of errors in the fluency of written responses as part of language acquisition. Hager (2020) recommends that teachers "provide comments about the text as a whole; for example, the cohesion, the structure, awareness of audience and purpose, use of vocabulary" (Hager, 2020, p. 37). Thus, while all students should receive timely feedback, providing EAL students with timely individual feedback can give them the support needed to develop their writing.

Of course, all of this takes extra time from teachers, as found during the interviews. Ryan indicates that he would like to be "... able to spend more time with the students in, I guess, a smaller group setting and focussing on developing a language" (Ryan). The use of after-school homework clubs can provide that much-needed individual time for students' needs. While teachers must not overextend themselves, and maintain a work-life balance, providing a time allowance can be significantly beneficial for both EAL students and teachers.

#### High Expectations.

The following quote describes Jane's experience with a successful EAL biology student. It reveals the commitment the student had to completing their work to the highest standard. It also demonstrates the student's ability to self-reflect and use feedback to further develop their skills and knowledge.

Like every homework club, constant emails, this isn't good enough. I need to do it again, and here's my third version of that thing that was due three weeks ago that you've been marking over and over again because I'm [the student is] still not happy with it. (Jane)

Successful students have high expectations of themselves. In terms of biology, continuing to develop their work until it reaches a higher standard compels students to think critically about and interact with the content, encouraging deeper understanding by allowing students multiple opportunities to interact with the content. Consistent improvement on a given topic will allow for more exposure to the content, which will support students in their long-term memory of the content (Chen & Yang, 2020). Similarly, regarding the language, high expectations and constant improvements promote further development of students' language skills. Teachers can facilitate this by maintaining high expectations of their students. While it may be tempting to allow concessions for students who face significant challenges, it is also essential to maintain high expectations and motivate students to continue developing their knowledge and skills. High expectations also promote students to be critical thinkers who study independently and, instead of just learning from their mistakes, make corrections to address the identified mistakes.

Studies have revealed many advantages when students self-correct and carry out critical revisions of their work (Forbes et al., 2004), especially for EAL students (Dung, 2016). In particular, there was a significant increase in the results achieved on summative exams, such as end-of-year exams (Grühn & Cheng, 2014). This can be especially beneficial for VCE students who are significantly impacted by the end-of-year exams for VCE subjects. Grühn and Cheng (2014) found that self-correction was more beneficial after students were introduced to the topic and not for self-revised material. Thus, self-correction should be approached as a method that provides

additional engagement with the topic. This aligns with the high expectations of the students, where students can carry out self-correction as a further revision of material and maintain higher expectations of themselves. The study by Dung (2016) revealed that self-correcting also promoted a more positive attitude toward autonomous learning and students became more confident in their abilities, further supporting them to maintain high expectations and promote autonomy in their learning.

#### *7.4.2 The System: Knowing & Meeting the Requirements for VCE & Biology*

##### Knowing the Content.

...multiple-choice starts up in the exams we're on par with the state... if not, in some cases, above the state with questions. The second we get to short answer questions, it's really atrocious, to be honest, how far that gap is between us and the state average, and that was indicative, not only our EAL students but also our EAL literacy students in general. So, it seems to be a bigger issue. But yeah, I think along the way, prioritising language and learning how to respond to questions, teaching students explicitly how to respond to questions, decompose them, understand the text that they're using, whether it be video, textbook [or] other resources. (Ryan)

Despite having enough content knowledge to succeed in the multiple-choice section, lower literacy can significantly disadvantage students in written responses. While this can affect any student with low literacy, it will be present in EAL/D learners who are more likely to have lower literacy levels. Scientific discourse and communicating scientific knowledge are crucial in biology and science subjects, and one primary form of this communication is through written expression (Fang & Wei, 2010). While all students need support in this area, EAL students require significantly more support due to low literacy. There are studies about strategies that can promote writing in



science, such as graphic organisers (Telesca et al., 2020) and compare and contrast (Drew et al., 2017).

The interviewed teachers also described various tools that successful biology students utilised such as Edrolo and Khan academy. These are online video platforms that cover the necessary content for the subject. Whilst Edrolo is a subscription-based program that is linked to the curriculum, Khan academy is a free online platform that consists of tutorial videos for a range of topics.

It [Edrolo] covers the content that they think is important and sometimes miss that extra stuff that's needed to create context.... (Jane)

Edrolo making the content more accessible to students because it is video, as opposed having to read a textbook, or watch very complex videos from things like Khan Academy and the like. That has changed the game a little bit for our EAL students because the content is delivered in a way that is more accessible. Not totally accessible to everyone but certainly more accessible. (Ryan)

The quote by Jane reveals that each tool has its limitations. However, both Jane and Ryan indicate that the programs were considered helpful in terms of learning and knowing the content. Whilst such tools facilitate independent learning by a student, students still require support from the teacher, and a common concern among teachers is the lack of time (Baker et al., 2008). Thus, the range of strategies used to support students is best incorporated into teaching time.

Knowing the system also involves using the system and ensuring that the students are prepared to achieve success within the system. One method that was used by one of the schools of Ryan and Jane was the use of pre-VCE classes to provide additional class time. Pre-VCE classes provide students with an early introduction to a VCE subject, providing an opportunity for the

teacher to introduce content earlier and over a longer period. Teachers then also have more opportunities to explore the written expression within the subject. This strategy will only benefit a select group of students who choose such classes as electives in their junior years. Having an early start can provide additional time for students to learn the necessary content as well as various skills needed to achieve success in their summative assessment for VCE. One such skill is to understand what is asked.

### Understanding What is Asked.

The quote by Michelle describes her process to ensure that her EAL biology student is able to break down the question and create an appropriate response. As the summative exam for VCE biology consists of short answer questions, knowledge of the content alone is not sufficient to successfully answer the questions. Students need to be proficient at identifying and understanding what is asked in the question.

So, I said instead of doing that, what's the question, what are the keywords? So, we'd go through and highlight the keywords and then we kind of dot point our responses to make them key and precise. So exactly what we're after. And then over time, she's then been able to do that and then develop them into nicer sentence structures that are more to the point, instead of just repeating herself.

(Michelle)

While there is sparsity in the amount of research that has been conducted to support students reading questions effectively, there is a plethora of support online. This includes various strategies such as reading the complete question first and highlighting and underlining keywords. Furthermore, there are problem-solving techniques such as the mathematical word problem-solving strategy "cubes," which stands for circle the number, underline the question, box the

keywords, eliminate the unnecessary information and then solve and check. Whilst science subjects can be more language heavy and require a more complex approach, Michelle's suggestions about highlighting to obtain the necessary and relevant information can be used to address the key requirements of the questions. Identifying the keywords and eliminating the unnecessary information in a question can be further effective for an EAL student considering the challenges of the language in biology, as discussed in the challenges section. Strategies such as identifying, highlighting keywords, and eliminating unnecessary information can support the students' understanding of what is being asked in the question. Mainstream students and English proficient students can effectively implement this strategy because they understand what the keywords are and can thus understand the intention of the question. This strategy can be significantly more challenging for EAL students, who have difficulty identifying the question's verbs or action words.

“A number of times, the students can't identify the verb in a sentence, so they don't actually know what they're being asked to do” (Jane).

Whilst this can be relevant to both mainstream students and EAL students, the language will be significantly more challenging for an EAL student, who may also be lacking in the BICS, so action words can provide further challenges. In VCE summative assessment, action words indicate what the examiners require. The words dictate whether an explanation, comparison, contrast, or other action should be completed by the student to satisfactorily meet the requirements of the institutional achievement. One method to support EAL students in identifying and addressing action words is to create a glossary of common action words and their definitions and deliberately omit the action words during a practice session to allow the students to identify them (Johnson, 2009). They may use translations in their glossary to further scaffold their understanding. Teachers

can provide students with more exposure to action words by including the common action words in their lessons' learning objectives (Felder & Brent, 2004). Whilst the method of identifying and isolating the action words can be significantly beneficial for EAL students, it can also facilitate mainstream students' knowledge and support them in understanding what is asked in the question. Efficiently understanding what is asked of the question can support the student in crafting the relevant response.

### **Crafting the Response.**

To craft an adequate response to questions, students need to be proficient in the academic language related to the subject. As VCE biology measures its achievement based on summative assessments, it is integral that students craft their responses to align with the expectations of the assessment. "So, biology's all about like keywords. You have to hit those keywords to get those marks, and if you're not specific and you don't hit that keyword, you don't get the mark" (Jane). Some methods of addressing the ability to cater to the summative assessment include developing sample responses, identifying the action words, and discussing the structure required in the responses. This is intended to support students with their written responses, which will be the major assessment form for VCE biology students.

### *Terminology.*

"Low-level literacy kids and everyone needs that kind of intro into how to read scientific words because the language of biology is a whole another language" (Jane).

One key aspect of teaching biology is the terminology associated with it. An overview of some strategies that can be utilised was discussed in the study by the (Fernando & Cooper, 2017), who emphasised that the terminology should be a primary consideration when supporting EAL students in science and biology subjects. Teachers in this study reiterated this in regard to the BICS

and CALP. Whilst all students need to learn how to communicate using the CALP in biology, EAL students face the additional hurdle of BICS and CALP, which results in students carrying out at least two translations instead of one translation from the basic interpersonal communication in English to cognitive academic language proficiency in biology. This further highlights the need for EAL students to receive additional support in biology terminology.

### *Tier Two Words.*

Rosebery and Warren (2008) use the *three tiers of words* to highlight how challenging language and meaning making can be for EAL students. The three tiers align with the model by Beck et al. (2013):

Tier One – these are words typically found in oral language.

Tier Two – wide-ranging words and of high utility for literate language users.

Tier Three – words that tend to be limited to specific domains or rare words. (Beck et al., 2013, p. 5)

BICs by Cummins (1981) sit within tier one, and CALP can be classified as either tier two or tier three. As tier two are words present in academic discourse but not subject or discipline-specific, they include action words as discussed previously. However, within tiers two and three, there is dual meaning vocabulary (DMV) defined by Song and Carheden (2014), who describe DMV as words that can “be used in both scientific and everyday contexts” and have a “general meaning in one context and a particular technical definition in another context” (Song & Carheden, 2014, p. 2).

It's not like they don't know what these words mean. It's that they don't know

“what they mean in this particular context.” (Jane)

Reaction... that could mean slightly different things in different contexts. So, if explaining what that means... it's not only covering the scientific terminology but also those tier two words as well and making sure they understand what it means within the context of biology or in science in general. (Ryan)

DMV can be especially challenging for EAL students. Song and Carheden (2014) found that when students had the choice of two definitions, they were more likely to choose the everyday definition instead of the technical definition, which was more abstract, challenging, and unfamiliar. The authors found that the best way to support students in developing their DMV was through the content-first approach, by providing students with ample opportunity to utilise the vocabulary within the context of the field. Thus, this demonstrates how practice with crafting responses can provide a positive feedback approach to developing EAL students' terminology and language skills. To meet the system requirements of VCE as an institution and achieve academic success, students need to be proficient and confident in their use of terminology, action words and DPV.

#### *7.4.3 Initiation-Response-Follow up Model: Strategies that Incorporate Funds of Knowledge within the System Requirements*

##### Communication.

"They're experts on themselves" (Ryan). Evaluation and self-reflection should be an ongoing component of all subjects and requires students to re-read their work and continuously develop and improve. Advantages for EAL students in this context include communicating their understanding to themselves and their teachers. While this may seem challenging for the student, if they can successfully provide feedback on their understanding, they will have mastered a level of English and biology content knowledge. Currently, mainstream teachers use class time and

outside hours to have individual conversations with students but also use formative tasks such as exit slips, requiring students to carry out regular self-reflection (Bennett, 2011). Such activities promote the inclusion of the practice of written communication, which will benefit EAL students significantly and allow them to incorporate the biology context and knowledge within that.

#### Translation.

In an EAL class... there's been a teacher in there, so for example, if there were lots of Mandarin-speaking students in that class, they had a translator that could speak Mandarin, and they were discussing the book in Mandarin. (Amber)

There were differing views on the translation of documents and material for students. For example, one teacher discussed translating school assessed coursework (SAC) and working with a multicultural education aide (MEA). There was a mixed review about this activity. The teacher's primary concern was that as the assessments are in English, it would be of limited benefit to translate one assessment. However, the student understood more due to the translated assessment. The advantages of translated work have been discussed in various studies (Arnot et al., 2014). This article builds on previous work and incorporates it within the method of collaboration. Whilst it is helpful to receive translated documents through a translator, EAL students need other opportunities to develop their knowledge and be provided with sustainable strategies for their future. One such approach is to combine the translation with peer collaboration.

#### Collaboration.

But it's like you need a classroom where they can teach each other, and I found that that works quite well, having EAL kids teach other EAL kids... They will ask their neighbour a question like, what do mitochondria do... And then the other person

might explain it in Dari where they could use more specific words that they are familiar with, and then the kid will reply back with, “oh, so it’s the one that makes energy for the cell”. (Jane)

We can also focus around and let them [students] then have that collaborative learning where they can speak in their own language and talk about the concepts. (Michelle)

The worry would be if they were just all like, “Oh gosh, let’s just speak in Farsi because it’s too hard to speak in English,” and then that may not help much. (Amber)

There are significant benefits to collaboration whilst translating in biology and language learning that allows EAL students to convey their understanding of English and provides more opportunities to develop their language skills. Whilst this also requires the student to have basic foundation knowledge of the content being studied, it will also mean that students who can have translated discussions about the topics have a good understanding of the content. Once again, this reiterates the need to have modified tasks and multiple opportunities for students to present their knowledge.

Similarly, the double talk strategy allows students to develop their biology terminology whilst driving the discussion about biology (Brown & Spang, 2008). One of the methods being used, as discussed in the translation section, is allowing students to discuss their native language and translate it back to English. This can facilitate peer learning, which is significantly effective for all students (Topping, 2005), especially in science subjects (Thurston et al., 2007). This strategy is not without its challenges, especially in regard to EAL students. Some concerns discussed by other teachers include keeping students on topic and ensuring discussions return to English. Some



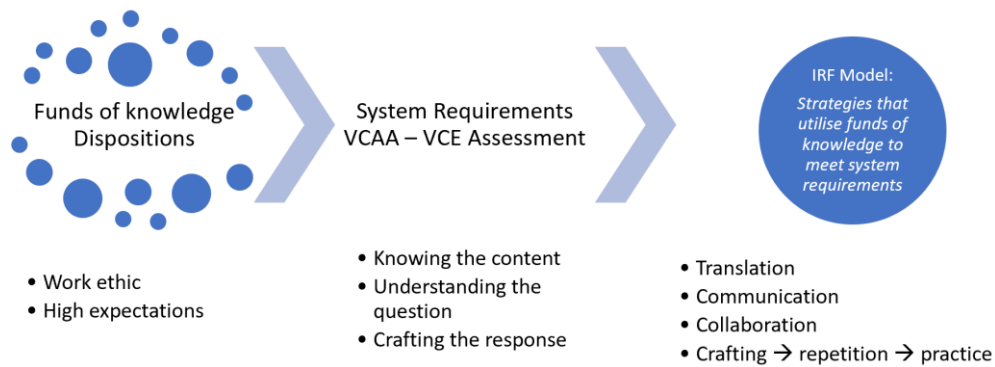
methods by teachers to address this include a booklet to complete following the discussion or discussing and reporting back to the class.

Crafting → Repetition → Practice.

An emerging idea from the data and literature was the benefit of students developing their thinking and building on it. It incorporates the tools and strategies discussed in this article, facilitating content learning, and is supported by translated documents that support students in learning the content. Following this, the crafting process includes producing their content by formatting their answers and ensuring they maintain fluency. The crafting process is also facilitated by the collaboration process, which allows students repetition and to practice their knowledge. Finally, these various methods complement the traits identified in the successful traits section. For example, students can maintain high expectations of themselves by conducting the repetition with the translated and collaboration processes and various practice methods during crafting. Likewise, the process will also require a positive work ethic, a trait of EAL students also acknowledged earlier in this paper.

The data and the literature build on the re-worked Initiation-Response-Follow up (IRF) model by Wells (1993). This article adds repetition and practice to the framework to emphasise the need for EAL students, in particular, to practice applying the various language techniques in a language that is not their primary language. Thus, the repetition following the follow-up stage can encourage students to learn from their mistakes, develop them, and improve.

**Figure 2** *Summary of Overarching Themes*



## 7.5 Conclusion, Limitations and Further study

The FoK theme demonstrated how students' dispositions could be utilised to significantly support their learning. Promoting a good work ethic and facilitating students as they maintain high expectations of themselves can also promote success in their learning. However, utilising this approach will have limited benefits if one cannot meet the requirements of VCE biology.

Understanding the system and the various layers and intricacies of teaching biology as a VCE subject is an important part of teaching the subject, especially to EAL students. For example, while students have to know the content, they also need to understand how to interpret questions asked of them in class and especially for high-stakes assessments. These two skills are then combined to facilitate the crafting of responses that would meet the system requirements.

Once the teacher understands the approaches that should be utilised and understands the system, they need to utilise both to create strategies that will benefit students. The IRF model was used to present how various strategies appeal to/connect with the students' learning dispositions that are embedded due to the daily practices and routines of families (FoK) and meet the requirements of VCE biology. The relationship between these three themes highlights that one theme alone will have limited benefits when compared to the rich understandings generated by the intertwining of all three themes. The identified strategies are more beneficial when a teacher

understands a student's context through their FoK and dispositions and can utilise the identified strategies within the system requirements.

Some limitations of this study include the small scale with only two schools and two teachers from each school participating. Further studies should be conducted to include a bigger sample. Furthermore, this article presents a brief overview of the emerging ideas. Further studies should be conducted within each of the identified themes, such as how to promote various learner dispositions, how to promote further knowledge of the system requirements of VCE and curriculum expectations, and other methods to apply the strategies identified within the IRF model.

One set of strategies or tools will not create an ideal learning environment for any student. However, this article reports the perspectives of experienced mainstream biology teachers supported by literature to present a modified framework that incorporates a range of ideas fit for the purpose of supporting EAL students in mainstream biology classrooms.

## Chapter 7 Summary

**How do mainstream teachers currently support EAL students in their biology classes, and what support would enable more mainstream biology teachers to provide better support for EAL students in their biology classes?**

Celebrating the success: Supporting EAL students in Biology classes from four mainstream teachers' perspectives	<b>Student attributes and factors (Funds of Knowledge)</b>
	Work ethic
	High Expectations
	<b>Meeting the system requirements</b>
	Knowing the content
	Understanding what is asked
	Crafting the response
	Terminology – tier two words
	<b>How Teachers help EAL students</b>
	Communication – time required
	Translation
	Collaboration

*Note:* Key findings are colour coded according to Bourdieu's cultural capital manifestations (1986).

■ Objectified Manifestation    ■ Embodied Manifestation    ■ Institutionalised Manifestation

As discussed in Chapter 3, the framework of funds of knowledge was chosen to demonstrate the positive advantages that one brings from a minority household. Whereas cultural capital claims that schools tend to favour students from middle- and upper-class home environments on the basis of their cultural capital. The benefits of separating funds of knowledge and using the IRF model was to demonstrate how funds of knowledge and student disposition can be utilised by mainstream teachers to support students' language and biology needs. To do so, mainstream teachers used a variety of strategies that were discussed in the language learning section in Chapter 2. Strategies include guiding support for developing understanding of terminology in relation to academic language (Cummins, 1981), building on the previous knowledge gradually (Krashen, 1987), and doing so through collaboration and scaffolding in a

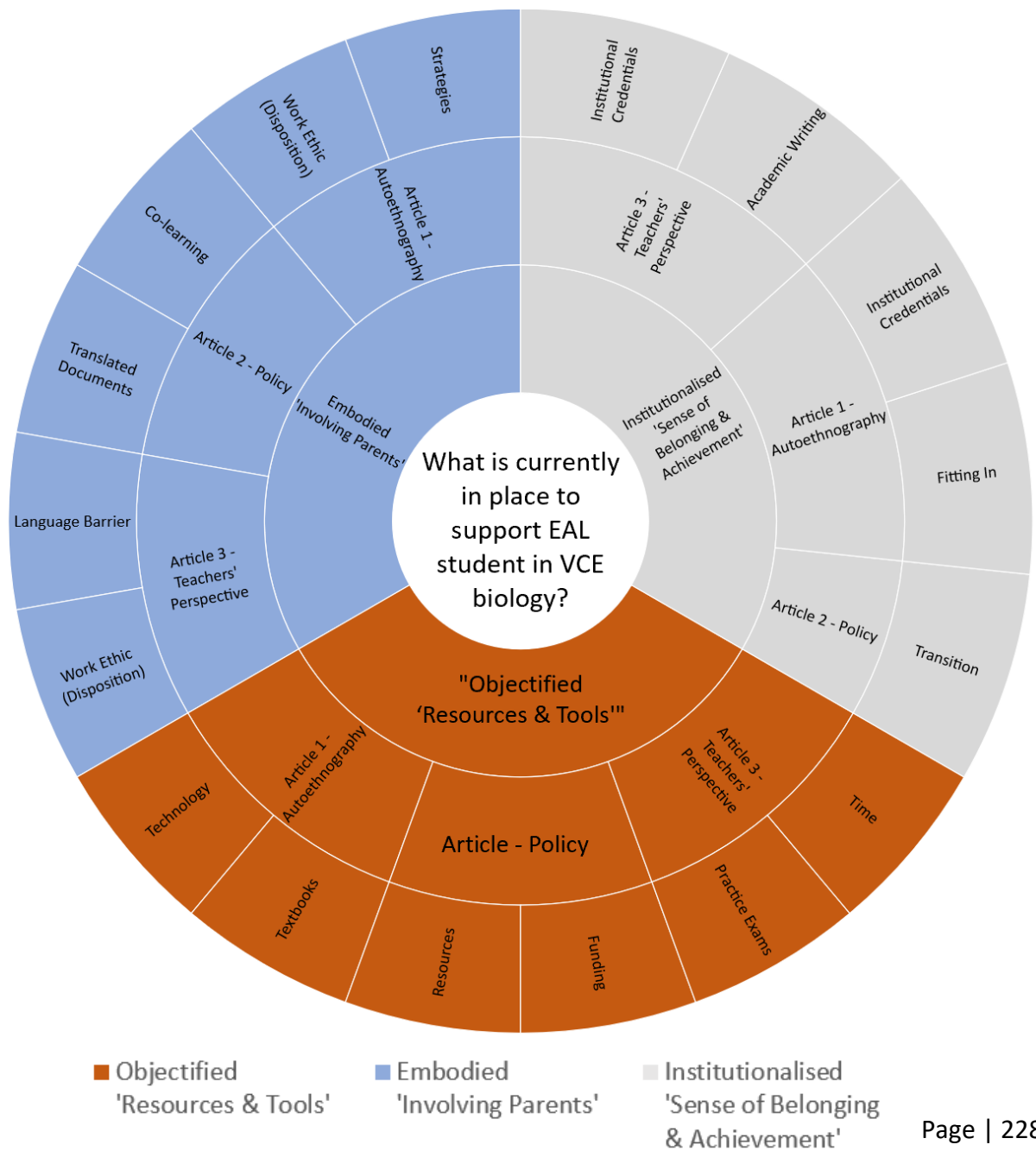
space that students are able to perform (Vygotsky, 1980). As a range of language learning theories are applied within this chapter, the findings demonstrate how effective learning of language and biology is taking place. This ties back to the CLIL strategies as discussed in the literature review where there were benefits of content integrated language learning. This chapter demonstrates how CLIL can be implemented in VCE biology classes with adequate support. However, it is evident that it is at great cost to mainstream teachers in terms of time and input. The next chapter, which covers findings and the discussion, addresses the concerns and constraints involved with providing the necessary support in mainstream classes. Chapter 8 also collates the emerging themes across the publications and presents it through the cultural capital manifestations framework by Bourdieu (1986).

# Chapter 8: Findings and Discussion

## 8.1 Introduction

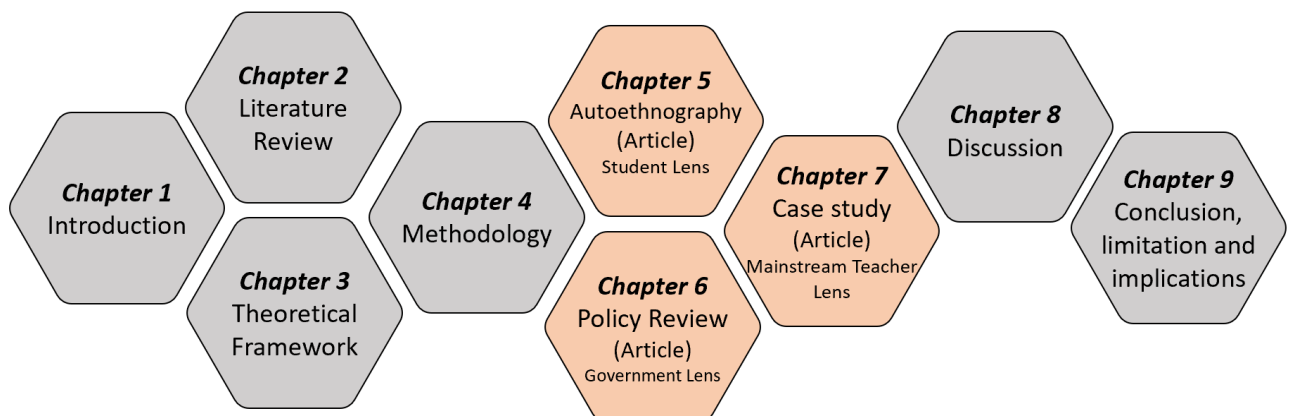
This chapter presents a synthesis of the findings and discussion from the research questions included in the three publications and addresses the overall research question of this thesis. It presents the key themes that were identified through the framework of Bourdieu's cultural capital (Bourdieu, 1986).

**Figure 14** *The Study's Emergent and Major Themes*



The findings from all three articles (Chapter 5, Chapter 6, and Chapter 7) will be discussed using Bourdieu’s cultural capital as a theoretical framework. Bourdieu believed that cultural capital played an important yet subtle role. The more capital an individual has, the more powerful they are. He defined cultural capital as possessing a familiarity with the legitimate culture of a society (Bourdieu, 1986). This chapter synergises the findings of the three articles in the thesis using a perspective that positions EAL students studying biology in the high-stakes VCE examination as marginalised due to a lack of cultural capital. The challenges of English as the mainstream language, access to physical and human resources, coupled with a lack of deep knowledge of the mainstream structures, policies, and school culture, place them at a disadvantage.

**Figure 15** *Structure of this Thesis*



The hexagons in Figure 15 are arranged to demonstrate how the first three chapters provide the overview and the initial information relevant to this research topic. This information is then utilised through the various methodology in Chapter four to obtain the three data chapters, Chapters five to seven. Whilst the data chapters can be read in any order, the optimal order is to explore the student and government lens prior to how mainstream teachers address the student

needs within the government guidelines. These chapters are then analysed and discussed in chapter eight to develop the overall conclusion, limitations and implications in chapter nine.

## 8.2 Study Synthesis Overview

To respond to the overall research question (“**What are the current supports in place for EAL students studying VCE Biology?**”) the perspectives of multiple stakeholders, such as student (autoethnography), Victorian Government (policy review), and teachers (case study), were considered through the three articles written. outlines the placement of the articles within the thesis structure and the stakeholder perspectives used for each article. To answer the main research question, the three articles are further analysed in this chapter using an inductive thematic analysis to identify emergent themes in each article. The commonalities and relationships between the emergent themes are considered to identify major themes across this thesis. These major themes are presented in Table 10.

**Table 10** Common Themes under Three Major Themes

Articles	Emergent Themes from Articles	Major Themes
Mapping a Language(s) journey in science; from learning Biology to teaching Biology: An Autoethnography. (Chapter 5)	<b>Three cultures</b>	<b>Theme 1: Importance of parental involvement in students’ learning</b> <ul style="list-style-type: none"> <li>- Parents and communication that was associated + strategies</li> <li>- Suggestions and documentations promoting interactions with parents</li> <li>- Studies showing how such policies have benefitted</li> <li>- The challenges of communicating with the parents – their literacy and fluency in English</li> </ul>
	Science EAL Integration of Science & EAL	
	<b>Manifestations</b>	
	<b>Embodied:</b> Parents support and the strategies that were passed on	
	<b>Objectified:</b> Tools that were used to support my learning	
Institutionalised: How I had to navigate to obtain the academic credentials based on the language and science knowledge	<b>Theme 2: Need for and use of resources and tools</b>	



EAL Teaching and Learning in Victoria – How Policies impact Teaching (Chapter 6)	<b>System-Level Policies</b>	<b>a) Resources at an institutional level</b> - Funding and resources  <b>b) Student use of resources</b> - Tools that were used - Tools and resources – used by the teachers  <b>Theme 3: Creating a sense of belonging and achievement</b>  <b>a) What’s done at an institutional level</b> - Positive learning environment - How to support students to settle into a school environment  <b>b) How to support students to obtain educational credentials</b> - How I met the requirements of the institution - How to cater to VCE standards - The learning continuum
	Monitoring and evaluation	
	<b>Resource Allocation Policies</b>	
	Teaching and learning	
	<b>Whole School approach</b>	
	Ensuring positive learning environments for diverse students	
	Promoting the Mother Tongue	
	Parental Community Involvement	
Celebrating the success: Supporting EAL students in Biology classes from four mainstream teachers’ perspectives (Chapter 7)	<b>Classroom Support</b>	
	<b>How Teachers help EAL students</b>	
	Knowing the content	
	Tools	
	Answering the question - Fluency	
	Terminology – tier two words	
	Communication	
	<b>Student attributes and factors</b>	
High Expectations		
Communication - parents		

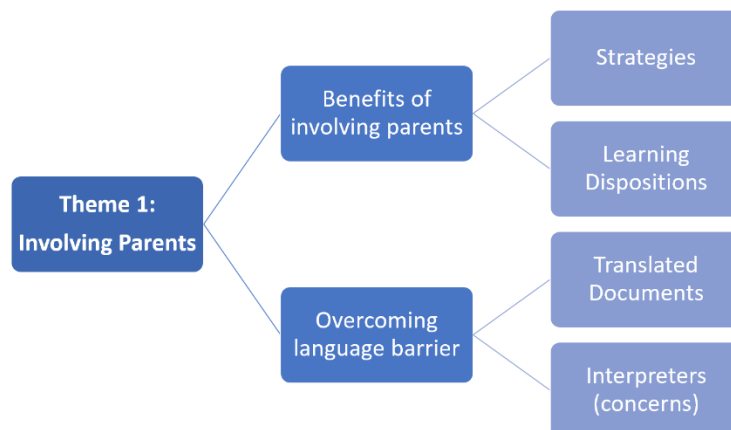
*Note:* Key findings are colour coded according to Bourdieu’s cultural capital manifestations (1986).

■ Objectified Manifestation    ■ Embodied Manifestation    ■ Institutionalised Manifestation

Within these major themes, I use my articles to delve further into answering the main research question. As I explore the current practices, I discuss concerns and areas that are currently in place and what should be addressed and promoted within these major themes. Further recommendations and elaborations are made based on my thesis articles and relevant literature. Whilst no new ideas are introduced in this chapter, additional perspectives on the various themes identified are considered using the data from the semi-structured interviews. This is due to the data chapters which have been written as publications had limited space to include all the relevant data. Thus, some new data is introduced in this section to further support the themes identified in the data chapters.

### 8.3 Theme 1: The Importance of Parental Involvement in Students' Learning

**Figure 16** *Unpacking Theme 1: Involving Parents*



One of the major themes that is evident across all three articles is a need for parental involvement in students' learning and the benefits of parents being involved. A range of studies have demonstrated the advantages of parental involvement (see, for example, Carr (2009); Cooper et al. (2014); Hollingworth et al. (2011)). In his study considering reading comprehension difficulties by Somali-origin students in English schools, Abikar (2021) found that students' comprehension skills increased when parents were involved in providing a more conceptual understanding of the vocabulary. Cuttance (2020) found that when provided with productive and sustainable support from parents, EAL students were able to carry out effective learning. Schneider and Arnot (2018) provide evidence of the impact of parental involvement for EAL students stating parents can often offer further benefits for EAL students at home and foster a strong sense of engagement. Having said this, studies such as (Symeou, 2007) acknowledge that some parents of EAL students will require further assistance to better understand the schooling system before they are able to provide significant support. This literature indicates that the roles of parents in the learning of EAL students is significant, a finding echoed in my study and, in particular, my autoethnography, which highlighted the generational passing of the traits and attitudes I had towards learning (Chapter 5).

Villegas (2007) defines dispositions as “tendencies for individuals to act in a particular manner under particular circumstances, based on their beliefs” (Villegas, 2007, p. 373). For the purpose of this thesis, the definition was further elaborated based on the work by Crick and Goldspink (2014, p. 21) who included the ability to change and learn, critical curiosity, meaning making, creativity, learning relationships, strategic awareness and resilience as examples of learning dispositions. A selection of these dispositions will be referred to in this section. The study by Crick and Goldspink (2014) demonstrated that students who had high scores on the learning dispositions, described above, were “articulate about themselves as learners and confident in their ability [to] take responsibility for their learning and achievement” (Crick & Goldspink, 2014, p. 8). Thus, they summarise that there are learning dispositions that are favourable for a student’s success. Deakin Crick et al. (2015) also demonstrated how resilience as a learning disposition in particular can influence how a student engages with challenge, risk, and uncertainty to adapt and change positively. Cumulatively, the discussed literature explores how a student experiences and deals with their learning journey.

From an EAL student’s learning journey perspective, the research regarding learning dispositions can be especially applicable to EAL students who may have more emotional and well-being needs in addition to literacy and academic needs (Premier & Parr, 2019). The additional literacy and academic needs highlight why it is important to promote positive learning dispositions among EAL students. Shum and Crick (2012) point out the link between positive learning dispositions and achievement on conventional assessments. This is especially relevant to VCE biology students who must meet the requirements of conventional assessments such as School Assessed Coursework (SACs) and exams. Noyes (2004) found that parents were integral in motivating and supporting their children and fostering learning dispositions. My autoethnography

(Chapter 5) reflected on my experiences, where my parents enforced my learning dispositions, such as work ethic, which resulted in favourable results in my conventional assessments.

I would wake up and sit at the dining table as my parents made me copy each word 5 times with no mistakes and 10 times if I made a mistake..., the effort my parents and I put in would always show [as a success] on the day of the test (Chapter 5).

This quote is used to showcase how a range of dispositions that were nurtured over my life can be attributed to my parents. Further examples from my autoethnography (Chapter 5) include regular timetables and waking up early to complete extra work. Such routines instilled commitment to my studies, work ethic, and persistence in pursuing a goal. These dispositions then led to my perseverance with science and biology subjects. The findings of my autoethnography are supported by several studies that indicate that dispositions and attitudes are passed on to children from their parents (Cooper et al., 2014; Kwan & Wong, 2016). This presents an opportunity for parental involvement by modelling practices that foster dispositions of valuing the work and dedication of their children. For example, actions referred to in my autoethnography showcased how my parents practised activities that promoted key dispositions, as identified by Carr and Claxton (2002). Some examples include ensuring that homework is completed regularly (promoting responsibility), and consequences are given when work is incomplete (promoting persistence). Thus, the literature in conjunction with the findings from the articles indicate that strategies should be implemented to allow students to persevere despite the challenges they face and maintain responsibility of their own learning. These dispositions will lead to greater learner engagement and should be utilised and addressed in teaching pedagogy (Crick & Goldspink, 2014).

In addition to parents' contributions, my third article (see Chapter 7) examined how mainstream teachers supported students' learning dispositions. Interviews conducted for the case

study (Chapter 7) revealed how learning dispositions were observed within the classroom context. Multiple teachers identified a crucial characteristic of EAL student success was related to the students' learning dispositions, such as work ethic (Meriac, 2012) and maintenance of high expectations of themselves (Sarra et al., 2020). Teachers in the case study discussed the benefits of working with hardworking students and pointed out the amount of time that has been spent by teachers after class time to support EAL students. As raised by Barnes et al. (2019), while teachers should endeavour to promote positive learning dispositions, there is concern about the lack of time available for them. The limitation of time will be discussed further in the next section. Nevertheless, teachers in the case study were willing to facilitate students' learning dispositions by taking the time to support their high expectations by grading their work in detail and providing scaffolded, extensive feedback for students to implement.

Betancur et al. (2018), revealed that parents who had prior academic, science expertise and education were able to support their children more than a parent with limited experience, language skill, education and science content. This raises the concern that students who are currently disadvantaged due to the lack of experience will be further disadvantaged due to their parents' lack of experience. However, Symeou (2007) states that, "Despite family variations in terms of socio-economic or local background characteristics... all families valued their children's educational success and wanted their children to do well in school" (Symeou, 2007, p. 483). Most parents long to support their children's education regardless of their own experience and are willing participants in implementing various learning strategies at home. Thus, it is important to support parents in building their knowledge in English and science subjects. Whilst there is a paucity of research in this field, some examples of how this can be applied have been identified. One such strategy describes having a check-in book or a summary book that students

can share with their parents. If the parents are not first-language speakers, this will provide the students with the added benefit of explaining subject content in multiple languages, which could support their knowledge through the use of bilingual reading (Berens et al., 2013). Furthermore, the use of a learning management system can be employed to communicate with parents and ensure that they are aware of their children's progress and the content being studied (Laho, 2019). Despite teachers and school personnel engaging more with learning management systems than parents, the findings by Selwyn et al. (2011) included positive responses from parents about receiving more information about their children.

The need for parental involvement was also emphasised in my policy review (Chapter 6), which showed that a range of government documents and programs promoted parent involvement and the need to keep parents informed. The policy review referred to government initiatives that recommend educating parents about transition processes (Department of Education and Training, 2019b), ongoing advice on keeping parents updated (Astbury et al., 2016), and organising more opportunities for parents to be involved in school activities (McDougall et al., 2014). While there was a variety of policies and documents available, there were concerns about the accessibility of the documents due to the varied location of the documents. Given the language barrier of parents who may be looking for translated documents, it was considered impractical to have documents that require a range of convoluted navigation. My study suggested the need for all translated documents that are relevant to EAL students to be stored in one location, utilising simple language for easy comprehension (Chapter 6).

The teachers I interviewed for the case study (Chapter 7) also commented that there was a need to communicate effectively with parents of EAL students who were also English language learners. All four of the teachers noted that it was challenging to communicate when there was a

language barrier, which often exacerbated the co-ordination of support mechanisms and communication between parents, teachers, support staff, and translators.

...there's all these layers behind communication that become really difficult and hard. So, things like booking parent teacher interviews, and learning conferences, you need to make sure you've got a translator available there for them. And then we rely on multi-cultural aids to call the families and quite often they will book appointments for them. (Amber, 2019)

Whilst teachers in the case study (Chapter 7) noted and acknowledged that it was crucial to involve parents, they also stated that it was challenging to coordinate such stakeholder meetings for each individual EAL student and their families. Similarly, there were challenges with translation and the inability, even using translators, to use the correct linguistic register and tone to convey important messages. One teacher participant in this study noted that, sometimes, it was crucial to convey urgency and that this was a delicate balance as parents sometimes, who themselves were culturally and linguistic diverse, were anxious in their dealings with schools (Chapter 7).

It's really hard because you don't know if what you're saying is actually being said. And sometimes you're trying to make a point of things so you're actually being a little bit harsher than what you normally be... it's questionable whether those get translated. (Jane, 2021)

Teachers cited that translators' understanding of parents' anxiety tended to at times soften the tone and urgency of the message, which in the view of teachers can disadvantage students by inspiring less urgency in their parents. Findings indicated that teachers appreciated and acknowledged the benefits of maintaining contact with parents and promoting parental

involvement; however, as supported by literature, this is not without its challenges (Colina & Sykes, 2004).

While data analysis for my papers suggests that there is a significant need to involve parents when supporting EAL students, (Chapter 5, 6 and 7), there are many complex challenges in the implementation process (Schneider & Arnot, 2018). Parent involvement can provide EAL students with a significant advantage, but it must be handled in a supportive manner for all stakeholders involved. To apply this theme and findings using Bourdieu's work allows for both rigour and enrichment in positioning the theme and data within the impact of a broader societal framework.

### *8.3.1 Theme 1 through the Frame of Bourdieu – Embodied Cultural Capital*

Each section of the discussion chapters positions each major theme found in the data within the framework of Bourdieu. By doing this it allowed me to indicate how different manifestations of cultural capital link to both the themes identified, whilst acknowledging the type and amount of capital students may have, which can often be indicators of success for EAL students learning science (Claussen & Osborne, 2013). Furthermore, different manifestations of cultural capital will be addressed. Bourdieu's framework enabled me to discuss how to cater to the needs of science EAL learners using different manifestations of cultural capital.

The policy review looked at various government documents to argue that within the group of students considered EAL, there was a wide range of previous schooling experience, English literacy, and literacy in any language (Chapter 2). Whilst there will be a significant amount of heterogeneity among the students, another component to be considered among the EAL student cohort was the influence by their families and communities. However, it was evident that regardless of high socio-economic (Sullivan, 2001) and low-socioeconomic backgrounds (Symeou,



2007), families demonstrated the transmission of capital towards their children. Considering these components and various socio-economic backgrounds, students will all have a certain amount of knowledge that was passed on from their parents. Though this knowledge is not quantifiable, it can strongly affect what EAL students can do or achieve and how much further support is required for them to succeed in learning science. This knowledge of attributes and skills inherited from one's family is classified as cultural capital by Bourdieu (1986).

Bourdieu classifies habitus as a set of social and cultural practices and values within members of different groups. Cultural capital consists of the rules, knowledge, and the skills to interact and succeed in the group. Bourdieu states that each person possesses cultural capital (Erel, 2010). One can consider habitus as the game that is being played and the cultural capital as the rules for the game. According to Bourdieu, schools reflect and respond to the cultural capital of the dominant class (Kingston, 2001). This is supported by Claussen and Osborne (2013) who argues that dominant cultures within the society use education to sustain their dominance and privilege. They also describe examiners, educational officials, teachers and counsellors as gatekeepers who determine who has the access to valuable resources (Claussen & Osborne, 2013). Thus, in terms of VCE biology education in Victoria, the dominant culture would include English speaking and proficiency in academic writing, which will lead to cultural capital in terms of educational credentials.

The advantages available to children whose parents had previous academic backgrounds (Betancur et al., 2018) highlights Bourdieu's concept of cultural capital as currency. It became evident from findings in this study that parents who had currency in the language and the subject of science could provide better support because of their experience in the field. In my autoethnography, it was evident that my parents were able to transmit their currency to me in

terms of knowledge, strategies, resources (such as textbooks) and access to digital opportunities (Chapter 5). The method of supporting EAL students by utilising their parents' "experiences" (Chapter 5) connects to Bourdieu's embodied manifestation of cultural capital.

Bourdieu describes embodied cultural capital as a manifestation of cultural capital that is accumulated throughout a person's life (Bourdieu, 1986; Kraaykamp & Van Eijck, 2010). The interpretation by Kraaykamp and Van Eijck (2010) also points out that socialisation with parents is one of the main contributors to a child's initial embodied form of cultural capital. Within the major theme of parental involvement, it was evident that the components of involving parents aligned with the embodied manifestation of cultural capital. Such capital is unconsciously inherited from a young age and then more consciously acquired as various strategies were undertaken with the family. This conscious acquisition and unconscious, often passive, inheritance links to the embodied cultural capital manifestation.

Understanding the importance of a manifestation of cultural capital offers the view that more opportunities need to be provided for parents to build on their cultural capital and in turn transfer the capital to their children (Kraaykamp & Van Eijck, 2010). For the purpose of this thesis, this transference of capital is considered in English and science. The study by Symeou (2007) looked at students and parents who were lacking in the dominant cultural capital and revealed that the parents valued their children's educational success. Therefore, it was important to adjust and accommodate to provide further support for parents who were lacking in cultural capital. This can be implemented through communication with parents, involving them in their children's work and providing them with strategies that they can use to build on their own capital and, consequently, their children's. As discussed earlier, these strategies include the development of learning dispositions that can support their learning. Some examples of such strategies can include

holding the child accountable to foster high expectations of themselves and encouraging them to identify and build on their mistakes to foster resilience. Teachers can support parents through regular communication to inform them about their expectations and provide students with regular feedback. This can be used to provide students and their parents with the cultural currency to obtain capital in the field of science and English language.

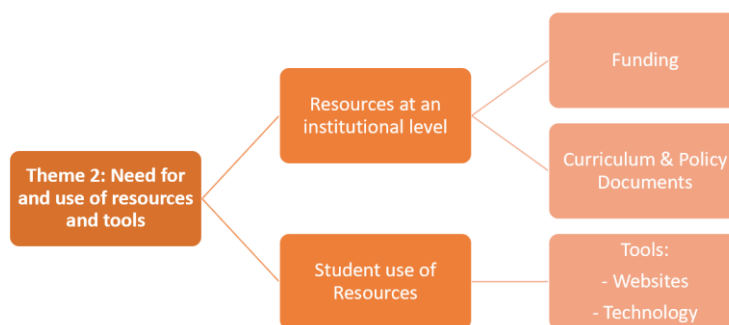
One concern that arose from this study is that the majority of this communication and information to parents is often accomplished by the mainstream teachers, such as science teachers (Chapter 7). Whilst this is necessary when the conversation is regarding the mainstream subject, it leads to the question of whether the teachers believe they are qualified to support parents in building their capital within the subject context.

That is quite challenging because then... I do then sometimes get that guilt because I'm like I know that they need more language support, but then the curriculum is so demanding on how much you need to cover in a set period of time. It's really hard to find that happy medium where you're giving enough support in the class and out of, and then also covering off on everything. (Michelle; Chapter 7)

This has been reinforced by other studies that found that many teachers do not believe they are qualified to interact and develop professional relationships with parents and community. For example, the study by Doেকে et al. (2008) that investigated the policies and practices of teacher professional learning in Australia, revealed that 82% of in-service teachers believed that they require more professional development. Cuttance (2020) attribute the comments to time constraints, which reinforces the concerns by the teachers in my case study (Chapter 7). Thus, more time needs to be provided to teachers to facilitate the engagement with parents of EAL students.

## 8.4 Theme 2: Need for and Use of Resources and Tools

**Figure 17** *Unpacking Theme 2: Resources and Tools*



Another major theme across all three articles was the need for and use of resources and tools. This will be discussed from a student perspective and an institutional perspective. From the institutional perspective, the discussion will consider funding: its value and allocation at the institutional level, as well as the relevant policies that are in place to support EAL students. From the student perspective, the discussion will focus on the use of resources cited in the data and policy article, which include technology, textbooks, and websites (Chapter 5 and Chapter 6).

### *8.4.1 Resources and Tools – Institutionalised*

As discussed in the policy review (Chapter 6), funding is allocated based on student percentages, equity funding, and weightings based on the densities of student family occupations. The policy review outlined the allocation of funds and the Victorian government’s method of allocating funds evenly based on student population and equity for all students (Chapter 6).

EAL funding is based on an integrated weighted index for primary and secondary students. This is applied to the number of students meeting the EAL index funding criteria, as identified in the August School census. A school’s EAL allocation will include a weighting to reflect the differing densities of Student Family Occupations (Department of Education and Training, 2021c, p. 1).

The following section discusses how the funding impacts various stakeholders, such as EAL students and their teachers. This aspect of funding is included in this section because the funds of the Student Resource Package (SRP) are utilised for infrastructure, workforce planning and targeted initiatives. The key aspect that is relevant to this discussion section is the workforce planning, which also includes provisions for relief staffing (providing an alternate qualified teacher to teach the class in the absence of the regular teacher) (State Government of Victoria, 2021). Extra personnel can be used to provide time for educators and school personnel to carry out the necessary tasks required to provide better support for their EAL students (Chapter 7).

From a teacher's perspective (Chapter 7), the resource that was of greatest importance to them was the time to support their students adequately. The interviews in the case study revealed that many teachers spent time in addition to the allocated class time to provide more opportunities for their students' learning. For example, teachers provided additional written feedback, personally delivered and explained feedback, and provided individual consultations to plan for improvement. This highlighted the need to make allowances so that teachers can provide the extra support that is required by EAL students in their mainstream classes. VCE biology subjects and science subjects are already content-heavy and require the full use of class time. Fang (2006) describes science as a form of culture with its own language that is more complex than colloquial English to accommodate scientific reporting, arguments, and theories. Consequently, significantly more time is required to cater for the needs of EAL students in addition to the content knowledge of science and biology. Research has demonstrated that many teachers have concerns about addressing the needs of EAL students given the limited time they are provided (Barnes et al., 2019). Studies have found that many mainstream teachers feel that supporting EAL students

requires a significant amount of time (Edwards, 2014; Reeves, 2006), used for modifying coursework and individually consulting students to plan their learning (Chapter 7).

The teachers in the case study (Chapter 7) raised concerns about the lack of time to collaborate with teachers from other domains and the teachers within their domains. As mainstream teachers, they recognised the advantages of consulting with specialised EAL teachers and literacy teachers. The collaboration between an EAL teacher and a mainstream teacher has been found to provide significant benefits to EAL students (Davison, 2006). It also allows mainstream teachers and EAL teachers to consult on “methods and techniques to use in the classroom or on the analysis of the linguistic demands of the content areas” (Davison, 2006, p. 3). There are also benefits to communication between teachers within the same domain. The biology teachers that were interviewed discussed the benefits of carrying out a handover of EAL students from their previous mainstream subject teacher to their new mainstream teacher (Chapter 7). While these meetings can provide significant benefits by ensuring that the mainstream teacher is prepared and well versed about the effective strategies to support their EAL students, there will be a significant setback in the mainstream teachers’ time.

Therefore, there needs to be other processes in place to support teachers who are working with EAL students and who need to commit to additional meetings. This can be implemented by providing time allowances or extra personnel to cover the necessary classes or for specific times to be allocated to conduct proper handover of students. Another method may be to complete a spreadsheet with suggestions and feedback from the previous teacher. However, the benefits of dialogue about the students and strategies will not be realised. Nevertheless, this could assist in opening the communication between teachers and promote the sharing of knowledge.

The case study in Chapter 7 discusses the government initiative to provide qualified or pre-service teachers to schools to act as tutors (King, 2021; Torpy, 2020). Despite this being an initiative in response to Covid disruptions, it could be an effective use of personnel as resources to support EAL students. This initiative of allowing students a time outside the mainstream class was also mentioned in interviews with all four teachers who agreed that it would be beneficial to have supporting staff who worked with individual students or small groups and did not cause interruptions in the class. When conducting the interviews for the case study (Chapter 7), teachers discussed the type of support they would like from extra personnel as shown below.

Come and quietly talk to a couple of the students and see whether they're working.... [because] if they sat in a classroom... there wouldn't be room to break it down with everyone... it would become very crowded in the classroom. (Michelle)

The tutoring initiative would reduce interruptions during class time whilst providing students who need individual support, with teachers or pre-service teachers. Whilst pre-service teachers have not completed their qualifications, they will have knowledge of the content and teaching as they are in the process of initial teacher education to become qualified teachers. The individual support will allow the students to clarify their knowledge and get extra time and attention to consolidate their learning. An added benefit is that it does not rely heavily on the limited time of teachers to make it work. As such, this initiative may have benefits even during a post-Covid era. As part of the initiative, the government mandate for a maximum of five students per group means that students will have more opportunities to ask questions and receive support. This will be ideal for EAL students who are more likely to ask questions and share their areas of concerns in small groups (Nair & Alwee, 2012).

However, this initiative has some issues and concerns. One main concern is that the tutors may not have the same experience as VCE teachers, who are aware of the structure of exams and the expected exam responses. They may also need further preparation to understand the context of the class, the content, and the curriculum for the unit. Similarly, they may not be as fluent in the curriculum and knowledgeable of the content. It is important to note that the described issues and concerns are more the purview of a teacher who has a different role to a tutor. Tutors can provide the necessary support without replicating the role of the teacher if clear role descriptions and boundaries are established for teachers and tutors. The allocation of the roles can be used as a method to overcome the limited experience and qualifications of the tutors. Thus, while there are some limitations in the tutor sessions, effective planning and communication will ensure that teachers and students receive the necessary support to facilitate EAL students' learning. This can be classified as an example of how the resources that are provided by the government are utilised by teachers at the school.

#### *8.4.2 Resources and Tools – Student*

The lack of time available for mainstream teachers also highlights the need for students to effectively use the resources and tools available to them outside of school. A range of resources was discussed across the three articles. Some examples of these resources include textbooks, dictionaries, computers, and websites. An example of the use of resources discussed in the autoethnography (Chapter 5) and case study (Chapter 7) was the use of textbooks for learning, revision, and extension. While it is widely accepted that textbooks have an integral role in teaching and learning settings, they provide significantly more support for EAL students (Väljataga & Fiedler, 2014). Studies have found that “textbooks are commonly used as either the primary (46%) or secondary instructional resource (40%) in science classrooms” (Morris et al., 2015, p. 4). As a



readily available print and digital item (digital to be discussed later), it has the added benefit of being an item that a student can access regularly. Its glossaries provide students with the essential terminology for the subjects, which they can use to create their own glossary and use to scaffold their learning (Robinson, 2005). The diagrams in the textbooks can be used to provide visuals of key language and content meaning (Leung, 2019). Whilst these components are beneficial in any content subject, they can be especially beneficial for subjects such as science and biology, which consist of their own language of terminology and processes (Quinn & Cooc, 2015).

As indicated in my autoethnography (Chapter 5), while teachers at school provided me with guidance about how the textbook should be utilised and specified a selection of questions, my parents ensured that I completed all questions in the textbook, not a selection. Similarly, they ensured that I was writing down notes from the textbook as opposed to only reading the textbook. This effective use of the textbook supported me in consolidating my learning. Once again, this ties in with the need to involve parents in students' learning because my parents were aware of what was required. However, not all parents will know how to use textbooks effectively and will lack experience with them. Provision of support to assist parents with the various resources available and how to utilise them effectively would be beneficial.

An item that builds on the function of textbooks and their ability to support student learning is the use of digital textbooks. It has been classified as "educational materials that have been electronically published to assist both teaching and learning methods" (Maynard & Cheyne, 2005, p. 104). Digital textbooks have the added convenience of being easy to access whilst simultaneously providing a greater variety of interaction with the content (Väljataga & Fiedler, 2014; Weng et al., 2018). In addition, for EAL students, digital textbooks can support a wide range of students who are visually/hearing impaired. Similarly, the publishers of various textbooks such

as Biozone and Pearson host their own platform with interactive activities and videos to supplement students' knowledge and scaffold their learning with a strong foundation of background knowledge. The ability to understand and utilise such resources to develop their own scientific knowledge is indicative of disciplinary literacy of the student (Shanahan & Shanahan, 2012).

While students are always encouraged to ask their teachers for clarification, digital technology will allow them more freedom to facilitate their own learning and clarify their knowledge without connecting with a teacher. The benefits of digital learning include more autonomy and independence for students to decide what they study and when they study. It will also allow them to take their time and clarify the knowledge before moving on with the expected pace of mainstream students (Welzer et al., 2019). This can be especially beneficial for EAL students who require some extra time to consolidate their terminology and the language of the content.

Digital platforms also have the added benefits of allowing students to choose their preferred platform and learning method (Welzer et al., 2019). Students can choose to listen to the textbook as they read it, annotate it and make notes using the digital copy, which will be more convenient in terms of ease of access. Furthermore, digital textbooks also allows learners to be virtually mobile (Welzer et al., 2019), providing access to the material through various devices, including their phone. While it is important to consider the negative impacts of mobile phone usage (Gilroy, 2004; Gingerich & Lineweaver, 2013), it should be recognised that many students have access to mobile phones and are comfortable using them. Therefore, it would be an ideal tool to use to support EAL students who do not have easy access to Wi-Fi and laptops.

There has been great progress made in terms of learning on mobile devices. Digital tools such as online platforms like EDROLO and Khan Academy were discussed in the case study (Chapter 7) as tools often recommended by mainstream teachers to provide students with further scaffolding. While these tools are beneficial for all biology students, the benefits are compounded for EAL students, who are able to process the content multiple times and at a speed that is ideal for them. Furthermore, the use of shorter videos and Khan Academy's style, with an instructor drawing freehand on a digital tablet, have been found to be engaging for students (Guo et al., 2014). Using video, students are able to pace their work and progress, building confidence with a given topic before moving on to the next one. Online platforms also have the added benefit of being efficient tools to provide content (Boyle, 2018). This means that teachers can allocate more time to create stimulating lessons and provide targeted support to the students who need it, such as EAL students. Furthermore, the use of digital tools can reduce the financial burden on EAL students' families who sometimes lack the financial capital to purchase the required textbooks (Tessier, 2014).

#### *8.4.3 Theme 2 through the Frame of Bourdieu – Objectified Cultural Capital*

The use of working laptops and easy access to Wi-Fi is an example of an objectified manifestation of cultural capital. Bourdieu refers to objectified manifestation as tools and resources that can be transmitted immediately as tangible goods (Bourdieu, 1986). They are affected most by parents' cultural possessions. However, Kraaykamp and Van Eijck (2010) caution against the assumption that objectified manifestation refers to the transmission of the objects (books and laptops). A key aspect of the objectified manifestation of cultural capital is the ability to appreciate the objects and utilise them for their purpose (Bourdieu, 1986).

Research demonstrates “past and present objectified cultural capital are substantially but not perfectly related ( $\rho = 0.52$ ), which may reflect intergenerational transmission” (Sieben & Lechner, 2019, p. 1). This study used the number of books in the household as a measure of objectified culture as it indicates the number of resources available to the family. This research supports the themes discussed above, which indicates the advantages of having resources, the inheritability of the resources, and the ability to use them. The inheritability of resources and the knowledge of how to use them were demonstrated in my autoethnography when I adopted strategies for using textbooks that were taught to me by my parents. Because of how I employed my resources, I was able to carry out tasks to obtain the science knowledge and demonstrate it in school. Therefore, despite my lack of familiarity with an English-speaking classroom, I was able to effectively use my resources to gradually overcome my limitations. This demonstrates how I used my objectified manifestation in science (textbook usage) to address my lack of institutionalised cultural capital (science test results) in an English-speaking science classroom (Chapter 5). Furthermore, this demonstrates how I benefited from my parents’ science capital, despite the lack of cultural capital in the dominant language culture.

The examples of the resources provided by the government also demonstrated the interconnectedness of the various manifestations of cultural capital and capital of different fields. The translated documents that were discussed in the policy review (Chapter 6), demonstrate how objectified manifestations of documents could support building the embodied cultural capital of EAL students’ parents. This is done by providing them with the opportunity to understand and be involved in their children’s learning. Having capital in other fields such as socio-economic status and academic or subject areas can significantly benefit students. As referred to in the study by Pham (2019), “PISA 2015 found that students from ethnic backgrounds on average performed

worse than those with English as the first language. However, students from an ethnic background in the top quartile of socio-economic status performed better than their counterparts whose first language is English” (Organisation for Economic Co-Operation and Development (OECD), 2015; Pham, 2019, p. 14). This demonstrates how a high amount of economic capital can be translated to educational capital.

The following section discusses how the objectified manifestation of science, and the English language is impacted by economic capital. As such, cultural capital of science knowledge, English language knowledge and economic capital are interlinked. This links to my autoethnography (Chapter 5) where my parents had sufficient economic capital to support my learning through the use of tutoring services and resources (Chapter 5). Furthermore, it visualises the advantages I had in learning science because of my parents’ science backgrounds, which translated to capital in learning science. This included understanding the learning processes of science, such as analysing, extracting experimental and observational evidence and logic (Shanahan & Shanahan, 2012). Despite myself and my family having limited capital in the English language, I was able to navigate my learning journey due to a combination of economic capital and science capital.

The discrepancy between high socio-economic and low socio-economic students from ethnic backgrounds highlights the disadvantages for low socio-economic EAL students. Objectified manifestation plays a key role in the transfer of economic capital to academic capital. Students who can afford tools such as computers and fast internet might educate themselves and obtain more scaffolded learning. By comparison, students who cannot access digital technology will be disadvantaged and deprived of a learning opportunity. Consequently, despite digital learning tools and digital textbooks being able to provide EAL students with objectified cultural capital, the

students who need this support the most may not be able to access it easily. This was acknowledged in the interviews completed in the case study (Chapter 7), where the teachers discussed the link that they saw between low-socioeconomic background and the student's inability to complete required work and meet the expected standards.

The overlap also meant that it was challenging for the teachers to identify whether the lack of engagement was a result of English ability or the lack of access and experience with tools and resources outside of school. This is confirmed in the study by Betancur et al. (2018), where they demonstrated that household income and parental education were linked to moderate gaps in science achievement. This was evident in the schools that were involved in the case study (Chapter 7) which had 59% and 68% of its school population in the bottom quartile of the distribution of Socio-Educational Advantage (SEA) scale, which is based on parental background. This also further emphasises the concerns by the interviewed teacher who could not confirm the cause of the lack of engagement (Chapter 7).

While further research needs to be conducted about the effects of socio-economic background versus EAL background on science learners, the discussion emphasises the discrepancy between students with and without cultural capital in the objectified manifestation. Thus, teachers and schools must provide students with multiple opportunities to build their objectified manifestation of cultural capital and to compensate for the lack of it. The lack of knowledge and exposure to the tools and technology can create a digital divide between those who have cultural capital within mainstream schooling, leading to a divide in the institutional credentials as revealed by the PISA scores (Pham, 2019).

Some methods that can support students to build their capital with objectified manifestation are through the use of libraries. Goulding (2008) describes libraries as possessing

large reserves of cultural capital. While the article is from 2008 and refers more to the available texts, current libraries have evolved with the digital age. Modern libraries provide computers and the internet to provide access to tangible goods for students from low socio-economic backgrounds. In terms of EAL students, the need for objectified manifestations is amplified as EAL students need the benefits of digital learning, the internet and computers for learning that will support their lack of capital in the English language.

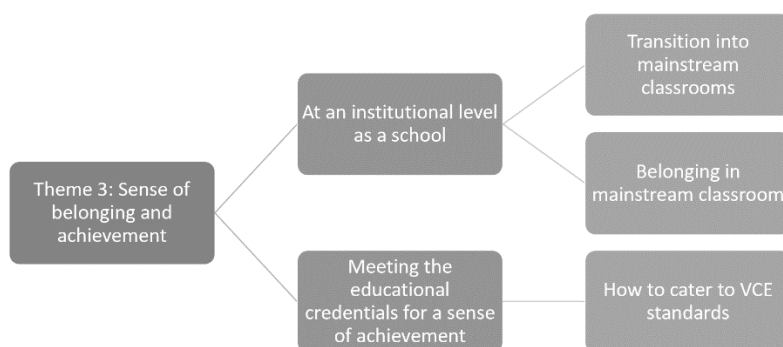
Despite the challenges of accessing digital learning tools, libraries can provide a significant benefit for EAL students to receive multiple learning opportunities. The objectified manifestation can be used to build capital in science and English knowledge. However, when considering the lack of capital economically and in the education field, there needs to be other methods to facilitate learning biology and science subjects by EAL students. In addition to the library, students should be provided digital work that can be accomplished on multiple devices such as phones.

While digital tools and techniques were discussed previously, the example of online videos and tutorials, such as Khan Academy and YouTube, indicate how objectified manifestation can address limitations of capital in socio economic circumstances and within the culture of EAL and biology. The autoethnography (Chapter 5) referred to my experiences with private tutoring sessions outside of school, which is common for EAL students who require literacy support (Dooley, 2020). However, this was only possible because my parents had the financial capital to afford it and because they had the academic capital to understand the need for tuition. Free online learning tools, such as YouTube and Khan Academy videos, can support students who do not have access to such capital. The use of objectified capital can be used to address the limitation of capital in English, science content knowledge and financial capital.

Teachers could be recommending and utilising online videos to provide the students with optimum exposure to build up their capital. Based on the advantages of objectified manifestation, schools should endeavour to follow up on students who are missing essential tools. They should also use the resources provided by the government to support provision of these tools and maximise opportunities for EAL students to obtain the institutional credentials as prescribed by the school and the VCAA curriculum standards.

### 8.5 Theme 3: Creating a Sense of Belonging and Achievement

**Figure 18** *Unpacking Theme 3: Creating a Sense of Belonging and Achievement*



The third major theme that was apparent across all three analysis chapters was the sense of belonging at the school as fostered by the teachers, classmates and parents, and the sense of achievement and success experienced by the students. I discuss this theme at an institutional level and at a student level, offering insights into creating and promoting an ideal learning environment for students to feel a sense of belonging and achievement at school.

#### 8.5.1 *Creating a Sense of Belonging and Achievement – Institution as a School*

Transition.

A key aspect of ensuring that a student feels comfortable at school is to make sure they have a smooth transition into the school. The policy review (Chapter 6) demonstrated that the government has a range of processes in place, such as the provisions for newly arrived students (Department of Education and Training, 2019b), including access to intensive EAL instruction and



EAL index funding and allocations for schools (Department of Education and Training, 2021c). This support was noted from a student's perspective in my autoethnography (Chapter 5), where I recalled how much easier it was to fit in at my first school in Australia compared to my initial school in Canada. This can be attributed to the various policies discussed in the policy review (Chapter 6) as well as a transition program, which is discussed below.

As presented in the policy review (Chapter 6), schools in Victoria have a detailed transition program that includes attending a language school for six to 12 months if the students have been assessed as eligible (Department of Education and Training, 2021b). However, a concern that the mainstream teachers raised in the case study (Chapter 7) was that much of the information from language schools and support was not transferred to mainstream content teachers. Concerns were present such that interview participants shared that, "I feel like all of the EAL support is in the language school, specifically" (Michelle).

In addition to the lack of support felt, the lack of communication was evident when another participant commented that they did not know the level of English that was required to transition from the language school to the mainstream school. This lack of communication and gaps during the transition process from language school to mainstream school process has also been noted in the literature. The study by Maadad and Yu (2021) emphasises the need to individualise the EAL support processes and provide ongoing case management of students who require further help, such as refugee students. The lack of support felt by the mainstream teachers in relation to language school highlights the need to provide more language acquisition and development support at the mainstream school.

The study by Barnes et al. (2019), which studied regional Australian mainstream teachers' beliefs, found that despite being overwhelmed by the time required to support EAL students due

to planning, modifying lessons and receiving professional development, teachers were open to additional training to cater to their EAL students. One method of providing language related support that was discussed during the interviews for the case study (Chapter 7) was the use of English and EAL (literacy) teachers at schools to support the professional knowledge of mainstream science and biology teachers' content knowledge. This was supported in the study by Arkoudis (2003) who determined that there was a need for ongoing communication between EAL teachers and the mainstream teachers about the needs of the EAL learners. She also discussed how there will challenges in addition to the lack of time for collaboration. Some challenges included negotiating the pedagogic understanding based on the language and teaching of the mainstream teacher and the EAL teachers' views, which were based heavily on their own disciplinary subjects. However, Arkoudis (2003) concludes that such conversation will produce productive dialogue. Thus, to address these concerns and limitations, specific times should be allocated so that conversations and collaborations can occur despite the challenges. This idea was further expanded in the case study interviews (Chapter 7).

The mainstream teachers in the interview discussed that an ongoing support and training would be more beneficial as opposed to an isolated single training session.

Over a whole year then, and you have time twice a term to go and do a workshop, and maybe start with it in general and get more drilled down maybe by the second half of the year, doing drilling down into the type of students at the school, and the different languages, and the different challenges with the different cultures or something like that. That'd be amazing. (Michelle, 2019)

I personally would prefer to have them teach me strategies away from the classroom and then try and implement them myself. (Amber, 2019)

The program proposed by the teachers in the case study (Chapter 7) has been discussed by Premier and Parr (2019). In their case study of a multicultural primary school in Melbourne, they expand on the concept of collaboration and co-teaching with the mainstream teacher and the EAL specialist teacher. They propose the value of creating a community of practice that involves, “the whole school, as much as individual teachers, teaching aides and administrative staff” (Premier & Parr, 2019, p. 59) . Wilkinson et al. (2010) likens the concept to an ecology of interconnected meta practices in education where all the roles at the school are contributing to support the EAL students, as well as learning from each other as an ongoing process. Further reference to this model, and how the themes of my thesis can be used to incorporate parents within the community of practice, will be presented in the conclusion chapter. While these transition models are important to any new arrival, it is essential for EAL students arriving at a new school, learning a new language and a new way of living.

Furthermore, if the student plans to study biology for VCE, they will have to face significantly more challenges compared to English-speaking mainstream students.

[EAL] students are required to learn a new language; acquire new values; compete with English-speaking peers who already have significant linguistic, cultural, and social advantages; and adjust to new ways of living in a very foreign environment.

(Hiorth, 2019, p. 57)

The quote above highlights how overwhelming a new school can be for an EAL student. Thus, it reinforces the need to ensure that an EAL students’ transition is executed effectively and that they are provided with the opportunity to belong to the school and achieve success. Following this, mainstream teachers will then have to ensure a comfortable environment within their content classes, which will be explored in the next section.

### Belonging to the Mainstream Class.

Another common theme was how mainstream teachers support EAL students in their classes and provide them with a sense of belonging in content classes. In my autoethnography (Chapter 5), I discuss how I was reluctant to participate in the discussion or contribute ideas because I was not comfortable in the classroom. Similarly, I did not request help when I was struggling because of my lack of belonging and exposure to the class culture. This experience highlights the need to provide EAL students with an environment where they can discuss their ideas and request help when required, through open ended tasks (Gümüşok & Balıkçı, 2020) and collaborative learning experiences (Maatouk & Payant, 2020). The policy review (Chapter 6) looked at various documentation that supports mainstream teachers in facilitating and promoting learning and engagement in their classes. Some examples include the EAL/D overview document, which extensively discusses factors involved in students' learning concerning English (Australian Curriculum Assessment and Reporting Authority (ACARA), 2014), and a range of documents that include techniques and strategies that can be utilised by mainstream teachers (McDougall et al., 2014; Saker et al., 2014). These documents promote the integration of EAL support within mainstream classes to support the EAL student in integrating into the class in addition to promoting learning engagement.

In the case study (Chapter 7), the teachers revealed they often felt ill-equipped to cater for EAL students in their mainstream classes. This feeling has been identified in the literature as being common among many mainstream teachers (Gitlin et al., 2003; Reeves, 2006). Hammond's (2008) study found that while 84% of teachers had a positive outlook on the cultural impact and the linguistic diversity EAL students will have on their school, they also had reservations about their

role, including teaching the English language. The teachers in Windle and Miller (2012) study agreed that the concerns were due to the lack of training and experience.

The mainstream teachers' feedback (Chapter 7), reinforced by the literature, highlights the need to equip mainstream teachers to create a supportive environment for their EAL students. By equipping the mainstream teachers to foster a supportive environment in the EAL students' mainstream classes, it allows the students to feel a sense of belonging at their school. The teachers should be provided with collaboration time and professional development to be able to implement such strategies. The need for training and professional development with mainstream teachers has been raised by researchers in a range of studies (Barnes et al., 2019; Miller et al., 2014; Turner, 2015) in addition to my case study in this thesis (Chapter 7). Other strategies have been suggested to better prepare mainstream teachers to support EAL students by providing additional EAL specialist support and after-school programs (Barnes et al., 2019). Murtagh and Francis (2012) identified key areas of training regarding mainstream teachers, such as pre-service training, continuing professional development, and the correct allocation of required content and resources to provide an optimal learning environment for EAL students.

Regardless of the lack of training, mainstream teachers continue to use various strategies to support their EAL students, such as group work for students in the same language groups and creating collaborative glossaries in specific language (Chapter 7). The group work in the same language incorporates a range of benefits identified in research, such as the students carrying out language learning in the mainstream classroom and maximising attention on the task by engaging cognitively and socially (Oliver, Philp, et al., 2017). Furthermore, encouraging students to discuss ideas in their native language promotes codeswitching, which has been found to be a builder of solidarity and a means of achieving task targets as well as interactional fluency (Kemaloglu-Er &

Özata, 2020). Another teacher suggested giving opportunities to all students to share words in a different language. This has the added benefits of developing vocabulary in a social setting (Yoshii & Flaitz, 2002). While such strategies were implemented by the interviewed teachers (Chapter 7), all teachers commented on the lack of training they received to cater for the EAL students in their classes.

In a study considering the strategies that mainstream teachers used to support EAL learners in class, Haworth (2009) found that some teachers were extremely frustrated by implementing trial and error-based lessons. This can result in the teachers having a negative outlook on the prospect of working with EAL students, which means they will be reluctant to engage in professional development in this field in the future. Therefore, Haworth (2009) goes on to suggest that an early approach would reduce the chance of teachers developing negative views on EAL integrations and instead provide mainstream teachers with a repertoire of strategies. These can be used to support and promote a sense of achievement among students.

#### *8.5.2 Sense of Achievement – Meeting the Criteria of the Institutions (School and VCAA)*

A student receives the VCE certificate when they meet the Victorian Curriculum and Assessment Authority (VCAA) requirements. If the student is interested in receiving a formal certificate of completion of school, VCE is one method to obtain academic credentials. However, VCE has a substantial amount of content that needs to be addressed in a given amount of time, as highlighted in this mainstream teacher's quote:

...you have roughly a week, just over a week per dot point per study design. And each dot point has so many terms within it and then you've got mandated practical that you have to do. So, there's a certain amount of experiments and practical work and group work and all that kind of stuff that you need to be doing to meet

the study design and what VCAA are asking for... It's a very difficult, like it's a really hard balance. (Jane, 2020)

While such difficulties are present for all students, EAL students need more scaffolding and support to navigate the language (Barnes et al., 2019). This is especially more relevant in subjects such as biology due to the need to address the content knowledge and the ability to communicate it effectively. The added challenges of learning biology and science subjects has been discussed in the study by McCallum and Miller (2013). This exemplifies the substantial pressure on mainstream teachers to ensure the relevant content is presented to their students (Chapter 7). The content heavy nature of biology was addressed in the autoethnography where I had to develop novel strategies for supporting my own learning. One such learning strategy was explaining the complex biology content to my grandmother in Sinhalese. The use of my native language helped me to scaffold my knowledge and process the content multiple times (Miller, 2009). Therefore, EAL students could be utilising their native language as a tool for more learning and for better scaffolding of the knowledge.

Despite having the content knowledge, VCE standards expects the student to structure academic responses in a specific manner and to also provide responses using a formal academic writing style. To obtain the academic credentials, one must present the work in the accepted structure by VCAA examiners. Studies have discussed the difficulties of science learning due to their “complex texts with academic language, high information density and abstract ideas” (Quinn & Cooc, 2015, p. 337). This is especially challenging for EAL students to navigate. The language criteria of academic science at times appears to be another language “which feature distinctive schematic structures, and specialised vocabulary, grammar and visual representation” (Feez & Quinn, 2017, p. 192). As such, it can be overwhelming for EAL students who are struggling with the

English language. As a student, I looked at past papers and imitated the format of the sample responses (Chapter 5). Similarly, interviewing for the case study revealed that many teachers provide templates for their students to format their answer.

So, I give them a couple of prac[tical] reports... and say, "right, read these prac[tical] reports", "Well, I liked this from this one and this from this one", like that's great. And what do they have in common? Oh, they all follow the same structure... so that's nonnegotiable, you have to have that bit. And then all of these bits here, yep, you have to have those bits in there. The rest of it is you telling your practical story. (Jane, 2021)

This quote highlights how the teacher promoted the student to identify key characteristics required of the structure and build their responses based on the provided structure. While it is more beneficial to allow the student to explore the question and develop their own answer, there is a level of scaffolding provided by the template while allowing for the flexibility to express themselves. It allows the student to explore the discourse of science (Pytash, 2013) and to tailor their work to the institutional requirements of VCAA. Other methods of improving one's academic writing whilst simultaneously learning the content is to carry out writing for learning (Pytash, 2013). By using the writing as a vehicle for knowledge, the student can use it to develop their writing skills and content knowledge. This can then be used to obtain the necessary academic credentials.

Another aspect of achievement is the high standards that are expected of the student. This is motivated by high expectations from the teacher, parent, and student. In my autoethnography (Chapter 5), it was evident that my parents ensured that I completed extra work to maintain an above standard level of work. Similarly, a common theme of the case study (Chapter 7) was the



high expectations that the teachers had of the students. This entailed providing feedback and requesting another attempt of the work when it was not up to standard. The teachers also recognised the students having such expectations of themselves, which was described as a trait of a successful student. Literature has supported the concept that teachers' beliefs about race can shape their expectations of the students (Villegas, 2007). This can have positive and negative impacts because it has been found that teachers who have low academic expectations will assume that the student's work will be at a lower standard. As such, their grading and feedback will align with that self-fulfilling prophecy. This highlights the need to have early exposure to teaching strategies for mainstream teachers of content subjects.

Teachers can offer an environment that promotes a sense of belonging for EAL students in which they can flourish and achieve success. A crucial aspect will be the professional training provided to teachers to foster such an environment and to feel confident doing so. While ongoing learning for in-service teachers is vital, a study by Cuttance (2020) emphasises the need to provide pre-service teachers with training prior to beginning their career. They can then support the development of knowledge and skills to support the learning of EAL students in their classroom, no matter their content area. As discussed in this section, a lack of awareness of the needs of EAL students combined with a lack of understanding of how to implement strategies to effectively support their learning, can significantly affect teachers' outlook and result in a negative view to carry out inclusive teaching in their classes.

### *8.5.3 Theme 3 through the Frame of Bourdieu – Institutionalised Cultural Capital*

Bourdieu (1986) classifies the "institutional manifestation as the objectification of cultural capital in the form of academic qualification" (Bourdieu, 1986, p. 247). Kraaykamp and Van Eijck (2010) argues that school is used to carry out the "cultural counterpart of money laundering

where... academic credentials serve to legitimate the social transmission of privilege” (Kraaykamp and Van Eijck, 2010, p. 211). This is supported by Bourdieu who states that the school has an active role of legitimation of family acquired habitus (Nash, 1990). The link between the various manifestations is evident as Bourdieu and Passeron (1977) state that institutional credentials, such as school success, are strongly reflective of the student’s family’s cultural capital. This emphasises transferability of capital and how it can be passed on from parents to their children. However, the inheritance of cultural capital and the manifestations involved also reveals areas that can be used to support students who are lacking in cultural capital.

The discussion of the third theme, creating a sense of belonging and achievement, aligned with the institutionalised manifestation of cultural capital. “Institutionalized cultural capital consists of institutional recognition, most often in the form of academic credentials or qualifications, of the cultural capital held by an individual” (Saraceno, 2014, p. 4). From the perspective of EAL students studying VCE biology, the gatekeepers that assess the EAL students consist of the school and Victorian Curriculum and Assessment Authority (VCAA). The dominant culture of the schools and VCAA can be classified as academic English, English culture, and science. Thus, students who do not have sufficient currency within those fields will face challenges when they pursue educational credentials within these fields. Therefore, receiving the VCE certificate will be challenging for an EAL student who has limited currency in English and biology.

My autoethnography (Chapter 5) demonstrated how currency in one field could be transferred across to another and thus receive the educational credential to obtain the cultural capital within that field. For example, despite my lack of capital in English, I was able to utilise my science knowledge based on my embodied manifestations (skills and dispositions from parents) and objectified manifestations (using tools such as computers). This suggests that if there is a lack

of capital in a specific manifestation, it can be offset by the another. Similarly, the exchange of capital across fields meant that the presence of economic capital led to the ability to obtain the necessary objectified manifestations of science (science textbooks and tools). Thus, the objectified manifestation of science could then be used to obtain the institutional credential, which acts as a formal recognition of one's cultural capital.

There were concerns for EAL students who lack the currency in language and science as well as economic capital. However, the previous section in relation to the embodied manifestation discussed that despite the lack of a specific type of cultural capital, all parents carry cultural capital currency. This includes their motivation for their child to succeed (Symeou, 2007). Thus, this emphasises the importance of parents being involved and being utilised to provide optimum learning opportunities for the students. Resources and funding that are provided by the government as identified in the policy review (Chapter 6) should be used to provide the necessary resources and tools to the EAL students. Thus, both embodied (skills and knowledge in relation to science) and objectified manifestations (tools and resources) can be used to build a student's institutionalised manifestation in English and science cultures and achieve the institutional credentials of the VCE certificate.

The framework of Bourdieu was used to situate the major themes and to expand the applications and the origins of the themes. As such, by drawing on Bourdieu's conceptual thinking and manifestations, we gain insights into the range of capital that different individuals can draw upon to build on their own cultural capital. Therefore, this discussion was used to demonstrate how various manifestations of cultural capital, such as parental involvement (embodied), tools and resources (objectified) and school engagement and success (institutionalised), contributed to EAL students learning biology. The conclusion chapter will utilise the various manifestations of cultural

capital and incorporate them to provide recommendations and discuss the implications of incorporating all three manifestations of cultural capital.

## 8.6 Chapter 8 Summary

In the first section of this chapter, I provided details on the three major themes found from data in this study. These were related to supporting EAL students in their mainstream biology classes. This study concludes that to provide a holistic support system for students, there needs to be support from their home background (embodied), tools and resources they can use (objectified) and school/schooling system (institutionalised). Data collected has clearly shown and documented that all of the key areas of support that were identified within the three analysis chapters can be classified under one of those manifestations of Bourdieu's cultural capital. The recommendations of this study will be detailed in the next concluding chapter.

## Chapter 9: Conclusion

### 9.1 What Was the Purpose of this Study?

This study aimed to answer the research question: what are the current supports in place for EAL students studying VCE biology? To address this question, I used the perspectives of various stakeholders with a view to gaining different perspectives on this issue. Each of the sub-questions related to these perspectives and considered how students, governments and teachers contribute to EAL students' biology learning:

- How have my experiences as an EAL biology student influenced how I understand and appreciate biology learning by EAL students as a teacher?
- What support materials and strategies are available for the teaching of biology to EAL students, and how are these promoted and made available by the Victorian DET?
- How do mainstream teachers currently support EAL students in their biology classes, and what support would enable more mainstream biology teachers to provide better support for EAL students in their biology classes?

Using these three questions and perspectives enabled me to obtain a more holistic picture of what was currently in place to support EAL students. Each of the sub-questions was used to create a publication that would present the findings of each perspective.

### 9.2 Data analyses - why use Bourdieu and other theoretical frameworks?

I used Bourdieu's cultural capital as the overarching framework and achieved a deep dive into each of the manifestations of Bourdieu's cultural capital of EAL students studying biology. Thus, I looked at how various forms of capital manifested through embodied (parental and background), objectified (resources and tools) and institutionalised (educational or formal

credentials) areas. During this in-depth analysis, I used other theories such as Bronfenbrenner's ecological systems theory and Moll's funds of knowledge to explore my data further.

For example, Bronfenbrenner allowed me to delve into the various ecological systems involved in an EAL student's learning journey and allowed me to focus on the perspective of government policies, while also considering the relationships between the teachers, students, parents, and the policies. Despite a range of policies being in place to support EAL students, teachers were not always aware of all the policies. If they were aware of the policies, many teachers extrapolated and built on the policies to provide further support for all students, indicating that many teachers were able to identify and cater for students who did not meet the criteria for EAL specified by DET.

Similarly, the framework of funds of knowledge was used to delve deeper into student dispositions and then a modified model of IRF was used to demonstrate how teachers utilised students' funds of knowledge to provide better learning opportunities for EAL students. Funds of knowledge was used for the initial assessment of dispositions to emphasise the ownership of students to their dispositions. Following this, in the discussion chapter, dispositions were considered as embodied manifestations, which could be further developed by parents and carers. The rationale was that funds of knowledge allowed the student's input to be studied separately but, when the information was combined, it was important to acknowledge how the student's cultural capital contributed to their learning dispositions.

The analysed findings and key themes based on the various theoretical frameworks were then linked back to Bourdieu to analyse how the key findings contribute to Bourdieu's cultural capital manifestations. Within each of the manifestations of cultural capital, I studied what kind of

methods were used to support EAL students in their biology classes and how further support could be provided to promote cultural capital.

Throughout the thesis, I also looked at strategies that were utilising the various hypotheses, such as Krashen's hypotheses (Krashen, 1987), Cummins' Academic language (Cummins, 1981) and Vygotsky's ZPD (Vygotsky, 1980) that were discussed in the literature review. These theories were incorporated within the strategies that were identified in relation to science learning as an EAL student:

- formative assessment
- inputs
- assess knowledge
- use of data to cater to the relevant levels

Whilst these links were not explicitly stated, the various strategies used within the multiple manifestations linked back to the learning theories and especially focused on CLIL where language learning was completed in conjunction with biology learning.

## 9.3 What Were the Findings?

### 9.3.1 Parents

One of the key findings from this study was the role that parents play in students' learning. The embodied manifestations explored how my parents contributed to my learning through the use of promoting dispositions and co-learning. Embodied manifestation also included the teacher data and policy data, which also emphasised the need to communicate with parents to ensure that they are aware of their children's progress to provide them with the necessary assistance. There were concerns from the teachers about the lack of support from the government in terms of

translated documents. However, strategies such as use of interpreters and MEA aides were discussed to foster better communication between the parents and teachers.

### *9.3.2 Benefits of Communication*

Utilising the various staff such as leadership, language teachers, literacy teachers, and MEA aides involved in education was also a key highlight in the discussions and various manifestations. The DET policy promotes and discusses the various roles available for EAL support and expands on the support they can provide to mainstream teachers. However, less experienced teachers were unaware of the available support, highlighting the need to provide more opportunities to educate new teachers on available support. Similarly, the disconnect between the new teachers and the knowledge or policy resources emphasises the need to provide further professional development opportunities. The findings demonstrated the advantages of utilising the various roles involved in education, such as tutors, MEA staff, translators, and past teachers.

In addition to communication and collaboration with non-teaching staff, another common theme was the benefits of communication with other content teachers and language teachers to share the knowledge and utilise strategies across subjects. The importance of communication among the various parties was highlighted concerning student and teacher. This involved allowing the students to receive feedback and further support but also allowing the teacher to monitor students' progress to provide targeted support.

Another crucial area of communication is between the teachers and the support in place concerning policies, documentation, and data. There was a disconnect between the available policies for EAL support and knowledge about them by mainstream teachers, especially newer teachers. In addition, newer teachers were less informed of the documentation and the types of data that was available about the students. Therefore, the findings demonstrated the advantages



and the need to utilise the available resources, such as the student language proficiency and data collected when newly migrated students transition from the language school.

### *9.3.3 Professional Development*

Teachers highlighted that as students transitioned from language school to mainstream school there were disconnects between the staff and records between the two schools. A lack of knowledge of the available tools and resources was also noted and emphasises the need to provide further training for teachers to become informed about the various resources and support available for them. Professional development could take the form of a mentoring program with an experienced teacher to provide teachers with less experience teaching EAL students with greater awareness of the available support.

### *9.3.4 Time*

Finally, a common concern by all interviewed teachers was the need for time. Whilst the findings presented different strategies and different methods to provide better support for EAL students in mainstream biology classes, teachers were very limited for time. Whilst extra support was already being offered during homework club, after school, and during separate tuition sessions, the work and the planning that was necessary to provide quality support for EAL students in mainstream classes required time. A new teaching agreement for teachers in Victorian schools is planned for implementation in 2023. This agreement provides teachers with an additional one and a half hours of time that could be utilised to provide further support for all students. Although this does seem to be a trivial improvement, it can allow teachers the collaboration time to learn from each other and support each other. The additional time can also be used to meet and discuss with students to provide individual support. Thus, this would allow mainstream teachers to provide better support for all students in their content classes.

## 9.4 Significance of Findings

### 9.4.1 *EAL Students*

For students, the findings of this thesis were significant because they can look at this thesis and its corresponding publications to find tools and strategies that they can use to support their learning. This thesis reveals that despite facing challenges in mainstream classes, every student, including EAL students, possesses their cultural capital. The most crucial step is identifying the cultural capital and how it is utilised. This research endeavours to present examples of how the cultural capital will manifest to facilitate the identification of culture and how it is utilised. Some examples include using their parents and carers to support, motivate and scaffold learning. Furthermore, other manifestations that took the form of tools and dispositions have been discussed to reveal how they contribute to educational success and, thus, science literacy. This thesis aims to celebrate EAL students' cultural capital and present them with opportunities and ideas to utilise them to achieve educational success.

### 9.4.2 *Mainstream Teachers*

For teachers, the findings of this thesis are significant as the research data and discussion from corresponding publications, can offer possible tools and strategies to use support their teaching and further their understanding. Teachers can also use the various frameworks that were identified in chapter 7. Chapter 7 was used to combine two theories to produce a student-focused framework. The combination of funds of knowledge and the IRF model allows the students' dispositions and attitudes to be at the forefront of the strategies. It also allows the teacher to incorporate the students' dispositions and background knowledge than to meet the system requirement of the summative assessments. IRF provided a framework that utilised various aspects of learning and facilitated the learning for systems such as VCE. Linking this model with

FoK promotes student autonomy and success by demonstrating that their input fosters the success of the various strategies implemented.

#### *9.4.3 Policies*

One of the broader implications of the study is the identification of the need to include teachers in policy decisions and implementations. It was evident that teachers' interpretations and extrapolation of the various policies assisted all students to require the support they needed despite not being under the classification of EAL. There is a clear need in terms of the policy to include microsystems (teachers, parents, and students) in various policy decisions and also keep these parties informed about the multiple changes. Thus, the stakeholders involved in supporting EAL students in their content learning can be well-informed and use the resources and tools available to them.

#### *9.4.4 Contribution to the field*

A major contribution of this thesis is to demonstrate the variety of the types of support that are available for EAL students studying biology. Using Figure 14 in the discussion chapter, we demonstrate how all strategies identified and explored through various theoretical frameworks and perspectives can contribute to a specific manifestation of Bourdieu's cultural capital. These were the embodied, objectified, and institutionalised manifestations. The visual demonstrates how various stakeholders such as the government, parents and teachers can contribute to each of the manifestations. The visual reveals how interlinked the various stakeholders are and provides multiple opportunities to receive support within each of the manifestations. Thus, for an individual who wants to support EAL students in their biology learning, the visual presents a range of avenues they can pursue.

## 9.5 Limitations of the Study

One significant limitation of this study was the lack of student data. Whilst the autoethnography was used to provide a student perspective, that is from one student's perspective. In addition to researching the experiences of EAL students, further studies should be undertaken on EAL students from low SES backgrounds and what can be provided to support their learning in biology. Similarly, whilst I acknowledged that EAL students included First Nations students, I focused on immigrant students. However, they should be included in the broader conversation of EAL support as there are EAL First Nations students. Another limitation of this study was that whilst I endeavoured to address the main stakeholders involved in the school context, other perspectives should be included, such as MEA staff, parents, administration, and leadership staff.

My theoretical frameworks were chosen because they represented the data. However, by presenting my data within the theoretical frameworks, I did generalise my data. Further research needs to be conducted with a larger sample size to obtain more distinct views.

My data was collected in the South-East of Victoria in a school with a similar demographic of EAL students and population. Once again, this may have provided me with a narrower data frame. The limited number of participants and participating schools means that further research needs to be done to obtain more varied perspectives and data. Similarly, the data collection methods were also minimal. Other research that is carried out anonymously may foster more varied responses.

## 9.6 Implications for Future Research

One implication for future research would be to include EAL parents and carers in the conversation to explore how they support their children and what tools, and resources will

facilitate that support. Another strategy mentioned repeatedly was using time to conference with students and cater for their individual needs. As teachers will be catering to EAL students in their mainstream classes, they must be informed about the opportunities and support that are available to them. Further research could be conducted to determine how to keep the mainstream content teachers informed about the available support for EAL students and to consider the effective use of time by teachers who support EAL students in mainstream classrooms (in and out of class) in biology. One crucial aspect in this research area is the voice of students. So, further research needs to be carried out to obtain student perspectives and answer research questions such as:

- How do EAL students utilise their cultural capital regarding parents, tools and resources?
- What strategies of teachers do EAL students find helpful?
- What strategies do EAL students utilise to support themselves?

In terms of the teachers' roles in supporting EAL students, this thesis explored the cultural capital of the students, but further studies can be carried out to explore the role of teachers' cultural capital and the presence and impact of unconscious bias in their practice. In terms of the theories used in this study, we focused on the aspect of dispositions in funds of knowledge (FoK). Further studies can be carried out to explore in greater depth the Funds of Knowledge that EAL students bring to their formal education, in particular extend beyond dispositions. Finally, another method of measuring student success will be beneficial instead of solely relying on teachers' opinions. Some forms of assessment, either summative such as a study score or formative as a feedback form or pre/post-test method, will provide an impartial measure of students' success.

## 9.7 Afterword

This thesis was completed as a thesis with publications because I wanted to create user-friendly articles that would share my findings and research with the general public, especially stakeholders involved in EAL support in mainstream classes. One of my findings was the need to share the knowledge with mainstream teachers and provide professional development opportunities. Thus, I hope that the products of this thesis can be used to introduce and refresh various strategies and approaches that can be used to support EAL students in content classes such as mainstream biology. Being an EAL student is often viewed as a disadvantage, and it is a concern of many students in Victoria during the crucial time of VCE. I hope this thesis presents students with a framework to utilise the cultural capital they possess to succeed in their biology learning.

I wish I could go back and show my younger self, the EAL biology student, and tell her how much support is there for her. I wish I had appreciated it back then.

Instead of feeling sorry for myself because I was an EAL student, I wish I had seen how many hands were reaching out to help me. As a teacher and a researcher, I will ensure that all students I contact are informed about the support and how to use it. I will use the publications in this thesis to share that knowledge with other educators. (Primani Fernando, student, teacher, and researcher)

# Appendices

## APPENDIX 1: INTERVIEW QUESTIONS



### Interview Questions

How long have you been a teacher for? How many years as a Biology teacher?

What is currently available for EAL students studying in mainstream classes at Hampton Park Secondary?

- Do you prioritize the language or the content? How do you find the balance?
- What are some key strategies that you rely on?

What kind of support is available for you when you are working with EAL students?

In terms of being able to support EAL students:

- What support is available to you from the Department?
- What support would you want in terms of addressing EAL students' learning? Any areas in particular? Why those particular areas?
- How would you like that training and support to occur?

Do teachers and support staff have specific roles and responsibilities in relation to EAL students in mainstream classes? How frequently do you get to communicate and collaborate with other teachers?

- Do you have many opportunities for collaboration between language school staff/EAL staff and mainstream teachers?

Success story:

- Do you have any examples of any success stories?
- Why do you consider them success stories?
- What aspects do you think the student addressed well? What aspects could have been addressed better?

In your day-to-day life, what kind of support would help you to be better equipped?

- In an ideal world, where you had unlimited funds and resources, what would be something you would add or change in relation to supporting EAL students in your Biology classes



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