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

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Abstract

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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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.

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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 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 analyzed 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 analyze 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.

My Life in Sri-Lanka... the Cultural Capital of English

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 a 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, 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.

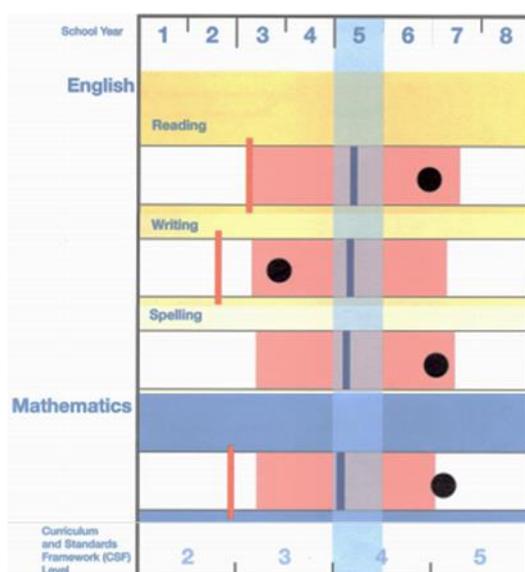
Migrating to Australia – Primary School Memories

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.

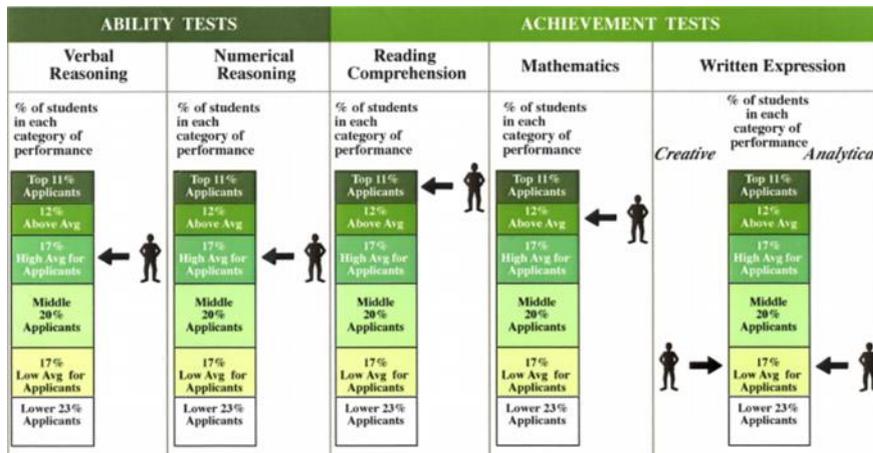
Australia My Learning Journey Continues... Early Secondary School Years

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.

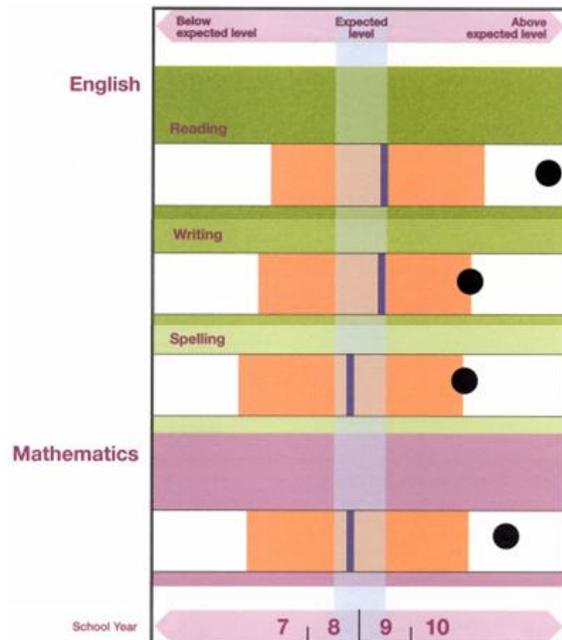
Figure 3
Ability and Achievement Tests



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.”

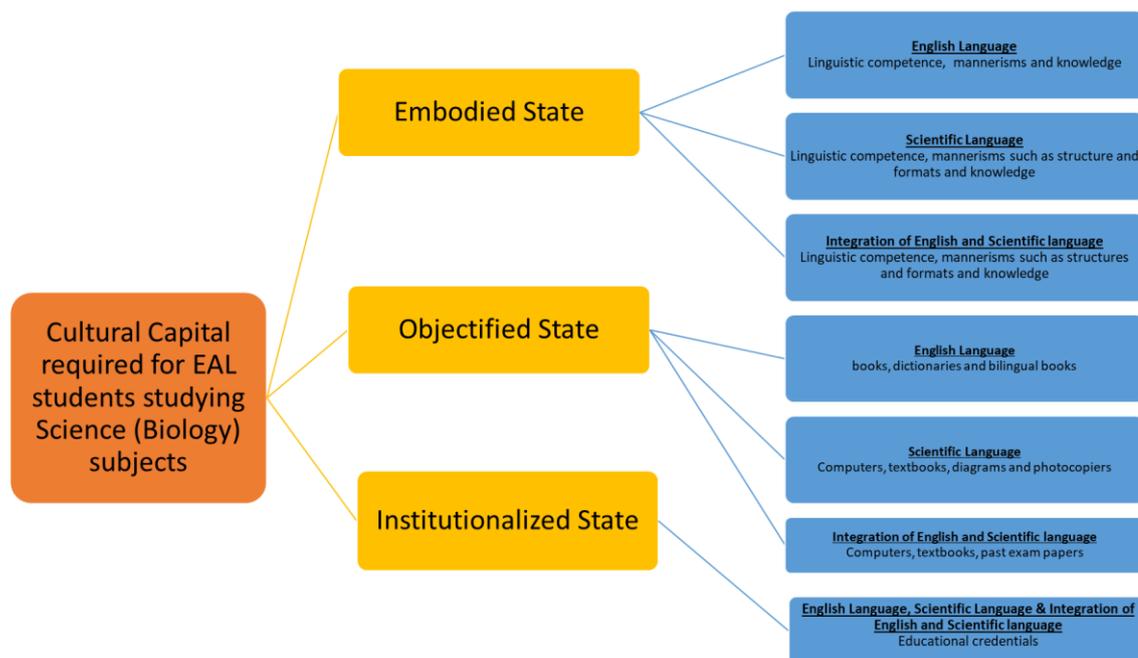
Discussion of My Findings

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 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.

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