



# BENEMÉRITA UNIVERSIDAD AUTÓNOMA DE PUEBLA

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Facultad de Lenguas  
Maestría en la Enseñanza del Inglés

*An Examination of Research Writing for  
Publication in English in a Physics /  
Mathematics Public University Faculty in  
Central México from a Multi-Theoretical  
Perspective*

A thesis submitted to the Faculty of Languages for  
the degree of

**Maestra en la Enseñanza del Inglés**

by

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Puebla, Pue. December 2015

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Multi-Theoretical Perspective*

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MAESTRÍA EN LA ENSEÑANZA DEL INGLÉS

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## **A b s t r a c t**

This study reports on a qualitative approach in which the main aim was to discover and contribute to the analysis of the funds of knowledge mobilized in non-native English speaking (NNES) scientists' writings in English. In order to do this, ethnographic type methods were used to collect evidence leading to an understanding of the participants operating in the various spaces of their professional lives.

The research data sources were collected from a number of qualitative methods such as narrative interviews, elicitation interviews, and observations. Interpretation of the data was based on the theoretical framework consisting of writing and publishing in English by Spanish speaking researchers in mathematics and physics and the galaxy of associated theories in orbit around research writing in an additional language specifically: *intertextuality & genre, hybridity, heteroglossia / multivoicedness, Third Space Theory*, and the concept of *funds of knowledge*. This was used as a means for describing how these scientists manage their writing as they move in and out of the various spaces they inhabit as part of their professional lives.

In order to deduce the research findings it was important to try to construct as complete a picture as possible of the literacy development in order to better understand their current literacy practices and for this interpretation – how they acquired and used their funds of knowledge, the analysis framework was based on Social Cognitive Theory.

To conclude, this study provides clear evidence that according to several factors as well as the strategies used by the NNES scientists, this study describe the different funds of knowledge and discourse that may shape NNES scientists' writings when publishing in a second language and the way they bring this knowledge and discourse to support their writings.

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Last but not least, I would like to thank my family, especially my parents for all of their support throughout my life.

***An Examination of Research Writing for Publication in English in a  
Physics/ Mathematics Public University Faculty in Central México from a  
Multi-Theoretical Perspective***

*This thesis is dedicated to my beloved parents, Victoriano J. and Elena E.*

*whose guidance, unconditional support and understanding has always guided me;*

*for giving me their valuable advice to take the best decisions throughout my career,*

*thank you for believing in me.*

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## **CHAPTER I: INTRODUCTION**

1.0 Introduction

1.1 Significance of the study

1.2 Context of the research

1.3 Background of the researcher

1.4 Location of the research

1.5 Aims and objectives

1.6 Research questions

1.7 Chapter summary and overview of thesis document

## 1.0 Introduction

Writing in the academic field is a creative act in which we must be rational and logical beings functioning cognitively. However, when writing in a second language, writers must meet different disciplinary knowledge, different types of discourses which require sophisticated uses of language in order to integrate it with the literacy of school disciplines in order to create new knowledge. According to Bhabha (1994), this integration of different types of knowledge and discourses<sup>1</sup> allows the construction of a third space that merges the first space of people's home, community, peer networks among others with the second space of the types of discourses they encounter in more formalized institutions such as work, school, or the professional places in which they are immersed in.

Very little research about the Third Space Theory has been carried out; therefore, not too many studies about this recent theory have been published. The Third Space Theory explains the uniqueness of each person or context as hybrid that draws on multiple discourses to make sense of the world. As mentioned above, even though this theory is recent in a way, there are some researchers who have worked with it in fields such as geography, arts, postcolonial studies, feminist studies and recently in education. However, it has not been widely used to describe L2 English writing in the sciences.

The Third Space theory or perspective made by Homi K. Bhabha states that in any given situation people draw on multiple resources or "funds" to make sense of the world. In the case of education, it is used to make sense of oral and written texts applying funds of knowledge and discourse, integrating different components such as spaces, contexts, and

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<sup>1</sup> By *discourses* we mean those forms of communication generated and interacted with in daily personal and professional life. These can be texts, spoken language, and non-linguistic forms of communication / interaction. The term implies also the influence of *intertextualities* as transmitters of cultural concepts and behaviors along with knowledge and tools which are enacted or called into use in the various spaces we find ourselves (Fig. 2.1) (and as discussed further in Chapter II).

people's identity together to construct new knowledge. Third spaces are the in-between, or hybrid, spaces where the seemingly oppositional first and second spaces work together to generate new third space knowledges, discourses, and literacy forms.

### **1.1 Significance of the study**

In the sciences, L2 writing for publication is a topic of great importance which merits constant research in English language since investigators whose L1 is not English need to publish articles in national or international journals; moreover, a number of researchers are asked to do it as a requirement in their places of work or frequently they do it for passion to contribute to science.

The significance of this study is to discover and contribute to the analysis of the construction of the third space in non-natives English speaking (NNES) scientists' writings in English. To explore how the concept of third space has been used and by what means the diverse worlds can be brought together in educational settings, mainly in the research area where English is not the L1. Third Space Theory is joined in this study with hybridity theory, which recognizes the complexity of examining people's everyday spaces and literacies, particularly in a globalized world (Soja, 2009). The concept of hybridity in L2 writing addresses the conditions in which writers find themselves in which a number of elements come together to create new spaces. This theory along with third space attempt to explain how people in any given community draw on multiple resources to make sense of the world and in this particular case to make sense of written texts.

### **1.2 Context of the research**

As outlined above, constructing a third space involves bringing together *funds of knowledge* are developed and called upon in research writing of the participants to

understand how language and literacy are practiced in the multiple spaces of a group of NNES scientists of a public university encounter. However, this research also draws from other critical and social theories such as the Post-colonial theory and, as mentioned above, Hybridity theory, which examines how being “in-between” (Bhabha, 1994, p.1) several different funds of knowledge and discourse can be productive and constraining in terms of one’s literate, social, cultural practices and one’s identity development. In other words, hybridity theory connects in important ways to third space, because third spaces are hybrid spaces that bring together any or all of the constructs named mentioned above.

It is precisely in this area of study where investigators have carried out research in order to know the way third space is constructed with students of elementary and high school level on content subjects. However, there are few studies in the context of the present study.

Thus, this study attempts to analyze the way NNES scientists construct this third space by analyzing the funds the different funds of knowledge and discourse they use in order to shape and support their scientific research.

### **1.3 Background of the researcher**

I have been working as an English language teacher for almost four years and I have worked with private university students for the last two years and during this period of time in my professional practices I have focused my attention on their L2 writing processes. Therefore, it was recently, during my masters’ studies when I got interested in the author’s voice when writing. However, I decided to work with NNES scientists of a public university in Central Mexico since there is not enough research carried out about the articles written and published in English by NNES scientists in various international

journals who manage to have a high publication output in spite of having, in most cases, only a basic command of the English language.

Personally, I was excited about how this project would take me into a third space where NNES scientists bring together their strengths, interests and needs would be addressed.

#### **1.4 Location of the research**

Since this research aimed to analyze NNES scientists' writings, the study was carried out in physics and mathematics faculty of a large and public university located in Central México. The reason why I chose this study to be carried out in the location mentioned before was because it is a place in which I have easy access to NNES scientists' writings in English. The participants of this study were researchers, graduate and undergraduate theses advisors, and authors and co-authors of international articles.

#### **1.5 The research aims**

The main aims of this study were to analyze the different funds of knowledge and discourse that may shape the researchers' writings in a second language and explore the way they bring this knowledge and discourse to support their writings when writing and publishing scientific articles.

#### **1.6 Research questions**

The present study sought to answer the following two research questions:

RQ1 What are the different funds of knowledge and discourse that may shape NNES scientists' writings when publishing in a second language?

RQ2 How do NNES scientists bring this knowledge and discourse to support their writings?

## **1.7 Chapter summary and overview of thesis document**

When writing third spaces are created by incorporating everyday language and knowledge with disciplinary words and phrases which are called “funds of knowledge” and “discourses” as writers engage with topics of different areas. A number of researchers have demonstrated that third spaces that build bridges between every day and academic knowledges and discourses do support students’ literacy and content learning (e.g., Gutiérrez, Baquedano-López, Alvarez, et al., 1999; Gutiérrez, Baquedano-López, Tejeda, et al., 1999; Heath, 1983; Hudicourt-Barnes, 2003; Lee & Fradd, 1998; Moll et al., 1989; Moll & Gonzalez, 1994; Moll & Greenberg, 1990; Warren et al., 2001). Therefore, the importance of third spaces appears to be in the support the theory can provide in explaining the processes involved in L2 writings.

In Chapter II, the literature review and theoretical framework for this research will be presented, in other words, previous contributions to the field will be mentioned. In Chapter III the study methodology will be explained as well as the instruments used in order to gather data. Once having the data collected, findings and discussion will be given in Chapter IV. Finally, in Chapter V the research questions are addressed supported by a discussion of the data presented earlier in order to reiterate or summarize the findings.

## **CHAPTER II: LITERATURE REVIEW & THEORETICAL FRAMEWORK**

2.0 Chapter introduction

2.1 Research writing in second language (L2)

2.1.1 NNES scientists writing in English

2.1.2 Research on NNES scientists and writing

2.2 Multi-Theoretical Framework

2.2.1 Intertextuality and genre

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2.2.4 Third Space Theory

2.2.5 Funds of knowledge

2.3 Research in Third Space Theory and Literacy

2.4 Study research questions

2.5 Chapter conclusion

## **2.0 Chapter introduction**

“Academic writing, like all forms of communication, is an act of identity; it not only transmits disciplinary content but also carries a representation of the writer” (Hyland, 2002, p. 1092). Writing directly engages issues of personal identity which are created, re-created, and reinforced as the writer moves into (and out of) different discourse spaces. These complex changes involve various processes such as “negotiation, adaptation, appropriation, and resistance that can occur during the acts of conceptualization, drafting, and writing” (Phan & Bahrain, 2011, p. xiv). Theories have been put forward as way of understanding the complexities associated with academic writing. Some of those are concepts such as intertextuality (Bazerman, 2004); hybridity and heteroglossia or multivoicedness (Bakhtin, 1981) and Third Space (Bhabha, 2004).

In this chapter we want to construct a framework for understanding the experiences of the NNES writers who are the focus of the study. The framework has two principal branches: one that very briefly addresses the well-researched area associated with writing in a second language and the other more detailed branch which attempts to create a more theoretical focus bringing in a number of associated areas which can help illuminate our understanding of the second language writing experience. The chapter ends with the reintroduction of the research questions showing how the frameworks constructed for the study create the space for the study questions.

### **2.1 Research writing in second language (L2)**

Research on L2 writing is an area of increasing research. It is a relatively new area compared to other disciplines emerging for the most part in the early 1990s. Several accounts of the history of L2 writing and of the discipline itself document the development

and growing importance of L2 writing studies as a field of practice and investigation. In a like manner, so many L2 writing subfields have evolved, including writing for science and technology, industry, business, and the medical fields (Leki & Cumming, 2008).

Writing research requires conscious effort and much practice in composing, developing, analyzing ideas and presenting results of a certain research area. Researchers who write and publish in a second language and whose L1 is not English are faced with social and cognitive challenges related to second language acquisition.

Currently, English is the language of international communication as well as it is for reporting research. For this reason, when NNES researchers/scientists use an additional language, in this case English, it is never simple and it is full of contradictions since it can be regarded and experienced as imperialistic and hegemonic (Clark, 2014). Thus, talking particularly of NNES researchers when writing research in a second language, and as Bazerman (2004) and Bazerman and Prior (2005), and before them Bakhtin (1986), researchers who use English language borrow, echo and change patches of the languages of others and their own and interlace them together in their own texts or writings. As a result of that blending, *hybridity* (2.3.2 below) is produced in their writings or research since more than one language source is present.

As cited in Viete (2011), Kramersch (2001) argues that second language users, in this case researchers, should exploit their different ways of putting text together by adopting the genres, styles and rhetorical conventions of the English speaking world but also knowing how to “gain a profit of distinction by using English in ways that are unique to their multilingual and multicultural sensibilities” (Kramersch, 2001, p.7). However, as well meaning as these perspectives are, writers are still under pressure to conform to what they (and journal referees and editors) perceive to be standard forms of English (viz. Hanauer &

Englander, 2013; Flowerdew, 2008). It is this situation that the theories outlined below might provide additional insight towards our ongoing understanding of NNES writing in English for publication.

### **2.1.1 NNES scientists writing in English**

Writing in academic discourse communities brings the identity and voice of the writer as while “attempting to establish their identity within such communities that writers bring with them, complex identities from their social life outside the academic community” (Ivanič, 2005, p. 82). Every act of writing conveys a representation of the self of the writer; as a result, writing reflects the writer identity to create meaningful space. As a matter of fact, language with all its echoes is a marker of identity since when it is used, we communicate who we are to others in our society. Consequently, the way we use language, no matter whether it is our first, second or third language, shapes the way others see us and the way we see ourselves. Language marks us as belonging to particular communities or cultures, in other words, it lends us many faces.

At many higher educational institutions professors/investigators are required to produce research in their areas, which is mainly done by publishing articles in journals, conference proceedings, books and book chapters among others sources. Unfortunately, it is known that scientific writing is a difficult task to accomplish for many authors but it is even more difficult for non-native English speaking researchers. And this is mainly because writing in a language which is not their L1 represents an enormous challenge.

At this particular time in human history English is the dominant language of international science (Hanauer & Englander, 2011). For this reason, when non-native English speaking (NNES) scientists want or need to take part in international science, it is necessary for them to speak, write and publish in English but not only in this language, they

need to know the scientific English language used. In other words, they need a good sense of the complicated elements of writing involving clearness in their communication, understanding and incorporation of the voices of others (intertextuality), understanding of genre conventions of their field, as well as grammatical elements and specific vocabulary used in their discipline (Bazerman, Keranen & Encinas, 2012).

Despite the fact that the hegemony of English in scientific research brings with it a number of important benefits, it is important to mention that it also has its negative factors. On the one hand, dissemination of scientific and technical knowledge in English has the capacity to bring with it progress in education, health among others as well as very significant material benefits on a world wide scale. Moreover, English as a common lingua franca has the potential to create cross-cultural understanding. On the other hand, the major negative factor relating to the need for scientists to publish in English is the potential advantage that this gives native-English speaking scientists against their NNES colleagues.

As the disadvantage mentioned above it is one of the major negative factors for the NNES scientists, it has been shown in a number of studies which have referred to difficulty NNES experience in writing for international publications compared to their NES colleagues (Swales, 1990; Flowerdew, 2008). Attention also needs to be focused on individual NNES scientists since it is important as well to discover their perceptions, problems and the strategies they used when writing for publication in English; therefore, in Chapter IV, some of these factors are presented as part of the study findings in order to know how the scientists view their situation and how they relate to it to ameliorate their position.

## 2.2 Multi-theoretical Framework

This section presents the second branch of the chapter. It turns the attention to theories which could be useful in illuminating the many elements involved in second language writing – and especially research writing for publication in English. The galaxy of associated theories in orbit around research writing in an additional language that we have brought together are *intertextuality & genre*, *hybridity*, *heteroglossia / multivoicedness*, *Third Space Theory*, and the concept of *funds of knowledge*. Each of these are reviewed and linked to the study in the following sections.

### 2.2.1 Intertextuality and genre

“Almost every word and phrase we use we have heard or seen before. [...] We create our texts out of the sea of former texts that surround us, the sea of language we live in. And we understand the text of others within that same sea” (Bazerman, 2004, p. 83; Bakhtin, 1981). *Intertextuality* describes the process in which one text relies or borrows elements from another text (*text* in the sense of written or spoken language). *Genre* refers to a set of characteristics texts in various contexts display. These two concepts are associated. The text elements that writers will incorporate into their texts depend on the genre characteristics of the discourse community in which they are working. Any writer aiming to write successfully for publication will need to understand the ‘conversation’ (appearing in their intertextual discourse) in the area and how that conversation is carried out (genre features) and then be able to incorporate that in their texts. As a writing tool, these features can ease writing in an additional language because writers can learn, collect and reuse discourse in their particular disciplines. This know-how is referred to in the associated literature as *funds of knowledge*, a term which evokes an image of resources to be called on when needed (discussed further on in 2.2.5).

### 2.2.2 Hybridity

Things that come together and form something new – with qualities of each of the originals – are said to be *hybrid*. Hybridity means *mixed*; it describes a mixture of elements. There are many forms of hybridity. It is used to describe mixed conditions in: biology, culture, language, anthropology, politics, and geography to name a few (Ashcroft, Griffiths, & Tiffin, 2007). Because of this characteristic of mixing there is no one feature or process that can be used to describe hybrid spaces. People in their social and cultural contexts have access to and draw from multiple funds or resources to make sense of the spaces they find themselves in. However, being in-between or when moving into these spaces (or out of) can be both rewarding and restraining for development of identities and literate, social, and cultural practices.

Writers move in and out of hybrid spaces as they function in the various spaces which intersect the spaces they inhabit (Fig. 2.1 below). Each space has indigenous features and also features the writer brings to it which give it the writer's own flavor based on the funds of knowledge the writer possesses and acquires through learning and experiences. Part of how this process of bringing resources to manage and succeed in a space is discussed in the following section.

### 2.2.3 Heteroglossia / Multivoicedness

Bakhtin's (1981) work on the dialogic nature of language emerges again<sup>2</sup> in this topic. These terms – heteroglossia and multivoicedness, used synonymously, refer to the multiple ways of speaking in any given social or cultural situation. As such it is a learning feature which allows people to become integrated / assimilated / enculturated (or excluded)

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<sup>2</sup> Mijaíl Bakhtin is generally thought to be the first theorist to propose the notion of *intertextuality* which he referred to as *dialogism*. Intertextuality was a word coined by Julia Kristeva in her 1966 presentation on Bakhtin's work (Duff, 2002).

in various social and cultural environments – many of them hybrid spaces. This feature of learning through language is particularly relevant to understanding the experiences of incipient researchers and those beginning to grapple with publication in an additional language – in this case, English. The relevance of these terms to the present study can be illustrated through a study done by Cohen (2009) on the heteroglossic discourse of children's play.

The literature reviewed in Cohen's (2009) study examined the role of discourse in the development of children's social and cultural identities. Acknowledging the socio-constructivist nature of language and identity construction, Cohen challenges the typical theoretical frameworks of Vygotsky and Piaget most commonly relied on to explain these phenomena. Both Vygotsky's and Piaget's theories do not encompass the heteroglossic nature of the language children create while playing. Through their play and their language, children 'try on' various social roles and the associated discourse. Thus they not only learn through immersion and observation as Vygotsky and Piaget propose, but they learn by "extending themselves into the place of *the other*" (Cohen, 2009, p. 332). This allows them to experience how they might react in and experience a variety of potential situations in which they will find themselves as they assimilate into their target social and cultural lives. There are multiple examples of this type of play language but one that comes readily to mind is the child taking the role of the mother or other caretaker and using the language of that 'other' to interact with a doll or another child. Through this play, the child uses the language and all the associated communication elements as if he or she were putting on clothes and testing out how they fit and what other's reactions to (interaction with) them are. Depending on those, the language can be taken up, adapted, or rejected as unsuitable.

This appropriation and assimilation of other's words (the concept of *intertextuality* is clear in these ideas) in Bakhtin's theory, is a central process of identity formation. This *ideational becoming* is an essential component that everyone engages in – consciously or not – in any developmental situation (Cohen, 2009). Thus, it is clear to see that this concept has something to say about the ongoing developmental processes writers in additional languages go through as they seek entry into, become more immersed, and maintain their membership in their international professional communities.

These processes are not without, by any means, problems. As the theory presented in the following section (2.2.4) and other theories (e.g., post-colonial perspectives and Mary Louis Pratt's (1991) concept of the Contact Zone) which seek to explain what can happen when social and cultural worlds meet, there are forces which facilitate and those that debilitate such encounters.

It is often assumed that professional communities have a single discourse form which everyone uses to communicate. An overly simplistic definition of *genre* would propose that researchers in mathematics publishing internationally should be able to learn the *language* of the genre and then be able to publish without any problems within the discourse conventions of that language. However, that clearly is not the case. As we have been trying to demonstrate in this chapter there are many forces from many directions and dimensions acting on writers.

Bakhtin identifies two of those forces as being *centripetal* and *centrifugal* (Cohen, 2009). The former describes forces which draw all language elements into one system in which there are clearly defined norms which all participants conform to – it is a monologic language. At the same time there are centrifugal forces that *problematize* the common understanding assumed in the monologic language. These centrifugal forces “are the

products of social and linguistic diversity” (Cohen, 2009, p. 335). They are the social and cultural languages we speak – heteroglossia. These are illustrated in Fig. 2.1 below which shows the spaces a researcher inhabits, intersects, and creates (hybrid spaces) as she or he functions within her or his scientific field (or *fields* as science becomes more and more multi-disciplinary). What can be deduced from this discussion is that social and cultural spaces (including professional spaces) are not unified – they are heteroglossic and *multi-voiced*. They are also conceived as monological, and that is the source of the difficulties encountered by people writing in the professions and particularly the challenge for those writing in additional languages. Just as children try on and test out the language that comes from many areas of their lives which in turn form the foundation of their identities, writers need to try on and test out their language as they form and maintain their professional identities – and as those identities continually evolve.

The heteroglossic and multivoicedness of these discourses can upset the power balances in the disciplines because they challenge established norms. This is manifest in much of the literature on publishing in an additional language as discussed in the first part of this chapter (e.g., Hanauer & Englander, 2011).

This spatial conflict is taken up in the following section on Third Space Theory.

#### **2.2.4 Third Space Theory**

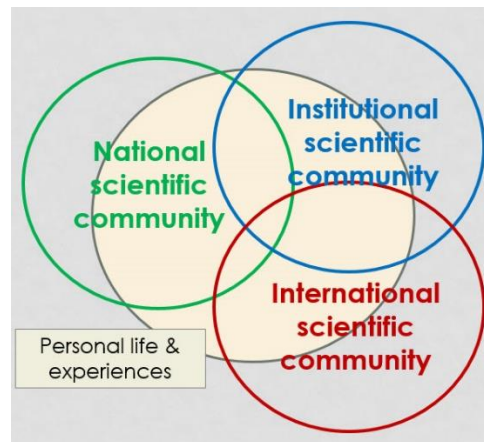
Ikas and Wagner (2009, p. 1) use the term “nomads” to describe the people of the 21<sup>st</sup> century: “At the turn of the 21<sup>st</sup> century globalization has turned the earth into a planet of nomads....millions of immigrants challenge the existing power structures .... Meanwhile, the residents’ collective identity is ceaselessly confronted ...” by the newcomers and their customs and traditions. This observation can be extended to any social or cultural entity in which newcomers are constantly crossing the boundaries – as in

the case of professional disciplines as novice members enculturate via learning the profession and constructing career identities (Carrasco, Kent, Keranen, 2012). As discussed above (2.2.3), this is not a problem-free process. Third space theory proposes a way to understand the complicated situations and processes associated with this activity.

The third space theory or perspective made by Homi K. Bhabha (1994) states that in any given situation people draw on multiple resources or funds to make sense of the world. In the case of education, the theory helps to describe how resources are mobilized to make sense of oral and written texts applying *funds of knowledge* and discourse, integrating different components such as spaces, contexts, and people's identity together to construct new knowledge. Third space theory, like hybridity theory, re-conceptualizes the first and second spaces of human interaction. First and second spaces are binary. They possess certain characteristics maintained by physical and social interactions of the people in the spaces (Moje, Ciechanowski, Kramer, Ellis, Carrillo, & Collazo, 2004). Binaries in literacy are the first and second spaces of everyday versus academic knowledges. Third spaces, on the other hand, "... are the in-between, or hybrid, spaces where the seemingly oppositional first and second spaces work together to generate new third space knowledges, discourses, and literacy forms" (Pane, 2007, p. 79) (Fig. 2.1 below).

The conception of third space was first developed and established in depth by Bhabha (1994) as a metaphor for the space in which cultures come together or overlap. It is a space in which two groups with distinct levels of power and authority where discourse, translation, and inter – or transcultural communication lead to the development of hybrid identities. These identities are "neither one nor the other" but a completely new set of identities (2.2.3 above) (Ikas & Wagner, 2009, p. 2). This space is not a cohesive one; Bhabha stresses that it is often a site of tension, of competing powers and differences.

Figure 2.1 Third spaces occurring in academic disciplines



As pictured in Fig. 2.1 above, in the context of our study, these spaces are not literal geographic spaces. They are *virtual spaces* and because they are third spaces, they challenge the traditional binary notions of *space* and *spatiality*, e.g., place, location, region, territory, country (Soja, 2009). Thus, third space is not a stable geographic or ‘either / or’ construct, but a fluid concept of “both / and” (ibid, p. 51).

How then can writers of any language or additional language negotiate the third spaces they find themselves in? The following section addresses another theory in the cosmology of the constructed theoretical framework which proposes how people manage the third spaces.

### 2.2.5 Funds of knowledge

Writers inhabit a third space by drawing on their knowledge(s) of the various languages and language usages vernacular, academic, every-day, and disciplinary – that make up their *funds of knowledge* and *discourses* – the texts (spoken, written or non-linguistic) they generate and texts they interact with. Culture and funds of knowledge are inseparably related. However, *culture* is a broad and ambiguous term. A thorough discussion of the complicated concept of culture is not practical (nor entirely relevant) in

this study, but a definition of culture as understood is possible. For the purposes of the study we are adopting the position that culture is not only systems of “behaviour, attitudes and values” but as referring to the *process* through which these things become known to members. This cultural knowledge is itself a hybrid entity because it contains “traces of other meanings and identities”, while at the same time it is interpreted, re-interpreted, and enacted by the individuals acting within the spaces (Ashcroft, Griffiths, & Tiffin, 2007, p. 53). This concept of culture becomes more evident in “borderland” spaces (Gonzales, 2004, p. 37). In anthropology this refers to the fluid nature of culture as people cross back and forth over geographical borders. This concept can be extended to the virtual borders and spaces writers cross into and out of in their personal and professional lives (Fig. 2.1 above). Thus, for purposes of this study we regard *culture* as fluid, mutable, hybrid, and interpreted and *funds of knowledge* as the means by which culture is enacted in all its forms. In other words, funds of knowledge are the tools or know-how (2.2.1 above) that are engaged when encountering cultural elements. This knowledge provides the *means* for directing behavior in the spaces we find ourselves. In the case of this study, for example, funds of knowledge are culturally transmitted / acquired elements which are drawn upon as the participants move in and out of the various (and changing) spaces of their lives (Fig. 2.1). These funds are acquired throughout our lives and in line with the definition we have taken regarding culture: the funds are changeable and context dependent.

One way to understand the concept of funds of knowledge is to frame them in terms of household knowledge (Vélez & Greenberg, 2004). A home needs a variety of funds of knowledge to function: “caloric funds, funds of rent, replacement funds, ceremonial funds, social funds” (p. 49). They define these as “bodies of knowledge of strategic importance to households” (p. 49). This definition allows us to ask a number of

questions: “How were such assemblages historically formed? How variable are they? How are they transformed as they move from one context to another? How are they learned and transmitted? How are they socially distributed” (Vélez & Greenberg, 2004, p. 49). Those questions give us clues as to the nature of funds of knowledge: i) they are formed through historical processes; ii) they are variable; iii) they have context dependent elements; iv) they are learned and transmitted; and v) they are socially distributed.

Those characteristics then can form the basis of investigation as reviewed in the following section.

### **2.3 Research in Third Space Theory and Literacy**

A number of researchers have demonstrated that third spaces build bridges between every day and academic knowledges and discourses do support literacy and content learning. Those studies have focused on hybridity as a theoretical lens for exploring diversity in elementary education (Gutiérrez, Baquedano-López, & Alvarez, 1999); how children cross boundaries between home literacies and school literacies (Heath, 1983); how Haitian children use their funds of knowledge (a part of third space theory) to use the argumentation genre in science classrooms (Hudicourt-Barnes, 2003); children from minority languages (Moll & Gonzalez, 1994) to cite a few.

In Gutiérrez, Baquedano-López and Alvarez’s (1999) study the theoretical concepts of third space and hybridity were brought together to direct pedagogical practice in literacy education. Third space, hybridity, funds of knowledge and interaction are all put in to action in their study. As the students in their study engaged in an activity, they constructed their interaction based on their needs to communicate and to accomplish the activity but this only happens within the constraints of the intersecting cultures (hybrid spaces). The

theories describe the interaction and construction of knowledge associated with the collaboration within the hybrid space.

In Heath's (1999) remarkable 30 year ethnography on language and families in the southern United States, she used the theories associated with Third Space to frame her interpretations of the communication between students from two distinct ethnic groups. Her study looked at children and how their cultural spaces – family, medical, educational, religious, and other spaces influences the children in the study and how those influences were manifest in classrooms and how teachers interpreted the children's interactions and reactions, performance, and learning. Her study contributed to our understanding of how individual cultures are present – and come together in hybrid spaces, and the importance of understanding the these theoretical concepts can help educators understand the dynamics of hybrid spaces in which learners inhabit.

Hudicourt-Barnes (2003) used the funds of knowledge concept to challenge the notion that Haitian children could not actively participate in argumentative forms of discourse. She brought to the science classroom the Haitian form of argumentation referred to as *bay odyans*. Thus, recognizing a culturally transmitted form of discourse and bringing it to another culturally influenced space – science, she was able to create a hybrid space where the students' funds of knowledge from another space worked in the science space. What her study strengthened were the theoretical notions of third space, hybridity, and funds of knowledge and how those concepts could be mobilized to help the children in her study negotiate the spaces they found themselves in associated with science (in their educational setting).

Moll and González (1994) used the concept of funds of knowledge to explore the literacy practices of bilingual third grade elementary students as they used them to manage

their school projects and assignments. Their article (1994) begins with examples of how the students were using both Spanish and English to carry out research on Native American tribes. Using both their languages, the students were able to “formulate their own research questions, search for and document their sources of information, abstract relevant information from multiple texts, conduct interviews and supplement their readings, and produce text that summarize and communicate what they have learned” (Moll & Gonzalez, 1994, p. 440). The authors stress the importance of the “strategic use of cultural resources for learning” (p. 440) – i.e., funds of knowledge.

The theories and studies associated with third space, hybridity, funds of knowledge, intertextuality, heteroglossia and multivoicedness form part of a galaxy of interrelated theories. They work together to offer (a myriad of) explanations for events that happen when cultures come together. We chose this framework to look at how the study participants mobilize their funds of knowledge to negotiate the communication of their disciplines – particularly focused on their research writing in English for publication in international journals. Because of this, we needed to understand the origins of their funds of knowledge (via the narrative interviews) and their current practices – how they use those funds (via the elicitation array interviews).

From the studies briefly reviewed in this section, it seems evident that much of the research using this theoretical framework has been until now focused on children’s learning spaces. What may be lacking are studies from this framework looking at L2 writing and writing especially in the sciences. This study aimed to fill this apparent gap and thus create the space for the following research questions.

## **2.4 Study research questions**

RQ1 What are the different funds of knowledge and discourse that may shape NNES scientists' writings when publishing in a second language?

RQ2 How do NNES scientists bring this knowledge and discourse to support their writings?

## **2.5 Chapter conclusion**

This chapter has attempted to create a theoretical picture of the topic under investigation. It first set out to review the literature and theories on second language writing and NNES writing in the sciences in particular. Then the second half of the chapter was dedicated to constructing a theoretical framework based on five interrelated theories: i) intertextuality and genre, ii) hybridity, iii) heteroglossia and multivoicedness, iv) third space theory, and v) fund of knowledge. All of these were put together to create a framework for understanding the data gathered from this study as explained in the following chapter.

## **CHAPTER III: RESEARCH METHODOLOGY**

**3.0** Chapter introduction and overview

**3.1** Research design

**3.2** Research location and participants

**3.3.** Research Methodology

3.3.1 Narrative Interviews

3.3.2 Elicitation Interviews

3.3.3 Observations

**3.4** Data collection procedure

**3.5** Data analysis procedure

3.5.1 Narrative interviews

3.5.1.1 Analysis framework

3.5.2 Elicitation Interviews

3.5.3 Observations

**3.6** Data validation procedures

**3.7** Conclusion

### **3.0 Chapter introduction and overview**

This chapter describes the methodology that was used to collect data and answer the research questions previously presented in Chapter 1. This study used a qualitative approach. The main aim of this study was to discover and contribute to the analysis of the construction of the third space in non-native English speaking (NNES) scientists' writings in English. In order to do this, ethnographic type methods were used to collect evidence leading to an understanding of the participants operating in the various spaces of their professional lives. To understand how this was approached, the study design is first presented. This is followed by a description of the study location and participants. Next the research methods and the research procedures are described. This is followed by descriptions of the data collection and analysis procedures.

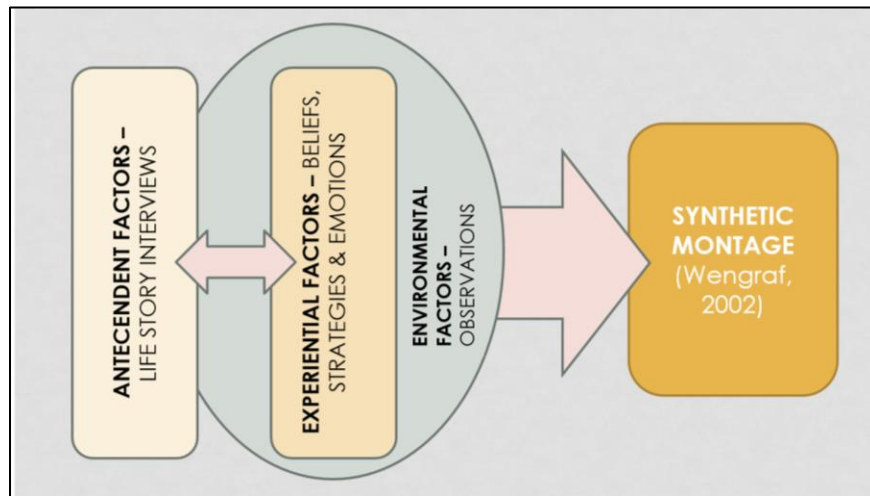
#### **3.1 Research design**

Based on the literature and theories presented in the previous chapter, the study design involved a number of data sources collected from a number of qualitative methods and leading to a composite portrait (see 3.5 below) of the participants (described in 3.2 below) as a group of scientists moving in and out of the various spaces they inhabit as part of their professional lives.

Thus, as illustrated in Fig. 3.1 below the study used three principal qualitative data collection methods i) narrative interviews, ii) elicitation interviews, and iii) observations. The three methods informed and complemented each other with meanings and understandings moving bi-directionally rather than in a single one way direction (as in sequential data collection designs). In other words, what was elicited in the narrative interviews informed understandings of beliefs, actions and emotions which emerged in the experiential interviews and vice versa as illustrated by the bidirectional arrows in Fig. 3.1

below. Observations of environmental factors underlay both interview methods and help to further illuminate understandings and interpretations of the context and the data. All of the methods were brought together to create the synthetic montage – a strategy used to portray the multiple voices in the study to help make sense of the data and the experiences of these people in their various spaces.

Figure 3.1 Study design



### 3.2 The context of the research

This study was carried out at in physics and mathematics faculty of a large, public university located in Central México. The participants of this study were 11 NNES researchers, authors and co-authors of international articles. To ensure a certain level of research productivity, publication in English, and immersion in their fields, the 11 participants were purposively selected. Only those with PRODEP<sup>3</sup> recognition and those in

<sup>3</sup> El PRODEP para el tipo superior busca profesionalizar a los Profesores de Tiempo Completo (PTC) para que alcancen las capacidades de investigación-docencia, desarrollo tecnológico e innovación y, con responsabilidad social, se articulen y consoliden en cuerpos académicos y con ello generen una nueva comunidad académica capaz de transformar su entorno (taken from: <http://dsa.sep.gob.mx/prodep.html>)

the SNI<sup>4</sup> were selected. Because of the high level of productivity in the faculty of physics and mathematics and an ongoing research relationship between the thesis supervisor and the participants, this research focused only on academic staff from this university faculty.

### 3.3 Research Methodology

This study used ethnographic type methods to collect the evidence such as resources, tools, artifacts that scientists have as their “funds of knowledge”. They were collected via observations and interviews. The observations were carried out at the same time as the interviews. The interviews were *narrative* (Lieblich, Tuval-Mashiach & Ziber, 1998) and *experiential* (Gordon & Dawes, 2005).

The main reason for using these types of methods was firstly, the narrative interviews allowed us to collect literacy experiences of the participants that could potentially provide antecedent factors to the things uncovered in the elicitation interviews; thus adding depth and background to those interviews. The elicitation interviews were used primarily to bring to the surface the beliefs, strategies and emotions of the participants associated with their writing in English L2 for publication. The observations were used to collect artifacts that would shed further light on their management of writing in their third space – hybrid contexts.

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<sup>4</sup> El Sistema Nacional de Investigadores fue creado Por Acuerdo Presidencial publicado en el Diario Oficial de la Federación el 26 de julio de 1984, para reconocer la labor de las personas dedicadas a producir conocimiento científico y tecnología. El reconocimiento se otorga a través de la evaluación por pares y consiste en otorgar el nombramiento de investigador nacional. Esta distinción simboliza la calidad y prestigio de las contribuciones científicas En paralelo al nombramiento se otorgan estímulos económicos cuyo monto varía con el nivel asignado. (Taken from <http://www.conacyt.mx/index.php/el-conacyt/sistema-nacional-de-investigadores>)

### 3.3.1 Narrative interviews

Narrative interviews were used for data collection in this study in order to obtain participants literacy experiences. According to Lieblich, Tuval-Mashiach, and Zilber (1998) there is a categorical narrative approach which may be adopted when the researcher is primarily interested in a problem or a phenomenon shared by a group of people. In this type of approach, the aim is to get to the implicit content by asking them about the meaning that the story and / or certain events in their experience convey, what traits or which motives of the individual are displayed. By using narrative interviews, researchers can explore the form of the life story since it seems to manifest deeper layers of the narrator's identity and this is what, in part, the study aimed to achieve.

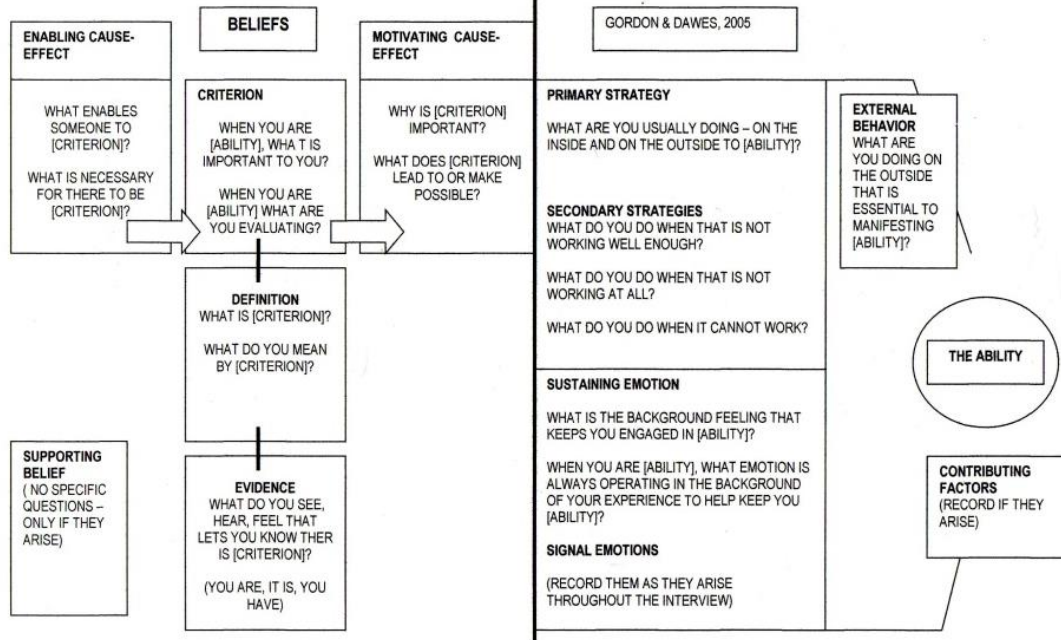
The protocol used followed Lieblich, *et al.* (1998). This consisted of a sheet of paper with numbers representing years of life written in two columns. The participants were then asked to think of their literacy experiences throughout their lives and to identify points when they felt changes were made in their levels of literacy (in both Spanish and English). The protocol calls for a minimum of questions from the interviewer. Rather, the interviewer listens and records and when necessary offers suggestions and questions for clarification. All but one of the interviews were carried out in Spanish and lasted on average 90 to 120 minutes. All the interviews were audio recorded and transcribed by student research assistants as this project was part of a larger funded project (see Appendix A for the interview protocol and an example of a completed interview, Appendix B for a partial transcript of 1 narrative interview (2 of 19 pages).

### 3.3.2 Elicitation interviews

The other data collection method used was the elicitation interview protocol by Gordon and Dawes (2005). The interviews ranged between 30 minutes and several hours. This depended on the interviewee. The elicitation array (Fig. 3.2) was co-created by the interviewer and the participant over the course of the interview. The interviewer filled in the sections of the array as the participant answered the questions. Questions were asked for clarification if necessary however the overall goal was for the interviewer to let the participant speak as much as possible with as little intervention as possible (see Appendix C for a completed array).

As seen in Fig. 3.2 below the array presents a schematic framework for arranging the qualities and actions involved in the enactment of an ability. By using this array, there is a flow effect which refers to what is going on in experience at the time an “Ability” is being manifested, which generally goes from beliefs and emotions toward external behaviors. The overall aim of using the array is to co-construct a model of behavior associated with the enactment of an activity – in this case, writing scientific articles in English for publication. The co-construction of the array refers to the manner in which the interviewer and the participant work together to draw out beliefs, emotions and strategies that are often only associated with tacit knowledge of the participant – thus requiring the aid of the interviewer to draw out these elements from the participant. The array is constructed during the interview. Questions are used to draw out, clarify and confirm participant responses as they are made. The array is explained in more detail the following paragraphs.

*Figure 3.2 The Elicitation Array (Gordon & Dawes, 2005).*



On the left side the beliefs are documented. They consist of the *central criterion* or a point of reference of evaluation the participant holds when he or she is performing the activity to their expectations. On the horizontal axis there are places to record the *cause and effect* beliefs and the *motivating cause-effect* beliefs. As the name implies, these beliefs are those which the participant thinks enable someone to engage in the activity. In other words, what does someone need to do to effectively mobilize the ability. The motivating cause-effect belief reflects those beliefs the participant holds which indicate why she or he has developed and continues to use the ability. These beliefs are associated with intrinsic and extrinsic motivations.

On the vertical axis, the equivalency beliefs: *definition* of the criterion and *evidence* of the criterion are recorded. As the names imply these ask for beliefs that are synonymous with what the participant identified as the central criterion or basis of evaluation associated with the ability. The first asks the participant to define what they mean by what they have identified as the criterion and the second asks them to indicate when they know they have

achieved or they have what they have identified as the central criterion. Both of these categories are important in understanding the participant's regard for the ability.

On the right side of the array the *primary* and *secondary strategies* are recorded. The strategies refer to the actions the participant engages when enacting the ability. The primary strategy is what they use to do the ability. The secondary strategies are what they engage when certain factors block or inhibit the primary strategy.

Below the strategies the emotions associated with the ability are recorded. There is an overriding central emotion the participant has towards the ability that is present even when the participant is not using the ability. Then there are the signal emotions which provide feedback regarding the level of enactment of the ability, i.e. whether the participant is engaging the ability proficiently or whether there are some problems associated with the performance of the ability. These signal emotions tell the participant to continue on (generally associated with positive emotions) or that changes need to be made (generally associated with negative emotions).

All the parts of the array work together to produce a model of the participant engaged in the ability under investigation. It is *not* the ability but a model of it – just as a map is not the actual country it represents but only a model.

Nevertheless, a map alone is never completely sufficient in understanding the terrain or the route – or in the case of this study in answering the research questions. To help fill the gaps, finally observations were carried out as described in the following section.

### **3.3.3 Observations**

Observation is a qualitative method with roots in traditional ethnographic research, whose objective is to help researchers learn the perspectives held by study populations. As qualitative researchers, we presume that there will be multiple perspectives within any given community.

Observations took place in the researchers' professional community settings, that is to say, in locations believed to have some relevance to the participants and to the research questions. The method was distinctive because we approached participants in their own environments rather than having the participants come to us. Generally speaking, we engaged in participant observation which tries to learn what life is like for an insider while remaining, inevitably, an outsider (González, 2004). The observations were done at the time of the interviews – both the narrative and the elicitation interviews. They were informal in the sense that there was no observation protocol. Only the general work environments of the researchers were observed and used to create an overall picture of the participant – adding to that created via the two interview protocols.

### **3.4 Data collection procedures**

Several steps were taken to carry out the data collection. First, I was trained by my thesis supervisor in the interview protocols. Second, the protocols were piloted and during that she observed me carry out a number of interviews. Third, each potential participant was contacted via email and asked for a time and location for the interviews. The interviews and observations were carried out by myself and my supervisor whenever possible. Participants were asked for permission to record the interview in order to support a proper analysis later. Pictures, videos, field notes and / or other strategies were also used

to record the interviews and to collect information on the observable elements. Also, I took occasional notes for later questioning so that it would not interfere with the narration.

### **3.5 Data analysis procedures**

This section provides a description of the analysis of the instruments used for this study. It begins with the narrative data, followed by the elicitation interview and the observations.

#### **3.5.1 Narrative interviews**

The narrative interviews were analyzed based on the RQs; for example, specific items were coded and categorized which helped to answer the RQs by means of deductive analysis. In this analysis, we looked at the importance of the context, that is, how detailed analysis of the formal aspects of a story can be indicative of the emotional content of a life story; the consideration of a linguistic expression in the context of the speaker individual style of speaking and writing. Both of these features were revealing about the emotion with which the narrative was infused and of the difficulty of entering into a narrative mode. Also, the speaker's linguistic style, and the broader social context were essential for analyzing sections of their life story.

##### **3.5.1.1 Analysis framework**

The analysis framework was based on Social Cognitive Theory. This theory proposes that people take up actions and beliefs based on three principal categories of behavior determinants: personal, environmental, and those associated with behavior bound by feedback factors (Bandura, 1997). Personal factors are those that are associated with personality: e.g., coping strategies, the ability to recognize and achieve goals, resilience, intellectual development, and motivation. Environmental elements are those factors

affecting a person which are sometimes within control and sometimes not, e.g. role models, family dynamics, chance encounters, educational situations and opportunities, and factors such as socio-economic levels. The third influencing category is associated with behavior.

### **3.5.2 Elicitation interviews**

The experiential interviews were analyzed via the construction of the experiential array for each participant. Individual differences and commonalities were noted. They were also recorded to be listened to later and made notes to the arrays, which were analyzed by both researchers individually. Then elements were compared across the participants. In order to do this, categories from all the arrays were put together. Comparisons and differences were then identified between the participants to help lead to answers to the research questions.

Once narrative and experiential interview data were collected and analyzed, they were combined to construct a composite portrait or “synthetic-montage” (Wengraf, 2002, p. 335) of which aimed to represent the participants as a whole. Wengraf (ibid) explains that the researcher, when creating an interpretation of interviews, creates a portrait of the participant in much the same way as an artist would paint a portrait of an individual. The portrait is a result of the way the artist or in this case the researcher interprets and represents the object of observation. The portrait is always situated within an interpretative frame bounded by culture, context, purpose, and the abilities and limitations of the artist. With this in mind, the purpose in the case of the montages constructed in this study, is to bring together the most salient features of the findings from the interviews that help illuminate the processes used by this group of NNES researchers.

### **3.5.3 Observations**

Observational data were categorized and used to shed further light on the interview data.

### **3.6 Data validation procedures**

After the analysis of the data, random participants were chosen and the interpretation of the data was reviewed with the participants. Both interviewers independently analyzed the data and then compared results. Interview data were also compared with observational data to complete the picture of the researchers.

### **3.4 Chapter conclusion**

In this chapter presented the study participants, data collection instruments and collection methods. It also provided a detailed description of how data was obtained from the narratives interviews, elicitation interviews, and observations were analyzed. The following chapter presents the results of the study.

## **CHAPTER IV: THE DATA ANALYSIS**

4.0 Chapter introduction

4.1 Antecedent factors: life story and interviews

4.1.1 Childhood

4.1.2 Adolescence

4.1.3 Adulthood

4.2 Experiential factors

4.2.1 Experiential interviews

4.2.2 Emotions

4.2.3 Strategies

4.3 Observations

4.4 The role of theory in the interpretation of the findings

4.5 Chapter conclusion

## **4.0 Chapter introduction**

In the previous chapter, the participants of the study were described as well as the data collection instruments and the procedures for collecting and analyzing the data. This chapter presents the outcomes of the analysis of the instruments applied to collect data for this study: narrative interviews, elicitation interviews and observations which were used specifically to address the two study research questions:

RQ1 What are the different funds of knowledge and discourse that may shape NNES scientists' writings when publishing in a second language?

RQ2 How do NNES scientists bring this knowledge and discourse to support their writings?

### **4.1 Antecedent factors: life story and interviews**

This type of information was collected to provide background information about the participants. It is important to try to construct as complete a picture as possible of the literacy development in order to better understand their current literacy practices. This information came from the life story interviews. These interviews are designed to elicit deeper layers of the narrator's identity and this is what, in part, the study aimed to achieve. The following findings present how these factors came into play in three stages of the participants' lives: childhood, adolescence and adulthood.

#### **4.1.1 Childhood**

While individual experiences varied, there were some interesting similarities among the childhood experiences and situations. Most of the participants came from very humble origins<sup>5</sup>. Most had parents who had received very little formal education. In spite of this

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<sup>5</sup> This finding contradicts Hanauer and Englander's (2013) demographic findings from their study on Mexican scientists. The difference may have to do with the overall characteristics of the research sites. The site of our

though, most of the parents had very strong and persistent opinions regarding formal education. They felt it was the only way to improve the lives of their children. Many had dedicated mothers (in particular) who ensured that the children developed positive attitudes towards education and also positive work habits. What helped in a lot of cases was the participants' own dispositions towards learning and education. Many of them from a very early age expressed an interest in reading. Again, this was in almost all cases associated with a parent's or both parents' love of reading and the presence of books in the house. Also, in some cases, the participants mentioned older siblings as role models in terms of educational factors (i.e., interest in learning).

Table 4.1

*Antecedent Factors Identified from the Childhood Stage*

Generalized patterns
1. Parents were originally from rural areas (not in general)
2. Parents, especially the mother had a strong interest in children's development of literacy and/or numeracy skills.
3. Both parents were hard workers.
4. Parents saw education as the way to get out of poverty.
5. Many participants had positive role models of older siblings.

It can be seen from the table above that most of the participants' answers were that in their childhood they were provided, within an immediate family context, with different models of behaviors and skills they were expected to learn from. In that way, during their childhood, they could set their goals.

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study was a university with over 500 years of history, and with over 60 years of modern history as an autonomous state university. Most of the participants were 'late career' academics with an average age of about 55. It may be that the participants in Hanauer and Englander's study were younger and had access and advantages that the sample from the presents study did not have.

#### **4.1.2 Adolescence**

It was during this stage that many of the participants mentioned influential role models. Those role models changed from those of the childhood stage to those associated with school – particularly an influential teacher. Many of them identified one specific teacher who caused them to begin on their career paths.

In addition to the teacher role model – perhaps directly related to it – was the growing realization of academic abilities which in most cases set them apart from many of their classmates. This success in often difficult subjects led to the building of academic self-efficacy beliefs. When a person has the belief they can do something, they are generally able to do it or at least more likely to attempt to do it and more likely to succeed. This in turn builds more self-efficacy beliefs and more successes.

As the students began to construct their academic and personal identities, they began in almost all cases to identify others like themselves – with similar interests and aptitudes. This led to formations of groups which in turn led to other likeminded groups and mentors / role models, and in many cases these led to educational opportunities and the beginnings of professional networks, many of which were maintained through adult levels and into their professional working lives.

Nevertheless, many of the participants had to take on responsibilities in this stage of their lives. Many had to work and go to school – even at rather young ages. But instead of blocking their development, these experiences seemed to have led to their development of a certain kind of resiliency. This quality is apparent in all of the participants and is no doubt part of the reason they have been able to survive in their English speaking professional worlds in spite of expressing having very little formal English language instruction or contact with the language.

Table 4.2

*Antecedent Factors Identified from the Adolescence Stage*

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Generalized patterns
1. Outside family role models: teachers
2. Become to understand their academic ability building academic self-efficacy beliefs.
3. Early identification of career path
4. Most had to work to support their immediate families – work and study (building resilience)
5. Preparatory school – identifying groups leading to influential contacts / career role models

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So, during this stage, participants mentioned that they were influenced by their teachers, especially the ones that inspired them. Many of the participants mentioned that these teachers inspired them to develop a love for reading in general and we can assume this love of reading helped them in many ways including increasing their disciplinary knowledge.. In this case, participants had as role models people from the social context they were immersed in, which most of the time was a scholar context. Since they had a clear understanding of their academic ability they realized of their identification of career path.

#### **4.1.3 Adulthood**

The adulthood stage beginning after adolescence (around 20 years old) was characterized with further challenges. However, by this time they had very well-developed coping strategies coming from their childhoods and adolescent periods. In the early adult period, all of the participants were already deeply into their career paths – those being identified in the previous stage. They had finished their undergraduate degrees and had started on graduate and post-graduate studies. By this stage all of the participants had married and some had children. For those participants work and study were parts of their

lives. Most were working as teachers in the undergraduate in their disciplinary areas – either physics or mathematics.

Because they began working in their areas, they continued to strengthen networks formed from adolescent periods and to actively form new ones. This action allowed them to become more immersed in their fields and led to opportunities on international levels. It was also during this period that many realized or accepted the fact that they would need to be able to manage English in writing as well as speaking. It was also in this period that they published their first articles in English. Through this action, they began to use their survival abilities (funds of knowledge) to get their papers written and published.

Table 4.3

*Antecedent Factors Identified During the Adulthood Stage*

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Generalized patterns
1. Marry and have a family
2. Need to study and work through masters and PhD
3. Contacts maintained and increases leading to university teaching positions.
4. Economical funding available for graduate and post graduate work.
5. Recognition of the contribution of the parents, role models, love of reading

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Thus, as it is shown in the table above, through this stage, participants witnessed changes in their social contexts, there is decision making, life satisfaction; they also expressed they had high levels of job satisfaction which have been influenced by sources of self-efficacy such as previous accomplishments.

**4.2 Experiential factors**

As described in 3.3.2, elicitation interviews using the protocol illustrated in Fig. 3.2 were used to understand the participants’ beliefs, strategies, and emotions currently associated with their writing in English for publication. These interviews were specifically

used to attempt to identify the funds of knowledge the participants enacted to accomplish their writing. As specified previously, the instrument used with the participants was the elicitation interview protocol by Gordon and Dawes (2005); by using this array participants were interviewed about their personal experiences and beliefs when publishing articles in English.

#### **4.2.1 Beliefs**

In the Experiential Array, it is established that the *Criterion* is the primary standard of evaluation. The beliefs are either equivalency or cause and effect beliefs. Table 4.4 below presents a few selected representative excerpts from the arrays. What most of the participants indicate as the central criterion – the element most important to them when writing in English for publication – is writing *correctly*. What most meant by that is writing in English that is according to a set of accepted norms specifically associated with their discourse communities. So it is evident that they are all aware that there are discourse conventions specifically associated with discourse communities (i.e., cultural aspects of the discipline and genres).

They define the criterion in general successful communication. In other words the criterion is the successful publication of an article, which also implies conformation to the disciplinary genre norms. This is closely associated with the evidence they see or feel associated with the achievement of the criterion. The evidence they identified is based on a comparison of their writing with their target journal, a comparison with a mental model they hold of the writing conventions, and even if it can be back translated into Spanish and still make sense or convey what they intend to convey.

Table 4.4

*Selected Beliefs about Writing in English for Publication*

Criterion	Definition	Evidence	Enabling cause & effect	Motivating cause & effect
Writing correctly in English	When the main idea has been communicated	Evidence is seen by reading and checking the phrases different times to see if that was the original idea	Listening and practicing English as much as possible	Responsibility to the knowledge community
Writing according to disciplinary norms in English	When an article is accepted for publication	Evidence is seen by putting the idea into the translator and it means the same as in SPN or vice versa.	Wanting to be part of a professional community	Increasing knowledge through scholarly discussion and criticism
To highlight the results and show that it's state of the art / knowledge	Writing must conform to accepted standards in the discipline	Whether it conforms to a mental schematic he has of it.	Models Knowing standard phrases Reading a lot with the intention of using models Speaking a lot with visitors, short stays in English speaking countries Conferences The obligation to live with English speakers for periods of times Interaction in English TV, movies, newspapers	Career building Wider relationship with the community Support / grants Students Academic position Satisfaction Pride ' <i>puedo decir cosas</i> ' – he can say things in his professional community He has access to things because of his English ability Likes to read SF And likes access to the culture
Put the results in perspective...to say previous to this work this was not known		If it compares to the language used in target journals		

The other kind of beliefs elicited in the interview are those associated with cause and effect: enabling cause & effect and motivating cause & effect. The enabling beliefs are those they think enables someone to write successfully in English (in circumstances similar to their own). Those responses were generally related to using the language, practicing, learning, reading, writing, conversing, and being immersed in English speaking settings such as living in a country or going to conferences. Some also stated that a person must be sufficiently motivated to want to function in English. If they are not, then it would be difficult if not impossible to write in English with any kind of proficiency.

Those beliefs associated with their personal motivation varied but all seemed to state a core of motivations. Those were mostly associated with their desire to be members of their international professional communities, to have a voice, to have their work read and recognized as valuable contributions. A number of the participants also said they were

motivated to write because they like English and they like being able to understand movies and to read books in English. Clearly their motivations are closely linked to the emotions they hold regarding writing in English.

#### **4.2.2 Emotions**

The interview protocol divides the emotional factors into two principal categories. One of those is the *sustaining emotion* and the other are a group of emotions referred to as *feedback* or *signal emotions*. The sustaining emotions are those that are held all the time regarding the ability. Overall, although writing in English is difficult and challenging, the participants had mainly positive emotions associated with the ability. The feedback emotions function as regulators indicating whether they are performing the ability to their set of personal standards or falling short of them.

Regarding these emotions we found that the participants mentioned that they felt pleasure when they were able to have an article published in English since when doing so, they shared their results with others international scientists. For them, having this feeling of satisfaction when they share their results of a research is a huge recognition. They also mentioned it was a challenge owing to the fact that by the time of publishing their writings they increased their knowledge, they were immersed in a certain international community specialized in their area. As a consequence, they get recognition, they get their work read by other scientists or colleagues and it is the case that at times their work or publications are cited in some other articles. Above all, they belong to a recognized community and as a result they get funding because of the reasons presented earlier.

On the other hand, there are some times that when writing they experience frustration and desperation because they realize things are not working the way they wanted

or just things are not working at all. As a result, they need to look for strategies or specific behaviors that help them to continue writing.

In the next section, some of the strategies NNES scientists use when they are writing will be mentioned.

#### **4.2.3 Strategies**

According to Gordon and Dawes (2005), strategies are a series of collection of certain inner and outer behaviors in order to accomplish specific results when doing particular things. Those strategies depend on the importance of the goal or need in our daily lives. The effectiveness of that strategy will depend on the processes followed to achieve the task. Within strategies, there are two categories: primary and secondary. Gordon and Dawes (2005, p. 73) define the primary strategy as “the set of internal processes and external behaviors that are usually effective in manifesting the Ability”. What Gordon and Dawes refer to Ability is the “whole of the Array”. In other words, the *Ability* is the outcome of the array.

With regards to the primary strategies, we found that NNES scientists use a variety of personal, print, collegial and professional editorial supports. The most used resources for them are online translators, bilingual dictionaries, translation machines, personal editors – presented in no order of importance or frequency because this was not examined as part of the study. As they progress, dependence on those supports fade and they move towards the kind of collegial supports and immersive language experiences typical of more experienced researchers – as they build their funds of knowledge.

Regarding one of the research questions that guided this study was what the different funds of knowledge and discourses that may shape NNES scientists’ writings are when publishing in a second-language-English and concerning this array, we found that the

most of them share the same strategies when publishing in English. The most common strategies are shown in Table 4.5 listed from the most common to the least common.

Table 4.5

*Common Writing Strategies (not presented in any particular order)*

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Most common strategies used when publishing in English.

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1. Help from colleagues or native English speakers
2. Reference to the journals they are intending to publish in
3. A bank of expressions which they reuse
4. Catalogs of useful phrases or technical terms used by experts in previous articles.
5. Similar ideas used by specialist in their area.
6. Article templates reused from their previously published articles
7. Read articles related to the area (using the articles as models for their own writing)
8. Digital guide book to write scientific articles
9. Write the introduction sections last and the results sections first
10. Use Latex software to write because it has a writing editor (and because it is designed for writing scientific texts)
11. Writes in English from the beginning

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What we can see in Table 4.5 that the participants rely on a number of strategies when writing. Some were chosen by more scientists than others; however, they are almost the same in the group. The only difference was that only one participant mentioned that he used a specific digital book that is intended to write specifically scientific articles. We can define these strategies as *funds of knowledge* because they are learned behaviors associated with the cultures and social spaces the researchers operate within. These funds are the result of the accumulation of experience, training, education, social contacts, and knowledge about their own personal needs and behaviors engaged when enacting the ability.

Table 4.6

*Secondary Strategies (presented in no particular order and indicating no frequency of occurrence)*

## Secondary strategies

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1. Erases and starts over again
2. Uses post-it notes to arrange ideas
3. Takes a lot of vacations
4. Just stays at his desk until he can write
5. Disconnects internet connections to avoid the distractions of looking things up and reading emails
6. Goes back to journal articles and looks for phrases and words which he can use
7. Goes for a walk and then comes back to write
8. Works at night in his office. He has a refrigerator with snacks.
9. Uses Spanish to get his idea and then changes it to English (two mentioned this secondary strategy)
10. Takes another look at reviewers comments from previous articles he's written
11. Reads to look for more information
12. Stops writing for a while
13. Works under pressure
14. Plays his saxophone
15. Uses Google Translate
16. (one participant said he has no secondary strategies yet because he felt he hasn't needed them)

The secondary strategies reviewed above so a variety of actions taken when their primary strategies have failed to certain degrees (Fig. 3.2). Like all the data presented these results have not been quantified in terms of frequency of mention because it is beyond the scope of the study. The findings report only the range of strategies mentioned by the participants. Like the primary strategies, these indicate a knowledge of personal working characteristics. The source of this knowledge comes from personal and environmental factors revealed in the narrative interviews. These *funds* are acquired through the spaces the participants have moved in and out of throughout their lives – professional and personal.

### 4.3 Observations

Observations were used in the study to add additional environmental information to the interview data. They took place in the participants' professional community settings, a

location which has some relevance to the participants and to the research questions. The method was distinctive because we approached participants in their own environments rather than having the participants come to us. Generally speaking, we engaged in participant observation which tries to learn what life is like for an insider while remaining, inevitably, an outsider. What we observed in their environments – their offices and work contexts – were their collections of books, their use of technology, and their general work conditions. All the participants had extensive libraries of books – from textbooks to reference books. They also had journals in their field but mainly articles stored electronically. They had access to a variety of journal databases via the university libraries. Most of their professional interactions were carried out via electronic means. They belonged to professional groups and actively read and exchanged ideas within these groups. The groups also gave them access to announcements about conferences, calls for papers, and other events associated with their work.

The observations complete the picture of these participants as they function in their professional environments. What emerges then are a set of actions, beliefs, and dispositions that can be combined leading to a better understanding of what it means to be successful in a professional community which uses English as the common language of communication. We put this picture together in the final chapter.

#### **4.4 The role of theory in the interpretation of the findings**

The theoretical framework established for this study first situated the study within the theories and literature on second language writing specifically related to research writing for publication. Then the other branch of the framework brought in the interrelated theories associated with intertextuality and genre, hybridity, heteroglossia / multivoicedness, Third Space Theory, and the concept of funds of knowledge. From this

framework we found it was possible to investigate various elements via a number of perspectives. In this study *funds of knowledge* were the central focus as seen in the research questions. The other theories created the means to answer the research questions as proposed in 2.2.5 above. Specifically with the narrative interviews we could look at the historical formation of these funds throughout the lives of the participants (as they described them). We could explore the transformation of them as the participants moved from their various contexts (spaces). We could see how they were learned and how those funds were transmitted to the participants, and how they were socially distributed throughout the trajectories of the participants – again as they reported them.

The elicitation array data allow us to explore how these funds are drawn on as the researchers go through their various processes associated with writing and publishing their research in English for publication. And how they are taken up and used in the various social spaces the researchers move in and out of (Fig. 2.1 above).

#### **4.5 Chapter conclusion**

The purpose of this chapter was to present the results of the qualitative data. This involved all the factors NNES scientists experienced by the time of publishing their writings in English. The following chapter will present the implications of the findings, study limitations and study contributions.

## **CHAPTER V: CONCLUSIONS**

5.0 Introduction

5.1 Overview of the results

5.2 Research Aims

5.2.1 Accomplishments

5.3 Significance of the findings

5.4 Limitations of the present study

5.5 Possibilities for further research

5.6 Final Comments

## **5.0 Chapter introduction**

In this chapter, I present my final discussion with respect to the outcomes obtained from this study. As mentioned in previous chapters, this analysis was guided by the completion of the research aims established in Chapter I. Thus in this final chapter, a short discussion of the significance of this study is presented and a summary of the answers to the research questions is provided. Along with these elements, in closing the study the study limitations, suggestions for further research and closing remarks are also included in this chapter. I close this chapter with some suggestions based on the results of this thesis and some final comments principally describing the experience of conducting this research.

## **5.1 Overview of the results**

As mentioned in the previous chapter, the results of this study describe the different funds of knowledge that may shape NNES scientists' writings when publishing in a second language and the way they bring this knowledge to support their writings. As a general conclusion, the findings obtained in this study determine different elements such as personal factors, especially the ones associated with personality; environmental elements and behavior as the most important factors that influence in their current literacy practices as elicited in the narrative interviews. After obtaining those results from this analysis, there is clear evidence that according to the factors mentioned previously as well as the strategies used by the NNES scientists, they share some of the funds of knowledge when publishing in a second language, in this case, English as presented further on.

## **5.2 Research Aims**

For this study, there were two research aims. The first one was to analyze the different funds of knowledge and discourses may shape the study group NNES scientists'

writings when publishing in a second language. The second research aim was related to exploring the way this knowledge and discourse is used to support writing and publishing scientific articles.

### **5.2.1 Accomplishments**

The first research question<sup>6</sup>, had the purpose of identifying the different funds of knowledge that may shape NNES scientists' writings when publishing in a second language. In this section, it is important to state that participants were not trained in advance to write a life story interview; the main purpose of these interviews was to elicit deeper layers of the narrator's identity in order to achieve the aim. In order to achieve the aims, the findings present how these factors which were instrumental in constructing the participants' funds of knowledge<sup>7</sup> came into play in three stages of the participants' lives: childhood, adolescence and adulthood. In childhood, the participants mentioned that during this stage, they had role models to follow regarding educational factors, which most of the times were older siblings. Most of them shared that they came from humble origins; therefore, their parents received little formal education. As a result, their parents insisted that a way to improve their children's lives was receiving formal education and teaching them positive work habits.

During the adolescence, participants pointed out that influential role models as the main response; contrary to the prior stage, these roles models were associated with schools, especially with teachers that inspired them. Participants also began to construct their

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<sup>6</sup> RQ1 What are the different funds of knowledge and discourse that may shape NNES scientists' writings when publishing in a second language?

<sup>7</sup> It is probably useful to just reiterate at this point that an individual's funds of knowledge are the tools acquired throughout life as third spaces - which are hybrid spaces - are entered and exited as a person moves through life. Those spaces and the characteristics of them form the basis of the development of funds of knowledge which are then mobilized in the myriad of situations that we find ourselves in throughout life (as discussed in CH2).

academic and personal identities; that is to say, they started to identify others like themselves with similar interests and aptitudes, which gave them the opportunity to create educational opportunities and the beginning of professional networks preserved until adult levels.

Since they began working in their areas in the earlier stage, finally in adulthood, they strengthened established networks and actively formed new ones, which allowed them to become immersed in their fields and led to opportunities on international levels. Since in this stage they published their first articles in English, it also provided us with information that many of them realized the need of communicating in English, writing as well as speaking. As a result they started to use their “*funds of knowledge*” to write and publish their articles.

Regarding the experiential factors, data obtained helped us to answer RQ2<sup>8</sup>. Within this information, we found, in summary, they use a variety of personal, print digital, collegial, and professional editorial supports. They also relied on many personal strategies which according to the theories presented in Chapter II arose as funds of knowledge resulting from their life experiences.

NNES scientists’ funds of knowledge and discourses are, to mention a few main ones:

- A bank of expressions, catalogs of useful phrases or technical terms used by experts in previous articles.
- Similar ideas used by specialists in the area.
- Articles related to the area (information such as phrases, expressions, terms)
- Digital guide book to write scientific articles (phrases to introduce or present ideas).

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<sup>8</sup> RQ2 How do NNES scientists bring this knowledge and discourse to support their writings?

- Personal secondary strategies as reported in Table 4.6.

Among the beliefs and emotions they mentioned were intrinsic and extrinsic motivation. The first one was related to sharing their research results with colleagues. They stated that by publishing their articles they increase their knowledge and a very important point, their work cited by some other researchers of their field is a very large accomplishment. Regarding the extrinsic motivation, they get funding from institutions as well as recognition and the most salient response was that as they are immersed in research; they are also immersed in an international community of their field of study.

### **5.3 Significance of the findings**

As mentioned in Chapter I, the Third Space Theory stated by Homi Bhabha (2009) is recent in a way; however, there have been some researchers who have worked with it recently in the educational field. As a consequence, very little research about the Third Space Theory has been carried out in this particular area; therefore, not too many studies about this recent theory have been published. It has not been widely used to describe L2 English writing in the sciences. Thus, this study has sought to begin to fill that gap.

In terms of the framework for understanding the sources and use of funds of knowledge of the participants, thus, we can reiterate the role of the theories in this study. After a discussion of the current relevant concepts associated with L2 English science writing, we turned our attention to setting up a framework based on the notions of: i) *intertextuality & genre*, ii) *hybridity*, iii) *heteroglossia / multivoicedness*, iv) *Third Space Theory*, and the concept of *funds of knowledge*. The purpose was to try to understand the funds of knowledge (see particularly 2.2.5, ¶2) held and used by the study participants. As

constructed in Chapter 2 (2.2), the first four theoretical areas work together as an interrelated set of concepts that attempt to explain the sources for the acquisition of the funds of knowledge.

#### **5.4 Limitations of the present study**

Like all research this study presented some limitations. The first one was the number of NNES scientists interviewed. It is clear that a larger group of participants would lead richer findings and conclusions. In addition, I strongly believe that this study was also limited by a lack of experience as an interviewer by one of the researchers using the Elicitation Interview Protocol. The protocol requires a certain level of dedication and effort on the part of the interviewer. It may not be the most appropriate method for novice researchers. The places in which some participants were interviewed also contributed to not carrying out the interview as expected because of interference and distractions associated with the locations.

#### **5.5 Possibilities for further research**

Related to the above limitations, there are ways in which this study could be complemented in the future. The first step to take into consideration is to increase the number of NNES scientists with a larger sample. This would result in bringing a wider view about the topic. A second recommendation is that interviewers must be familiarized with the type of protocol to be used during the interviews and if possible pilot it extensively previously so by the time they interview participants, the data obtained is more accurate. And, clearly interview locations should be free of other distractions as much as possible, but this is sometimes very hard to control.

## **5.6 Final comments**

First, it is important to mention that this study is a product of the cooperation between a supervisor and a supervisee. Therefore, findings emerged from this study represent a collaborative work. While, this type of collaborative work may not be characteristic of the arts and humanities or even the social sciences, it is typical of the type of collaboration found in the hard sciences (Trowler, 2008). It is interesting that a study situated in the former mentioned disciplines looking at a field in the latter disciplines follows a research characteristic of the latter. Nevertheless, I strongly believe that this research achieved the aims of the study and in spite of the limitations; it approached the topic from a novel theoretical perspective that can be a source for new lines of investigation leading to further understandings of this important topic.

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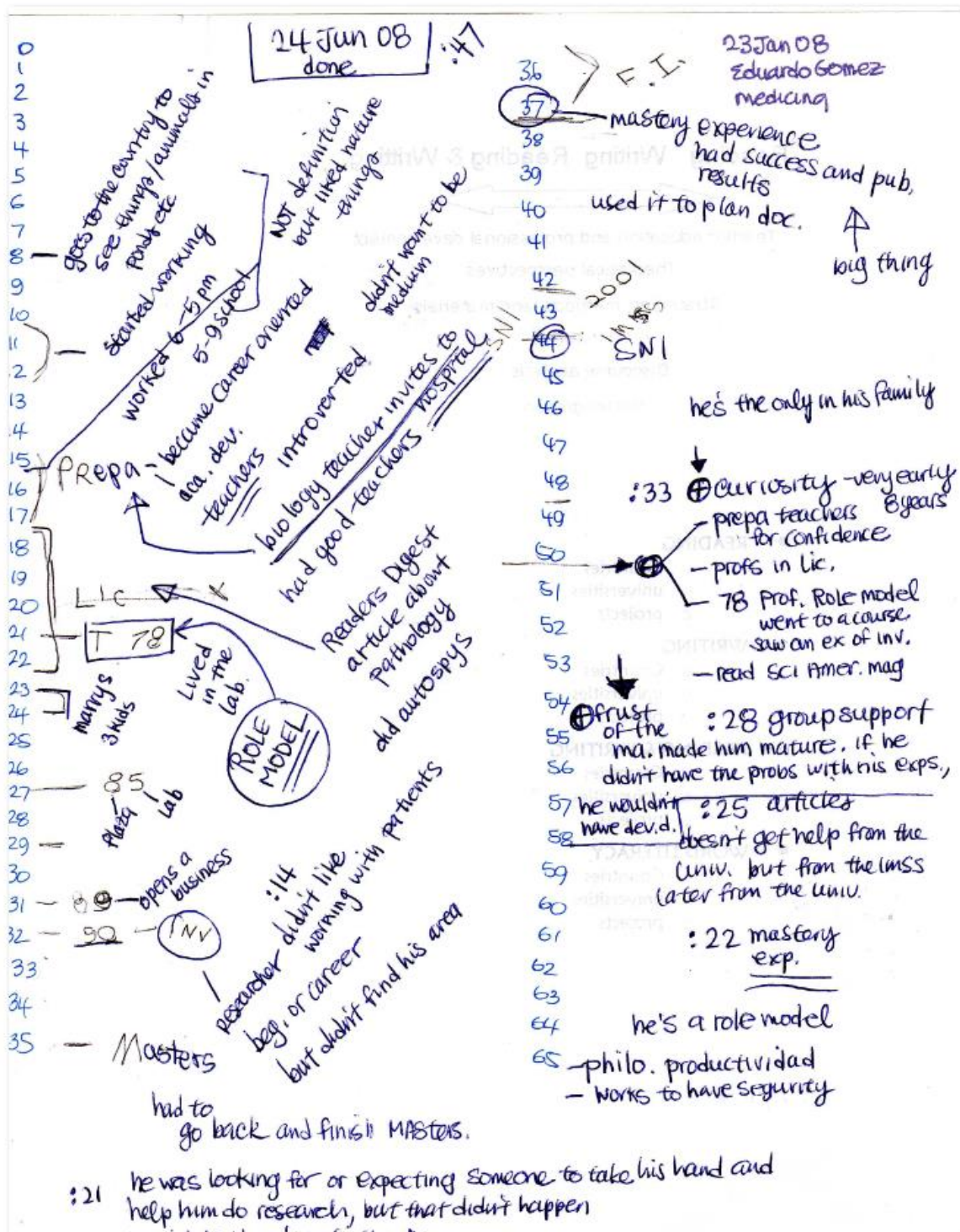
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# APPENDIXES

## APPENDIX A – NARRATIVE INTERVIEW PROTOCOL & EXAMPLE



**APPENDIX B – TRANSCRIPT EXTRACT (2 OF 19 PAGES) NARRATIVE  
INTERVIEW**

**TRANSCRIPCION** [REDACTED]

N.-VOY A GRABARLOS, ESTA BIEN?

I.- ESTA BIEN, ES MEJOR DICEN UNA COSAS DE ESTAS, QUE UNA MEMORIA FOTOGRAFICA. 15 INICIO SECUNDARIA, 18 FUI A LA PREPA, INICIO CARRERA 24 FUI DE CARRERA, INICIO MAESTRIA, ME CASE, FUI A LA MAESTRIA, INICIE DOCTORADO, DE 33 FUI DOCTORADO. BUENO ESA ES LA PARTE ACADEMICA, SOLAMENTE ESTA PARA MI ES MUY IMPORTANTE PORQUE YO TUVE LA FORTUNA DE TENER UN PROFESOR DE PRIMARIA QUE SE LE OCURRIO UNA IDEA QUE AHORA PARA MI ES GENIAL Y ERA QUE NOS LLEVARA COMO NIÑOS AL INAOE INSTITUTO NACIONAL DE ASTROFISICA CULTURA Y ELECTRONICA A UNA VISITA A ESE LUGAR QUE EN ESA EPOCA ERA EL OBSERVATORIO DE TONANZINTLA Y ENTONCES YO VI LA PRIMERA VEZ ATRAVES DE UN TELESCOPIO LAS LUNAS DE JUPITER Y ENTONCES YO EN ESA EPOCA FUE CUANDO ME PREGUNTABA SI SE PODIA VIVIR DE SER ASTRONOMO Y REULTA QUE SI

N.-A LOS 12 AÑOS

I.- SI, JUSTO DIGAMOS QUE PARA MI ES POR ESO PARA MI ES COMO MUY MEMORABLE PORQUE COMO LO HAGO AHORA ESTO DE LA OBSERVACION ATRAVES DE UN TELESCOPIO ES UNA EXPERIENCIA VIVENCIAL PUEDO VER LO QUE SEA..FOTOS MARAVILLOSAS EN LA RED, EN LA TELE O EN LO QUE SEA PERO UNO PROPIAMENTE VER ALGO ATRAVES DE UN TELESCOPIO SOBRE TODO COSAS COMO LA LUNA JUPITER, SATURNO, LO QUE SEA YO CREO QUE LE CAMBIAN UN POCO LA VIDA ES UNO NO SE SI SENSIBLE O QUE DEMONIOS PERO EN ESE MOMENTO YO ME INCLINE POR DEDICARME ESTO DE LA ASTRONOMIA Y YA TODO LO DEMAS ES CONSEC UENCIA DE ESO

N.-

I.-POR EJEMPLO ESTO ES LA PARTE DIGAMOS ACADEMICA, LUEGO CUANDO EMPECE A TRABAJAR AQUÍ, CUANDO EMPECE LA MAESTRIA YO EMPECE A TRABAJAR AQUÍ DE AUXILIAR DE LABORATORIO ENTONCES TENIA LA OPORTUNIDAD DE ESTUDIA R Y TRABAJAR EN LOS LABORATORIO DE AQUÍ A MI ME HA GUSTADO MUCHO SIEMPRE METER LAS MANOS EN LAS COSAS Y TAMBIEN TODA LA PARTE QUE YO HE HECHO HA SIDO ORIENTADA HACIA LA PARTE EXPERIMENTAL

N.-ES ESE LABORATORIO DE QUE?

I.-EMPECE A TRABAJAR EN LOS LABORATORIOS, COMO AUXILIAR DE LABORATORIO

N.-EN QUE AREA?

I.-EN LAS CUATRO QUE ERAN MECANICA, CALOR, ONDAS Y FLUIDOS Y OPTICA Y APARTE FUI JEFE DE L TALLER MECANICO, EN ESA EPOCA AQUÍ EN LA FACULTAD NO HABIA CASI EQUIPO COMPRADO, ENTONCES UNO TENIA QUE DISEÑAR Y CONSTRUIR MUCHOS PROTOTIPOS DE EQUIPO PARA HACER PRACTICAS EN LOS LABORATORIOS ENTONCES EL TENER ACCESO AL TALLER MECANICO, IMPLICABA QUE TENIAMOS QUE HACER MUCHAS COSITAS, ERA DIVERTIDO

N.-MAS O MENOS QUE AÑO ES ESE?

I.-ESTOS ES MAS O MENOS EN EL 86,87, 1987, ENTONCES TODAVIA LA FACULTAD NO ESTABA TAN FAVORECIDA POR LOS PROGRAMAS ESTOS DE APOYO INSTITUCIONAL, ERA MUCHO MAS LIMITADA EN RECURSOS, LOS LABORATORIOS ERAN MENOS Y ADEMAS NO HABIA EQUIPO ADEMAS TAMPOCO HABIA TODAS LAS FACILIDADES ELECTRONICAS QUE HAY AHORA, TODAVIA NO ERAN TAN POPULARES, ERA DE DIFICIL ACCESO. BUENO, QUE MAS PUEDO DECIR DE ESTA MARAVILLA? POR EJEMPLO UNA PARTE Q NO ES MUY INTERESANTE, BUENO ES QUE EN EL DOCTORADO SIEMPRE ESTUVE CASI AFUERA PERO LA PARTE DEL POST DOCT ES INTERESANTE PORQUE.... CAMBIE DE AREA

N.-OHH

I.- HICE MI DOCTORADO EN ASTROFISICA OBSERVACIONAL, ESPECTROSCOPIA Y EN EL POSDOCT, CUANDO ME INTREGRO DE NUEVO EN LA XFM, REGRESO EN EL 98

N.-Y EL DOCTORADO ESTABA EN EL INSTITUTO?

I.-SI LO QUE PASA ES QUE YO SOY EL SEGUNDO DOCTORADO DE AHI, Y ENTONCES..EHH.. JUSTO DIGAMOS POR CUESTIONES UN POCO DE PRESTIGIO, QUE LES INTERESABA A ELLOS MANTENER U OBTENER. IR GENERANDO UNA ESPECIE DE PRESTIGIO SOLO HABIA DOS LUGARES EN DONDE OBTENER EL DOCTORADO DE ASTROFISCA EN MEXICO, AHORA HAY MAS AHORA HAY CUATRO...CINCO, PERO EN ESA EPOCA SOLO ERA EL INSTITUTO DE ASTRONOMIA DE LA UNAM Y EL INSTITUTO EL INAOE, Y ENTONCES A TODOS LOS QUE HICIMOS EL DOCTORADO EN ESA EPOCA, DIGAMOS EN LOS PRIMEROS CINCO PASAMOS MUCHO TIEMPO EN EL EXTRANJERO..ENTONCES ADEMAS SIEMPRE TENIAMOS DOS ASESORES UNO INTERNO Y UNO INTERNACIONAL Y ENTONCES MI ASESOR INTERNACIONAL ERA ITALIANO ENTONCES YO CASI SIEMPRE ESTUVE EN ITALIA, BUENO EN EUROPA Y PARA GARANTIZAR QUE NO SE QUEDE, TENIAS QUE SALIR

NO SE COMO ENTONCES CUANDO ME REINTREGRO A LA FACULTAD LO MAS PARECIDO A LO QUE YO HACIA ERA LA FISICA DE RAYOS COSMICOS O ASTROPARTICULAS, ENTONCES CAMBIE DE AREA DE AQUÍ DE ASTROFISICA A FISICA DE RAYOS COSMICOS. Y ENTONCES EN LUGAR DE ANDAR EN EUROPA ME FUI A ARGENTINA, ALLA, ESTUVE EN SERVICIO EN EUROPA ORIENTAL SOBRE FISICA DE RAYOS COSMICOS Y DIGAMOS ME RESULTO BASTANTE MAS SIMPLE PORQUE YA TENIA COMO QUE LA DIGAMOS ADAPTACION A LA SOCIEDAD DE POR ALLA Y YA ENTONCES AQUÍ CON MIS AMIGOTES RESULTA QUE, AQUÍ EN LA FACULTAD, EL AREA MAS DESARROLLADA EN CUANTO A LA FISICA ERA LA FISICA DE ALTAS ENERGIAS Y ENTONCES JUSTO TAMBIEN EN ESA EPOCA, HAY UN GRAN ESTANCAMIENTO EN LA FISICA DE ALTAS ENERGIAS, FEROLAC TIENE MUCHOS PROBLEMAS Y EMPIEZA A RETRASAR EXPERIMENTOS Y ENTONCES LAS PERSONAS QUE SE DEDICABAN A LA FISICA DE PARTICULAS ELEMENTALES, NOS MOVEMOS HACIA LA FISICA DE RAYOS COSMICOS QUE ES UNA MEZCLA ENTRE FISICA DE PARTICUILAS ELEMENTALES EXPERIMENTAL Y ASTROFISICA ENTONCES ES COMO EMPEZAMOS A CONVIVIR LOS FISICOS Y ESA DIGAMOS CONVIVENCIA HA YO CREO QUE FRUCTIFICADO HASTA LA FECHA, SEGUIMOS TRABAJANDO JUNTOS. QUE MAS PODRE DECIR...POR EJEMPLO UNA COSA QUE ME PARECE INTERESANTE ES QUE TAMBIEN ACA, CUANDO REGRESE A TRABAJAR, DI MI PRIMER CURSO DE ASTROFISICA GENERAL I Y II, PORQUE PARA MI ES IMPORTANTE ESO? PORQUE CUANDO YO REGRESE DEL POSDOC, MI PRIMER ALUMNO SE ESTABA DOCTORANDO DESPUES DE QUE YO LE DI UN CURSO AQUÍ, EL TERMINO SU LICENCIATURA, SE FUE A HACER SU MAESTRIA Y CUANDO YO REGRESE EL SE ESTABA DOCTORANDO, SE FUE A DOCTORAR A CHILE Y ENTONCES, DIGAMOS A MI UNA DE LAS COSAS QUE MAS ME HA MOTIVADO PARA ESTAR EN LA UNIVERSIDAD, ES JUSTAMENTE QUE CUANDO YO EMPECE NO HABIA ASTRONOMOS DE LA UNIVERSIDAD Y ENTONCES SIEMPRE ME HA

## **APPENDIX C – COMPLETED ARRAY**

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