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WRITING IN ENGLISH FOR PUBLICATION: 7 SCIENTISTS' IMMERSION PROCESSES IN THEIR PROFESSIONAL COMMUNITY

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ABSTRACT

This thesis reports on a collective case study that sought to shed light on the seven scientists' immersion processes as they moved from the periphery to the center of their professional community. It also addresses the strategies and challenges they undertook when writing scientific articles in English for publication purposes. The study was carried out at a large public university in central Mexico in the faculties of physics and mathematics.

Its primary aim was to understand the immersion processes followed by seven scientists when moving from the periphery to the center of their community of practice. It also sought to understand the different strategies and writing processes participants use to successfully achieve publication in English. Research main data were collected via interviews. Participants' curricula vitae were also used as a secondary source of data. Most of this research is based on the theory of *Communities of Practice* (Wenger, 1998), and inspired by the work of Bazerman *et al.,* 2012. Other scholars (e.g. Flowerdew, 1999, 200, 2001) have addressed the issue of writing strategies used to write for publication through the lens of English native speakers. This study addresses the same issue from the perspective of seven non-native English-speaking scientists.

The research findings reveal that social relationships among members of a community of practice are key to the immersion process, but also to the improvement of their English skills when in touch with native speakers of the language. Research data also indicates that social relationships promote teamwork resulting in the creation of networks. Networks are means that participants use for different purposes, such as proofreading manuscripts, improving their English mastery and remaining up-to-date with colleagues around the world.

Overall, the study has also contributed to the understanding of the stages that exist between the periphery and the center of the community, which might provide its members better knowledge of how it works, and ease the process to the novice members seeking to change their membership.

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This thesis is dedicated to all the people involved in its realization: family, professors, friends, participants and scholars who made it possible.

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Finally, I would like to dedicate this thesis to the participants and scholars. Their time, contributions, and experience were an important part of this project.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER ONE: INTRODUCTION

1.0 Introduction

Scientific knowledge is constantly evolving. People dedicated to science make contributions to this evolution continuously. Therefore, scientists require a means to spread such knowledge around the world. Writing and publishing scientific articles is a useful way to fulfill dissemination and keep information in motion.

English is the language of international science (Tardy, 2004); as such scientific article production is generally written and published in English. This poses a challenge for non-native English-speaking scientists who face science and language related issues while engaged in the writing and publishing process of scientific articles. Writing in English for publication serves two purposes: it maintains knowledge readily available and updated, and it complies with a requisite established by the professional communities.

Scientists belong to different communities according to their science, e.g. physics and mathematics—particular to this study. Within those communities, scientists can be deemed as peripheral or central members of the community (Wenger, 1998). Members interact with other members thus establishing social relationships within the community, which ultimately results in the creation of networks.

Writing and publishing in English is a requisite for physicists and mathematicians; however, it is more than a requisite: it is a challenge for those scientists whose mother tongue is not English. Although writing and publishing scientific articles in English is a demanding enterprise for non-native English-speaking scientists, it is also possible.

CHAPTER ONE: INTRODUCTION

This study is concerned with the immersion processes of seven core members of two scientific communities (physics and mathematics) seeking publication in English as they moved from the periphery to the center of their respective communities. The study also addresses the resources employed by its participants to achieve scientific writing and publishing. For this particular cohort, writing and publishing scientific articles in English was an essential requirement in order to gradually change their membership status from peripheral to central.

Writing and publishing scientific articles in English, in addition to a number of other academic and professional requisites, allow members of the community to move closer to its center. People in the center of the community are considered 'expert members', while individuals seeking entry into this area are deemed as 'peripheral members'. Despite the importance of writing and publishing in English for the development of scientific academic careers, it is not an easy enterprise for non-native speaking scientists. The number of scientists whose mother tongue is other than English who can actually write and publish in the language is limited and the strategies they use to successfully do so are unexplored.

By knowing and understanding what and how these scientists do in order to successfully manage to write and publish scientific articles in English might be of great aid to those less-experienced scientists wishing to enter, and evolve in the community; thus reaching 'core' membership. Insights into the different resources these scientists use might ease the evolution process within a professional community of practice. Additionally, deeper understanding of the participants' immersion processes and writing strategies can help in intervention and education programs for novice or emergent scientists.

CHAPTER ONE: INTRODUCTION

1.1 Justification

The theme of this research is what participants of the study do in order to write and publish scientific articles in English and how they do it as they become immersed into the community. Wenger (1998) states that in every community there are members who are in the center, those at the periphery, and those located between the periphery and the center. The former are experienced researchers who have succeeded in becoming experts in their community; while the latter struggle to achieve the core of the community. Moving toward its center demands members to do research, be full-time working teachers, give lectures, advise graduate and undergraduate students' theses projects, English mastery and to publish scientific articles—among other professional requisites.

Understanding successful, at-the-center non-native speaking scientists' cognitive and physical processes associated with writing and publishing in English, might benefit novice members' production of scientific papers as strategies and techniques described by core members of the community become available. Thus, this study sought to shed light on the immersion processes that successful non-native English-speaking scientists followed when attempting to write and publish scientific articles in English.

To explore this topic, the nature of the research methodology is qualitative. Richards (2003) lists three grounds for adopting a qualitative approach: first; qualitative research is used to explore the complexities of the social world we live in; second, it is a person-centered enterprise; third, the investigation impacts on the person doing it and may have profound effects upon them.

Data collection for the current study took place in the physics and mathematics department of a public university in central Mexico. The participants

were seven scientists who are part of the *Sistema Nacional de Investigadores* (SNI). These seven participants held SNI levels two and three—there are three SNI categories, the third being the highest.

The starting point of this scholarly work was my first experience as transcriber. I was in charge of doing interview transcriptions of an actual research project being carried out at the time. During this process, I realized many of the resources being employed by the interviewees when writing and publishing in English. I was immediately attracted to investigate further on the various means used to address the challenges of writing and publishing in English by non-native speaking scientists.

1.2 Significance of the study

It is hoped that findings from this research project might contribute to a deeper understanding of the different resources scientists used to face the challenges of writing and publishing scientific articles in English. This information might benefit graduate and undergraduate students and scientists, who have a peripheral role within their community, to eventually achieve its center. Exploiting the same resources as successful, at-the-center scientists, from an early stage of their professional development might increase their opportunities to accomplish writing and publishing in English leading to the gradual achievement of the center of the community.

Although the resulting findings are exclusive to the local context where the investigation occurred, they might also be useful to the wider non-native English-speaking scientific community and in different areas of human knowledge where writing and publishing in English is mandatory.

1.3 Context of the study

There are a number of studies that have attempted to portray the processes that successful people, in this particular case, writers, followed when they become involved in the enterprise of writing (e.g., Belcher 2007; Buckingham 2008; Curry & Lillis 2004; Flowerdew, 1999, 2000, 2001; Hartley et al 2007; Okamura, 2006). The aims of these studies have been to shed further light in the topic so non-native English-speaking individuals have greater possibilities to participate fully in their disciplines through writing and publishing scientific articles in English and by having access to the resources employed by successful, non-native scientists. The studies previously mentioned have taken place mainly in contexts where English is the mother tongue; therefore, research on scientists' speakers of other languages seeking to write and publish in English has received little attention (Englander, 2006).

This research project shares the same major goal as the ones above, to explore strategies and techniques successful writers use so that less successful individuals can apply the same resources for their own benefit, thus increasing both: their possibilities of successful writing and publishing scientific articles in English and their possibilities of accomplishing the center of the community. Furthermore, this study could also support English teachers who are working in these academic contexts.

The following are the areas of research related to this project: communities of practice, legitimate peripheral participation, activity theory, and networking.

1.4 Background of the researcher

As stated before, I, at the time of this study, was the transcriber of a series of interviews related to an ongoing research project conducted in the same location—a university in central Mexico. This larger project also dealt with immersion processes, although from a different perspective. Whilst transcribing the interviews I was able to

identify some of the different techniques and strategies associated with writing and publishing in English that the participants of the study mentioned. I could realize that most of them relied namely on human resources as tools that eased the realization of their undertaking. Some of the participants acknowledged having only a basic command of the language; yet, they managed the consummation of a number of articles written and published in English in various international journals and magazines.

A desire of knowing, very much, how these participants performed this was a major appealing feature that led me to the selection of this as the topic for my thesis research project.

1.5 Research location

Data collection took place at the physics and mathematics faculties of a large, public university situated in central Mexico. These faculties are considered among the best in the country (regarding these two areas) due to their high academic level and research productivity. Having a superior academic quality requires a highly experienced staff; thus, most of the staff members are SNI members.

The participants in this study were SNI researchers; they were also full-time professors, graduate and undergraduate theses advisors, and authors and co-authors of international articles—among other characteristics. As a result of these features, the participants were located at the center of their respective scientific communities.

1.6 Aims

Taking into consideration the above discussion, this study aimed, namely, to shed light on the immersion processes and resources employed by successful, at-the-center, non-native English-speaking scientists when pursuing writing and publishing scientific articles. Thus, the principle aims of this research study were:

- To provide information about participants' background, considering their formative years in terms of education—early and professional—and English instruction.
- To analyze the insights of these at-the-center members of a community of practice in order to understand the resources they used when writing and publishing in English.
- To identify the writing and general strategies that contribute to the overall immersion processes.

1.7 Research questions

Therefore, the current research study sought to answer the following three questions:

RQ1 Who are these successful scientists who publish in English?

RQ2 What stages did these experienced researchers identify in their immersion processes as contributing to become experts in their field in this setting?

RQ3 What specific writing and publishing strategies appear to ease the immersion processes?

1.8 Chapter summary

The purpose of this chapter was to provide an overview of the current research project. In broad terms, its focus is on the immersion processes (what they do, and how they do it) that members of a specific scientific community followed when successfully writing and publishing in English—as they advanced from one stage to the next in their community, to eventually reach its center.

The following chapter presents the theoretical framework for attempting to understand the processes followed by the participants of the study.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter seeks to establish the grounds upon which the present research is constructed. In doing so, I cover two purposes: the first is to illustrate the transition from the periphery to the center that a group of scientists undergo during their professional development throughout their career—as part of a discourse community; the second purpose, is to explore literature and report studies that have contributed to the understanding of how non-native English speakers deal with the enterprise of writing in a language other than their own.

As previously stated in Chapter One the participants of this study were mathematicians and physicists whose professional trajectory at the time of the study was vast and who were renown within their field of work – some internationally and some at national levels. These scientists sought to make contributions to their respective areas of knowledge by disseminating their work to national and international colleagues. Sharing their research to the international academia might not be necessary for all scientists; yet, it is so for this specific cohort. Being able to communicate in a foreign language, in this case, English, demands expertise not only at a professional and scientific level, but also at a linguist one (Bazerman, Keranen, & Encinas, 2012). A more in-depth view of the difficulties non-native English-speaking scientists faced when attempting to compose and publish in English is presented in the second part of this chapter.

I now turn to develop the first part of this chapter by presenting a view of the concepts that frame this research project, starting with the belief that the action of learning is socially generated.

2.1 Learning is socially constructed

Historically, learning has been thought of as an individual process. It has also been considered as an endeavor that has a beginning and an end, and that in order to be acquired it is best separated from other activities. Within an educational setting, it is viewed as the result of teaching, where knowledge is demonstrated out of context. All these features have played a fundamental role in the perception that learning is "irrelevant, boring, arduous" and that we, humans, "are not really cut out for it" (Wenger, 1998. p.3).

On the other hand, contemporary thought acknowledges learning as a shared process rather than a lonely one. According to Wenger (1998, p. 5), this modern thinking takes into account the notion that "engagement in social practice is the fundamental process by which we [humans] learn and so become who we are".

Other scholars (*e.g.*, Brown & Duguid 1991; Cook & Yanow 1993; Lave & Wenger 1991; Wenger 1998) put forward a "[s]ocial constructivist perspective" where learning takes place and knowledge is created mainly through verbal exchanges and interactions between people (as cited in Lawless, 2008). In the same vein, de Saint-Georges and Filliettaz view learning as "an intrinsically collective and collaborative process" (2008, p. 215). Additionally, they say that while the construction of knowledge and the development of skills are individual in nature, the environment and resources for learning are "social and collective", that is to say, learning occurs in environments shaped by culture (ibid.).

Lave and Wenger (1991) conceived learning as something with deep roots in social contexts and cultural practices, not as a pure process of abstract cognition. Situated learning (Lave & Wenger, 1991) also claims that learning is not an individual activity of acquiring abstract knowledge; learning naturally occurs when a

person is exposed to a particular situation, where the situation is, actually, part of the learning process (Greeno, 1997). Situated learning criticizes the notion that learning is limited to the acquisition of objective knowledge –as some conventional theories suggest. Also, that learning is best achieved when exercised in settings detached from the actual place where such learning will be applied (Lave & Wenger, 1991). In the same tone, Handley, Clark, Fincham and Sturdy propose that:

> In contrast to the cognitivist perspective, situated learning sees learning and knowing as processes which are integral to everyday practice in workplace, family, and other social settings. The focus shifts from decontextualized 'objective' knowledge to the accomplishment of knowing in action and in practice. Thus learning and knowing cannot be separated from everyday practice; furthermore, learning cannot be isolated and then studied as through it were a discrete activity. (2007, p. 174)

Thought of as a situated activity, learning posses a central defining characteristic, a process Lave and Wenger (1991) call "legitimate peripheral participation". From this view, the legitimacy of participation is described as "a defining characteristic of ways of belonging, a crucial condition for learning and a constitutive element of its content" (Lawless, 2008, p. 119). Peripheral participation positions members "in the social world and draws attention to changes in actors' learning trajectories, developing identities and forms of membership" (ibid.).

As stated before, learning is best acquired when individuals engage in active practices that occur in their natural environment. Activity theory (Engeström, 1999) sees practice as an object-oriented activity. Practice, from this theoretical perspective, is the everyday activities that we, as individuals, engage in. It is by means of such activities that "consciousness and social and material reality are transformed and

changed" (Arnseth, 2008, p. 293). According to Lave and Wenger (1991, p. 35) "learning is not merely situated in practice…learning is an integral part of generative social practice in the lived-in world". Lave and Wenger also state that the environment where practice takes place is the site where the action is, and where communities are continually produced and reproduced. According to activity theory, object-oriented activities provide humans with a way of characterizing what the activities are directed at, in other words, the purpose of a given activity. Based on the above, one might say that learning occurs when practice takes place in settings that are meaningful to individuals and inherent to where specific knowledge is required.

Despite the fact that learning has been seen through the lens of different conceptualizations, it cannot be separated from human activity, or from the environment where it naturally occurs. Through time, academics have developed and proposed theories placing learning at the very heart of social activities making it hard to be conceived out of this setting. Humans are social in nature. It is our social characteristics that allow us to gather in large groups, which, in turn, have allowed us to generate, share and keep knowledge alive and transformed throughout our existence.

The following section deals with a concept that serves as the fundamental component of this research project. Such concept merges our social features and our capacity to learn in environments known as communities of practice. According to Brown & Duguid, 1991, learning from this perspective essentially involves "becoming an *insider*, acquiring that community's subjective viewpoint and learning to speak its language" (cited in Lawless, 2008, p. 118).

2.2 Communities of Practice

Individuals tend to get together thus forming groups. People living in the same place and having particular characteristics in common—such as carrying out activities in everyday life, in the workplace and in education (Barton & Tusting, 2005)— are considered a community. Translating this idea to the scientific field we find that scientists united by "mutual engagement", "a joint enterprise" and "a shared repertoire" are deemed as a "community of practice" (Wenger, 1998, p. 15). These three features constitute a community of practice where members interact with each other in different ways (mutual engagement), share a common endeavor (joint enterprise) and develop a shared repertoire, which Barton and Tusting (2005, p. 2) understand as "common resources of language, styles and routines by means of which they express their identities as members of the group". Wenger (1998, p. 6) asserts that:

> We all belong to communities of practice. At home, at work, at school…[c]ommunities of practice are an integral part of our daily lives. Yet, if we care to consider our own life from that perspective for a moment, we can all construct a fairly good picture of the communities of practice we belong to now, those we belonged to in the past, and those we would like to belong to in the future.

Yet, the concept is not limited to the various activities carried out in the community, it also considers the setting where this activity takes place, such as buildings and locations, as these present valuable social aspects of the practice (Lee & Roth, 2003).

Being part of a given community confers the condition of being a member. There are two main kinds of members: "core" and "peripheral" (Wenger, 1998). Core

members are situated at the center of the community while peripheral members are on the part farthest away from its heart. Changing the status from peripheral to core membership within a community is the transition I seek to illustrate, and what from now on I refer to as an *immersion process*. Namely, I attempt to portray the gradual progression by which scientists move from minimum to full participation within their community. Such immersion process might allow "newcomers" (Streitwieser, Light, & Pazos, 2010) to move closer to the center of their community, thus gaining local recognition in their field. Additionally, holding the status of at-the-center members might lead to international acknowledgement by allowing scientists to be part of the "mainstream" academia consequently being considered as researchers of the "inner circle" (Tardy, 2004, p. 248).

In order to acquire the status of "old-timers" (Arnseth, 2008, p. 296) in the community, novice members need to gradually get "acclimated to the practices of the discipline and guided and encouraged to move from the periphery to the heart of the community, where the experts reside" (Streitwieser, Light, & Pazos, 2010, p. 20). Moving from the edge to the center of the community suggests learning from more experienced members. Learning implies participation within the community in order to carry on with its practices and its culture. All these activities take place in a cyclical manner thus assuring the existence of the community by its members.

Among the vast practices new members need to be familiar with is that of sharing their knowledge and contributions to the community. For this to happen it is necessary to do so through publishing among other ways – e.g. giving conferences. With this respect, writing is an ability that proves useful to fulfill this requisite and so have a hand in shaping knowledge of their discipline.

One of the primary foci of this project is to illustrate the process by which some marginal members of a community of scientists move from null to full participation, thus eventually acquiring the status of central members. For this to happen, new members need to go through a series of stages. First, they need to get involved in the every-day activities the community performs and that are unique to it; in other words, they need to participate. Second, new members need to practice the every-day activities that occur within the community. Third, as they move from the margin to the center of the community, they gain a sense of belonging, which is shaped by participation and practice. Four, as new members become more active by participating, practicing and gaining an awareness of belonging, they also mold their identity from peripheral to, eventually, core members of the community. Learning plays an active role throughout the evolution of community members walking hand in hand in each of these stages. Learning within a community does not have an expiration date. As soon as new members are part of it, learning takes place and it does not cease once members reach its center.

The next section presents in more detail each of the stages required to achieve the position of core member within a CoP. It is based on the premise that learning cannot be detached from social environments.

2.2.1 Participation in the community

As previously stated, there are two kinds of membership in a CoP. Namely, members are classified as novices or experts and the level of engagement in the activities of the community varies according to the membership. In terms of participation, however, this broad classification might not be suitable to describe the extent of involvement in the daily activities that each member –regardless their status– performs in the community. There might be individuals who are more

dynamic participants than others in the activities of the community and those who are less. This is especially true for newcomers during the first days in the community when their social relationships are at the minimum. Wenger (1998) says that new members need to seek and even create participatory opportunities so they can be able to increase their degree of engagement in the community, therefore heading to fuller participation.

Participation within a CoP refers to "a process of taking part and also to the relation with others that reflect this process" (Wenger 1998, p. 55). Such relation with others is the interaction between individuals of varying skill levels (Streitwieser, Light & Pazos, 2010). Novice members are persons in the pursuit of expert-member status. Expert members collaborate with novices' immersion process easing their progression to reach fuller participation by playing mentoring roles. Learning activities including novice members are guided and assessed by the more expert members of the community. This perspective of learning focuses on a point made by Dewey: "discovery guided by mentoring rather than on the transmission of information." (cited in Streitwieser, Light & Pazos, 2010, p. 18). Social relationships emerge as the result from the interaction between members of contrastive expertise allowing the immersion process to begin.

In light of the above, participation in the CoP is an activity that involves learning although learning is not limited to acquiring only knowledge *per se*, but also a complex set of activities that might pass on among members without notice—*e.g.* norms, rules, practices, and concepts in which scientific information and skills are embedded (Streitwieser, Light & Pazos, 2010). In other words, newcomers experience an enculturation process, which "simultaneously presupposes individual learners of science and a collective science culture and the interactive mechanisms between the

two" (Hwang & Roth, 2008, p. 353). Learning plays a rather crucial role throughout the whole stage of participation enabling individuals to become more involved in the community. It is by means of learning that newcomers perform new tasks and functions and have new relationships with more experienced members (Lave & Wenger, 1991).

So far I reviewed some of the features that portray participation as a powerful and mediational tool to reach a position closer to the core of the community. However, when participation is peripheral in nature, it might perform two distinct roles. O'Donnell and Tobbell (2007) argue that it can be 'empowering' allowing novices to move towards full participation; or, it can be 'disempowering' preventing individuals to reach full participation (cited in Kim & Merriam, 2010, p. 441). There is no 'shortcut' to accomplishing full participation in a CoP. Moving from peripheral to full participation can only occur by means of engaging in sociocultural practices (Lave & Wenger, 1991). Thus, participation within the community requires members to be actively involved in the execution of its daily practice.

Wenger contends that participation does not only refer to "local events of engagement in certain activities with certain people, but to a more encompassing process of being active participants in the practices of social communities and constructing identities in relation to these communities" (1998, p. 4).

Participation and learning are then an important part in the foundation of the immersion process and cannot be isolated from one another. Barton and Tusting assert: "participation in communities of practice becomes the fundamental process of learning" (2005, p.2). The following section reviews in more depth another significant component in the construction of learning and the immersion process within a community: the concept of practice.

2.2.2 Practice in the community

Stated in simple words, practice might be defined as any human activity. Its nature renders its social component, *ergo*; practice refers to the everyday activities that we, as individuals, engage in. Activity theory (Engeström, 1999) understands practice as an object-oriented activity. Based on this view, every activity has a purpose. Arnseth (2008) illustrates activities and purposes as follows: hunting for food: satisfying the need for food; producing clothes: satisfying the need for income; and writing an exam paper: satisfying the need for good grades. The concept of practice and this analogy suggest that every activity individuals participate in, should have a clear objective or goal in order for those actions to be meaningful to the people who execute them. Activities vary from each other according to their objectives. Hung, Cheng, and Seng (2006) assert that in this sense "when we design for activities within CoPs, we need to articulate clearly the goals of these activities" (p. 303). Considering a CoP context, learning occurs when practice takes place in settings that are meaningful to individuals (members) and inherent to where specific knowledge is required (community). This idea confronts with the view that learning is an individual process that is best achieved when detached from other human activities.

Young (2009) introduces a more complex concept of practice incorporating social and psychological elements that demand more than participation in the daily activities in order to be part of a given community. Practice is the construction and reflection of social realities through actions that invoke identity, ideology, belief, and power. Practice, then, is performance in context. "By context, I mean the network of physical, spatial, temporal, social, interactional, institutional, political, and historical circumstances in which participants do a practice" (Young, 2009, p. 2).

Practice plays a significant role in the immersion process to the community due to its formative nature. At this stage, novice members eventually start to execute the activities characteristic of their community. Practice shapes their 'dispositions and belief systems' that in time will help them feel identified with the community and the profession. It is through practice that newcomers learn the 'how' of the daily activities and, by means of the latter; a sense of identity begins to emerge (Hung *et al.*, 2006). As stated before, expert members carry out tutoring functions preparing novices to approach fuller participation in the community. Although transmission of knowledge might seem to be full members' primarily goal, it is not the only process surrounding novices. Hwang and Roth (2008, p.353) state that enculturation into scientific practices is "a process that simultaneously presupposes individual learners of science and a collective science culture, and the interactive mechanisms between the two".

Wenger maintains that practice is "first and foremost, a process by which we can experience the world and our engagement with it as meaningful" (1998, p. 51). Practice requires engaging with others in the pursuit of a common endeavor. It is through practice that members develop numerous ways to participate in the community including—"ways of thinking, speaking, discourses, tools, understandings and memories which are to a greater or lesser extent shared amongst the members of the community" (Barton & Tusting, 2005, p. 39). Additionally, Wenger (1998) suggests that the main outcome during practice is the negotiation of meaning.

The following section reviews in more detail another necessary component that along with participation, learning and practice facilitates the immersion process into the community: the negotiation of meaning.

2.2.3 Meaning in the community

Participation and practice entitle members to keenly interact with each other at various stages throughout the immersion process creating social bonds. Interaction can occur among individuals of equal or distinct membership and expertise, which, eventually, results in learning. In order for this undertaking to be possible, another element is needed: the negotiation of meaning. Despite being diverse, activities members engage in during their membership within the community might become familiar, yet Wenger states that "a new situation, an impression, an experience" is created producing "meanings that extend, redirect, dismiss, reinterpret, modify or confirm – in a word, negotiate again– the histories of meanings of which they are part. In this sense, living is a constant negotiation of meaning" (1998, pp. 52-53). It is the conjunction of ourselves plus living in the world that give meaning to situations happening around our environment. "'Meaning' is therefore seen as something which arises inevitably from the process of engaging in living" (Barton & Tusting, 2005, p. 37). Wenger (1998) summarizes the concept of negotiation of meaning as "the process by which we experience the world and our engagement in it as meaningful" (p. 53). Wenger (ibid.) suggests that in the negotiation of meaning process in addition to participation another component is necessary: reification.

Reification—the means by which individuals make abstract thoughts, practices, experiences and so forth, more concrete—and participation are closely intertwined, since "[p]articipation in meaning making always implies reifications and vice versa" (Barton & Tusting, 2005, p. 39). Wenger defines reification as "the process of giving form to our experience by producing objects that congeal this experience into 'thingness'" (1998, p. 58). It is participation and reification that allow members of the community to negotiate meaning. As newcomers actively engage in

the daily activities of the community (participation), they gain and increase their experience in the practices performed (reification). That experience eventually becomes knowledge, the sort of knowledge that is passed on from the more to the less experienced members; thus, the more meaningful participation is the more individuals learn.

Participation, learning, practice and the negotiation of meaning converge to give birth to the concluding constituent of the immersion process: identity. The upcoming section deals with identity, another necessary stage to reach the center of the community.

2.2.4 Identity in the community

By means of participating, learning, practicing and negotiating meaning, identity arises as the final stage in the immersion process into the community. During the time that novice individuals participate, learn, practice, and negotiate meaning, they, as well, forge their identity as members of the community. Hung *et al.* maintain that through participation in daily activities "people's behavior or identity changes and, in the process, they become prepared to engage in similar activities in the future. By engaging in meaningful activities, people necessarily would make ongoing contributions, whether in direct actions or in contributing to the understanding of the actions and ideas of others" (2006, p. 301). Identity, then, is to be formed via enculturation mediated through activities in the community. Members of the community "appropriate an identity –a way of seeing or a personal epistemology– through observing and subsequently practising the 'trades' of the community" (ibid). The division of labor (or roles) and tools involved in mediating toward these goals, in turn, assist in shaping the identity of those members who use the tools and perform their roles and functions of the community. That is to say, the tools, the rules and the

roles within the activity system mediate the actions and processes by members in the community. Ultimately, identity contributes to the formation of a sense of belonging to the community allowing members to "engage with one another and thus acknowledge each other as participants" (Wenger, 1998, p. 149).

Working synergistically, these four stages (participation, practice, negotiation of meaning and identity—in conjunction with learning) are the necessary means that allow non-expert members to be part of the community and to gradually move from the periphery to its center. These are the features of the CoP concept that favor the achievement to the center. The figure below represents the necessary elements that allow newcomers to gradually achieve the center of the community.

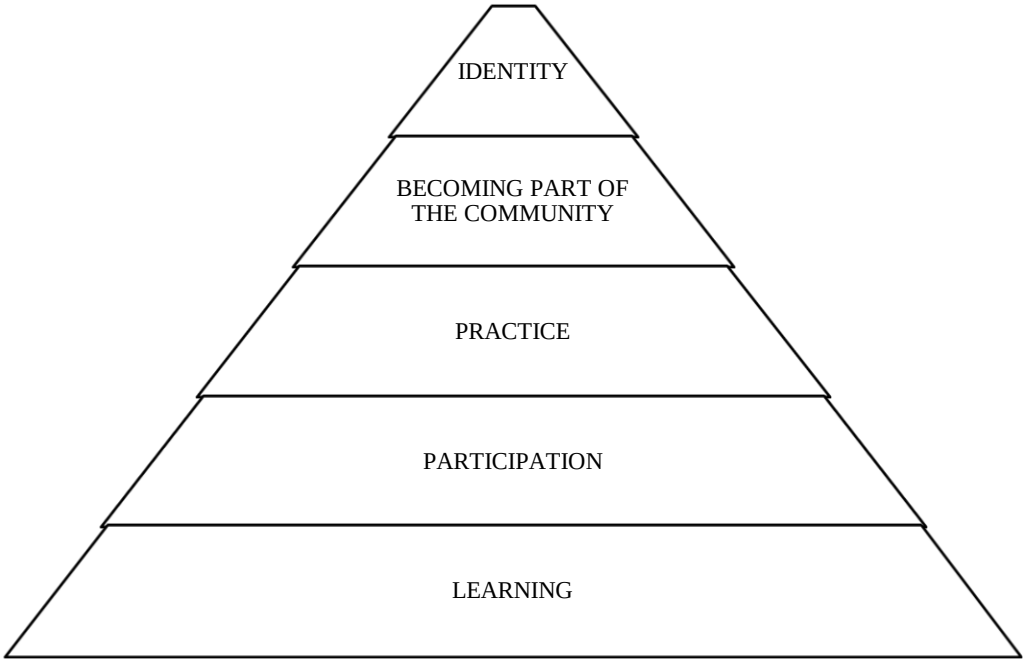

Figure 2.1 Elements that facilitate the immersion process (adapted from Wenger, 1998, p. 5)
Learning is the most significant element that contributes to the immersion process. Learning is present in every stage of the process, from the periphery to the center of the community.

However, the transition from one sort of membership to the other is not uncontentious and members are likely to face difficulties throughout the process. CoPs are not harmonious organisms. There might exist incompatibility of opinions, principals or interests and issues of power relations amongst members. O'Neill (2001)

states that "[i]mplicit in the idea of community are elements of stability and dynamism, continuity and change, shared interests, and ongoing contention of interests" (pp. 224-225). Its social, thus human nature triggers this sort of conflicts within the community. Scholars who have put into practice and analyzed the concept of CoP have found a number of downsides.

Barton and Tusting (2005, p. i) argue that despite this concept has become to some extent influential in education, management and social sciences, it has failed to consider "issues around conflict, power and the significance of the broader social context". Through time, this concept has been applied in numerous areas of knowledge and it has been used in different ways—sometimes it has been modified, some other it has been used as originally formulated. For some scholars it has been the central part of a theory, while others have only incorporated it in their theories, which, in accordance to Barton and Tusting (2005, p. 2) is "probably the fate of any useful concept".

Setting aside eventualities the community might encounter during its existence, I now turn to present an issue that is both the main focus of this research and a pitfall some scientists face: dealing with writing and publishing in a second language.

2.3 English as the international language for dissemination of knowledge

As scientists develop their professional career and struggle throughout the immersion process, ergo becoming part of their scientific community, they need to remain part of it. They do so through various actions such as giving conferences, being full-time teachers, assessing students' thesis projects and, namely, by doing research. However, one of the most demanding means to remain, as part of the scientific community is the dissemination of their current investigation. Sharing their

contemporary work with their international colleagues requires making their information available in a language that all the members of the scientific community understand—English.

In order to achieve participation and recognition in the scientific global arena, members of a CoP need to be able to demonstrate their membership by sharing their work—via publications and talks—with colleagues around the world. For this to happen English language is an indispensable requisite that simplifies communication and diffusion of knowledge, making it, on the one hand, a great tool among these individuals to share their present work. On the other hand, being English not the scientists' mothers tongue requires them to possess knowledge and mastery of the language, which might discourage scientists from sharing their work at an international level. Furthermore, not knowing the language also limits scientists' knowledge of the community's latest interests.

Currently, information is readily available through various means e.g. Internet, books and journals (on-line and printed). Individuals and organizations need access to up-to-date knowledge generated in science around the world. Most knowledge, at least that deemed as state-of-the-art, is presented in English. Tardy (2004) states that English is widely used for international communication and information access hence exercising some sort of domain over other languages. Such situation empowers English as an international language for science (EILS). However, this fact is not uncontentious. Tardy (ibid.) identifies two principal roles of English in science: restrainer or fosterer of information availability. As fosterer, English eases information storage and retrieval (Grabe, 1988 cited in Tardy, 2004), additionally it might provide means for knowledge advancement (Wood, 2001 cited in Tardy, 2004). English in its role as restrainer offers unequal access to information, giving

preferential treatment to English speaking individuals. This situation might be applied to both authors and readers in science, which might hinder the advancement of international science preventing knowledge generated in other languages to come to light soon enough.

English being the international language for science leaves no other choice to members of CoPs but to write and publish their work in English. According to Tardy (ibid.) articles published in English are more commonly cited, consequently gaining prestige and importance worldwide, while those written in other languages are not. Peripheral members of a CoP might also be affected in a number of ways by English language hegemony. First of all, attempts to publish an article in visible journals might fail due to a deficiency of 'key' citations—those in English. Second of all, peripheral members might not achieve recognition when writing on a particular subject related to their CoP, while their central colleagues do achieve recognition developing the same topic.

Successfully writing and publishing articles in English is a vital skill for non-native English-speaking scientists who want to be heard in the international scientific community. A number of studies have attempted to portray the challenges members of a CoP face when writing in English. Such studies have focused on peripheral members of distinct communities and examined the difficulties encountered when trying to compose and publish in English.

The following section provides an overview of various studies exploring the challenges non-native English-speaking scientists confront when attempting to write and publish in a foreign language.

2.3.1 Writing and publishing in the international language

As argued earlier, English mastery is a handy tool for scientists attempting to be heard in their international scientific arenas. Proficiency of the language allows scientists to be up-to-date in terms of their community's current research advancements and interests, to maintain communication with overseas colleagues and, namely, to internationally share their own work through publication in journals; however, composing academic texts—as well as achieving publication—is an arduous task for those scholars who do not belong to the "English-speaking center" (Curry & Lillis, 2004, p. 664).

A number of studies (*e.g.*, Belcher, 2007; Buckingham, 2008; Burrough-Boenisch, 2003; Cargill & O'Connor, 2006; Cumming, 2001; De Larios, Murphy & Manchon, 1999; Englander, 2009; Flowerdew, 1999, 2000, 2001; Hartley *et al.*, 2007; Hyland, 2003; Leki, 2001; Lillis & Curry, 2006; Okamura, 2006) have been conducted considering non-native English-speaking scientists who have managed to successfully write and publish academic texts in the international Anglophone community. Such research has mainly focused on two aspects of the process of having an academic article composed and issued in English: a) the challenges experienced during the writing process, and, b) the limitations experienced in publishing their works. Regarding the challenges experienced, research indicates that the main concern for scientists resides in issues of linguistic nature. As for the limitations, research suggests that the primary difficulty has to do with manuscripts being rejected by journal editors due to lack of native-like language.

Despite whatever deficiency in language these sort of academic texts might have, non-native English-speaking scholars (NNESS) have found ways to succeed

and be heard in the international scientific arena, thus gaining and/or maintaining visibility, presence and membership in the community.

The present study differs from others in the sense that its data gathered comes from a cohort of NNESS that already belong to the center of their community—the studies previously considered focused on difficulties and strategies experienced by scientists looking forward to moving to the center of the community. Additionally, its focus is on the strategies these scientists implement in order to successfully write academic texts in English. Although publication is crucial in the process of sharing scientists' present research, it is not viewed more in-depth due to it is not the main focus of this scholarly work.

2.4 Chapter conclusion

Perspectives about learning have evolved from seeing it as an individual process that could take place out of context, to a process considered most effectively acquired in settings inherent to where specific knowledge is required and intrinsic to social relationships. Starting off with the idea that learning is a social activity, the CoP concept serves to illustrate the immersion process newcomers undertake when entering the community.

A CoP clusters people by common goals. Novices and experts are the two different sorts of memberships within a CoP. Novices struggle to move closer to the center of the community: the place where members with higher expertise congregate and most knowledge is generated. The process of moving from the periphery to the center is what in this study is considered as: immersion process. This idea does not claim that the center is the place where expert members can be found. Neither that novices might learn exclusively from members who are at the center of the community. Learning is an ongoing action and might occur at any point during

immersion among members of equal or unequal expertise. An individual might be acknowledged as expert at a certain stage during the process, yet the same individual might hold a lower status at a different stage. In a few words, the immersion process, as conceived in this project, is to move from the periphery to the heart of the community thus acquiring higher status and fuller participation.

In order to achieve the center of the community novice members need to go through various stages that, in time, would turn into an immersive process. The stages identified in this project are: participation, practice, negotiation of meaning and identity. All four stages are closely associated with learning during the whole process. As new members advance from one stage to the next, they learn, usually from the more expert members —although learning from members of lower or equal status is not out of the equation. As they move away from the periphery and closer to the center of the community, their sort of membership begins to change. While developing, newcomers' degree of participation increases. They become more active participants in the practices and their meaning and identity in the community are shaped. Ever since the time novices are part of the community, throughout the immersion process and to the point of acquiring expert-member status, learning is always present: "[e]ven failing to learn what is expected in a given situation usually involves learning something else instead" Wenger (1998, p. 8).

Newcomers perform a vital function in a CoP. It is by this sort of individual that communities stay alive and knowledge is created and recreated. Novices become expert members, the ones that, in time, would have the tremendous commitment of assuring the continuity of the community by preparing the next generation of newcomers so they could carry out the trades of the community. The time a community might be alive depends on how long members are united by "mutual

engagement, joint enterprise and shared repertoire" (Wenger, 1998, p. 73)—the actual elements that brought it into existence in the first place.

CHAPTER THREE: STUDY METHODOLOGY

3.0 Introduction

This research project is concerned with the immersion processes followed by seven members of a scientific community in central Mexico as their membership evolved from "peripheral" to "core" (Wenger 1998, p. 7). Being closer to the heart of the community involves going through a series of learning stages (Participation, Practice, Becoming part of the community, and Identity – Fig. 2.1) that allows scientists to immerse gradually in the community, thus acquiring membership. According to Englander (2009), identifying themselves as scientists is "enacted and recognized by others through active social practice in which those who are in that community of practice also acknowledge other individuals as members." (p. 35).

Writing and publishing scientific papers in English are forms of active performance of membership in the community. Thus, this study attempted to shed light on two aspects: 1) recognition of the stages of the immersion process in a community of practice; and 2) the different resources these scientists used—what they did and how they did it—to address the challenges of writing and publishing scientific papers in English as they moved toward the center of the community.

Findings from this collective case study (Goddard, 2010) might contribute to a deeper understanding of the immersion processes and the different means participants used to face the challenges of scientific article construction and publication in English. Findings regarding publication might entitle peripheral scientists from diverse areas of knowledge with roles to seek a position closer to center of the community by means of writing and publishing in English.

3.0.1 Research questions

This study was guided by three questions focused on different issues: RQ1 provides information about participants' educational background, RQ2 examines the stages throughout the process of moving from the periphery to the center of the community, and RQ3 identifies participants' resources to achieve writing and publishing scientific articles in English.

This chapter provides a description of the setting where the research took place, the people participating in the study and its rationale, the research methodology upon which this project is based on, the data collection procedure and how its analysis was carried out to provide answers to the research questions. Finally, the chapter concludes with a brief summary and an overview of Chapter Four.

3.1 Context of the research

This research was carried out in a faculty of mathematics and physics of a large, public university in central Mexico. Both departments belong to the *Facultad de Ciencias Físico Matemáticas*. This faculty is characterized by three main features: first, its professional staff—at the time of the study there were 108 teachers, from which 85 held a PhD degree, 66 were recognized by the PROMEP (*Programa de Mejoramiento del Profesorado*) and 61 were current SNI *(Sistema Nacional de Investigadores*) members (personal communication). Second, it had quality academic university programs that offer a diversity of graduate and undergraduate studies—five undergraduate programs, three masters' and two doctoral programs in different areas of specialization. Third, at the time of the study it had a high level of research productivity, which included national and international research projects such as: ALICE-ACORDE and AUGER projects. The *Vicerrectoria de Investigación y Estudios de Posgrado* (VIEP) had financed various research projects for this faculty.

In 2014, this institution invested ten million pesos to fund 411 research projects—its largest investment so far. All these attributes position this faculty as a local, national, and even international icon on research grounds (Agüera, 2011).

3.2 Study participants

Participants in this study were seven full-time professors-researchers. They were selected based on two representative characteristics: 1) they all successfully dealt with writing and publishing in English; 2) they all were SNI members (*Sistema Nacional de Investigadores*). Participants' success in this project is conceived as having actual scientific articles published in international journals and being part of the SNI. Participants in this research were active members of the academic staff above described (3.1) and the SNI. Additionally, all participants were non-native English-speaking scientists.

Participant ID	Nationality	Academic degree	Area of research interest	Directed thesis BA - MA – PhD	SNI level	First publication Year-language	Number of publications
Researcher 1 = R1	Mexican	PhD, Optics	Quantum optics	1 – 1	1	1996 - Spanish	20+
Researcher 2 = R2	Mexican	PhD, Optics	Optics	11 - 17 – 11	2	(Information unavailable)	60+
Researcher 3 = R3	Mexican	PhD, Physics	Particles, fields, general relativity	12 - 10 – 3	2	1999 - Spanish	80+
Researcher 4 = R4	Cuban	PhD, Mathematics	Differential equations, mathematical modeling	10 - 9 - 1 Cuba 10 - 18 - 7 Mexico	2	(Information unavailable)	110+
Researcher 5 = R5	Mexican	PhD, Physics	Optoelectronics, photonics	11 - 13 – 5	1	(Information unavailable)	80+
Researcher 6 = R6	Salvadoran	PhD, Optics	Quantum optics	15 - 21 – 6	1	1991 - Spanish	50+
Researcher 7 = R7	Mexican	PhD, Optics	Optics	14 - 4 – 3	1	1995 - Spanish	25+

Table 3.1 Study participants.

The *Sistema Nacional de Investigadores* (SNI) was created in Mexico in 1984 in order to acknowledge the work of the people who produce scientific knowledge as well as technology. This system contributes to the formation and consolidation of researchers with the highest level of scientific and technological knowledge in order to increase culture, productivity, competitiveness and social well-being. By being

national investigators, scientists are rewarded with economical stimuli that varies according to the level assigned. The SNI levels are designated taking into account the contributions and value of the works made by scientists to the field of specialization. These levels are known as: SNI level one, SNI level two and SNI level three. Participants in this study were all SNI members,

To be part of the SNI, scientists wanting to be recognized as national researchers must comply with the following requirements: a) hold a doctoral degree and have contributed to the area of specialization, b) be actively engaged in innovative research projects and have publications in high impact journals, c) do scientific research activity regularly, d) have a minimum of 20 hours per week to do research at a higher education institution or investigation center—either public or private—, and e) be recognized as an investigation leader in the area of specialization.

A number of requisites need to be covered in order to be a member of the public university faculty staff: a) to be full-time professor and researcher, b) advise BA, MA and doctoral students on the thesis writing process, c) to give conferences, d) to do research regularly and, particularly important to the aims of this project, e) to write and publish academic articles in English.

In order to meet the requirements described above, most participants virtually spent all day in their workplace. Participants were actively engaged performing a number of activities such as: teaching BA, MA and doctoral students, providing feedback to students' theses at different levels, doing research and presenting results, preparing speeches and presentations for conferences, and of course, writing scientific articles and looking for suitable international journals where to publish in English their latest research project findings.

On the one hand, writing and publishing gave participants academic and professional status among colleagues. It also allowed them to move closer to the center of their community. On the other hand, writing and publishing in English facilitated the transition of moving from the periphery to the center of the community, thus allowing participants to change the sort of membership they hold from "peripheral" to "core" members of the scientific community (Wenger, 1998).

Some characteristics I personally find appealing are that only a reduced number of participants have a good command of English and enjoy communicating and expressing themselves in the language while the rest do not. Some reported to have started to study English years after the university. Others stated that they have never liked English. Despite the prior differences in opinion toward the language, participants have managed to successfully deal with the challenges of writing and publishing in English and have a number of articles in different national and international journals.

3.3 Research methodology

For this study interviews were utilized as the data collection instrument. Interview length varied from one participant to another. Data collected from the interviews consisted of: 1) participants' detailed accounts of their career development, which included the identification of key stages throughout their professional lives—BA, MA and doctoral studies as well as research projects, and 2) the process followed when engaged in a writing endeavor, in this particular case, writing and publishing a scientific article, which comprised the statements of the various ways participants use to deal with the difficulties of writing and publishing in English.

Interviews were selected as the way to collect data seeking to answer the questions underlying this work. Fontana and Prokos (2007) state: "interviewing is one

of the most common and powerful ways in which we try to understand our fellow humans." (p. 9). They go further saying that the most common way of interviewing is an individual, face-to-face verbal interchange that can be as short as five minutes or as lengthy as days, even weeks (ibid.).

Fontana and Prokos (2007) have expressed that the focus of interviews embraces the *hows* (the constructive work in producing order in everyday life) and the *whats* (the activities of everyday life) of people's lives. In terms of this research project, and particularly for research question number two, the *whats* part is related to the strategies and techniques participants use to deal with the difficulties of writing and publishing in English; the *hows* part relates to the unique ways in which participants utilize such strategies and techniques.

As stated in section 1.4, I was the transcriber of this series of interviews that were carried out as part of a larger research project. All data used in this study came from the interviews carried out by two of my M.A. teachers, who allowed me to freely use it for purposes of my thesis.

3.4 Data collection procedure

Data were collected during interview sessions that were not equal in length due to participants' experiences and professional development differ from one to another, yet, every interview lasted an average of 120 minutes. Questions were divided into two rounds. The first round collected data seeking to answer research questions one and two; while the second round of questions aimed at obtaining data that might answer research question three. The following paragraphs describe the process that was followed during the interviewing sessions.

Every interview started by providing interviewees with information regarding what the investigation consisted of. Participants were also asked to sign a written

form in which they stated their consent to use the information they would provide further in this research project. Likewise, general information such as name, occupation and age were asked.

Once they had a general idea of the investigation and having signed the consent form, the actual process of gathering data started. First, they were presented with the instrument for data collection. It was just a sheet of paper containing a sequence of numbers going from one to 70. This succession represented the years in participants' lives and in their professional lives. Participants were asked to identify the stage they were at the time of the interviews, regarding their academic and professional development, particularly, their line of investigation—in terms of this project, line of investigation is to be understood as the specific topic that is subject of research. Once they identified themselves professionally, they commenced with a detailed narration of their current stage. The second step also dealt with the narration of the process that aided participants to reach the position they previously mentioned. In other words, they stated the path followed in order to be at that particular stage of their professional lives. For this purpose, interviewees used the same interview format marking and making notes of the years, within their professional life, in which they started to achieve aims regarding their professional development. The third step consisted of the identification of the first publication they ever made. Once again, participants made notes on format related to what they narrated.

The objective of this series of questions was to gather data that sought to identify the immersion processes participants experienced as becoming part of the scientific community.

For the second round of questions, interviewees were told to provide thorough information regarding the process they adhere when writing and publishing scientific

articles in English. First, participants started to tell how they approach the enterprise of writing and publishing in English. They related about the obstacles and problems they found when engaged in writing and publishing, as well as how they managed to solve them. They mentioned the resources used to successfully write and publish in English. Having provided this information, participants were invited to supply facts about the process of publication, which involves the selection of the target journal, the submission of a manuscript and its acceptance or rejection. Such process takes part before publication actually occurs.

Inevitably, participants also included facts that had no direct relation to the information being asked, although those facts were significantly valuable and contributed not only to a deeper comprehension of the processes, but to a better understanding of them in a personal level. In other words, informers narrated and linked stories to the information requested: "[p]eople are storytellers by nature" (Lieblich, Tuval-Mashiach, & Zilber, 1998, p. 7).

3.5 Data analysis

Data collected from participants is considered to be "primary data" (Asher 2005, p. 95). Primary data "is narrated, described, expressed, illustrated, portrayed, explained and interpreted by the informants themselves" during interviews and other methods of data gathering (ibid.). The procedure underlying the collection of the necessary information to attempt to solve the research questions of this project is given below.

Once the interviewing task concluded the succeeding course of action was to transcribe all the interviews. The majority was made in Spanish at the beginning—participants' mother tongue—although some felt comfortable enough to speak in English, which resulted in richer and more varied data. After all interviews were

transcribed, they were printed and the reading task began. Reading had the purpose of getting familiarized with the information collected. At this point in the research process, the reading was preliminary in nature and was not done with an analytical eye. Based on the research questions, readings searching for specific information started. This time, information related to RQ 1 (green) and 2 (yellow) and RQ3 (blue) was highlighted. In addition to this, notes were made on the margins of the transcriptions for further consultation. Having distinguished facts related to all three research questions, the actual analysis commenced. On the one hand, immersion processes were identified throughout the informants' accounts. On the other hand, resources—what participants did and how they did it—utilized to deal with the challenges of writing and publishing in English were identified. Categorization was required to better exemplify and understand the strategies and techniques participants employed when writing and publishing in English. It also contributed to determining what strategies and techniques were used more often as well as the similarities and differences in terms of usage among the participants. Having identified data that was hoped to be useful to answer the research questions, another task began: translating most of the excerpts from Spanish to English.

Translation was the last task performed during the data analysis process. To this point, such analysis should be considered as preliminary, and deeper, additional examination of the data expected.

3.6 Chapter conclusion

This chapter presented information concerning a description of the location where the investigation took place, the people participating in it, the research methodology used to approach and collect data, together with the analysis procedures.

The following chapter presents the results of the analyses described in this chapter. It also offers detailed examination of the data with the most relevant pieces of information that help illustrate the immersion processes into the participants' scientific community and the strategies and techniques employed when writing in English.

CHAPTER FOUR: RESULTS

4.0 Introduction

The current study explored and analyzed some of the features surrounding a community of practioners, and its members, from the areas of physics and mathematics of a public university in central Mexico.

The purpose of this research was to have a closer panorama of the scientific community and the individuals that bring it to existence. In order to do so, three research questions (RQs subsequently) were formulated to portray this particular setting[1]. Findings based on the study RQs will be presented throughout this chapter. First, the scientists' common characteristics will be described; second, the process of becoming immersed in their scientific community will be presented; and, third, the strategies dealing with production and publication of scientific articles will be brought to light.

4.0.1 Description of the data analysis

The sources of data gathered were two: transcriptions from scientists' interviews and their curriculum vitae (CV hereafter). Each RQ led to creating categories for a better understanding and management of the data. Transcriptions and CVs were read in order to identify common topics throughout scientists' stories; then, potential categories that might contribute to the understanding of the data and to the answer of each RQ, were listed, evaluated and settled. After the categories were

[1] RQ1 Who are these successful scientists who publish in English?
RQ2 What stages did these experienced researchers identify in their immersion processes as contributing to become experts in their field in this setting?
RQ3 What specific writing and publishing strategies appear to ease the immersion processes?

selected, the search for excerpts containing information related to each category began in order to analyze the data.

The following sections contain the data analysis carried out in this study in order to shed light on the issues above described. RQ 1 sought to provide a closer view to the overall features of the scientists involved in this scholarly work. The objective of this question was to provide the reader with information related to the origin of these scientists, their family and life experiences that guided their path to professionalization, their limited second language education as well as information about their graduate studies.

4.1 The scientists' characteristics

This section presents the different characteristics that unify the participants of the study. Its purpose is to provide in-depth information regarding various aspects of this cohort. It seeks to depict four features: scientists' family background, childhood and pre-professionalization experiences, English language instruction and professional formation.

I now turn to illustrate the first category that emerged from RQ 1: scientists' family background.

4.1.1 Family background

Data collected to answer RQ1 indicated various characteristics that the scientists shared, such as similar family background. Findings disclosed a number of aspects that the whole group had in common. The first characteristic was that most participants, except one, were first generation students. Six out of seven scientists' parents did not finish elementary school, third or fourth grade being the highest they ever accomplished. Another aspect they shared about their family was similar socio-economic status.

The following excerpts, from interviews transcriptions, represent participants' family background:

> *Ella nada más estudió segundo o tercer año de primaria. No tenía mucha educación formal. R1*
>
> She [R1's mother] only studied second or third grade in elementary school. She did not have much formal education. R1
>
> *Mi familia es de artesanos, todos. Mi padre fue carpintero, mis tíos herreros, mecánicos. R2*
>
> All the members in my family are artisans. My father was a carpenter; my uncles were blacksmiths, mechanics. R2
>
> My father was, well, also my mother, they were very lower level of education, and, they had a very lower level. My mother was eh, she finished the primary school and my father reached only third level of the primary school. R3 [This participant spoke English during the interview].
>
> *Mi familia era de un pueblo pequeño, entonces no tenían mucha...o sea mis padres se dedicaban más que nada a cosas del campo, a cosas de la casa. R5*
>
> My family was from a small town, so they didn't have much…my parents would devote mainly to farming, housework. R5

These excerpts provide a powerful insight into the scientists' origin. They shared the same background concerning their closest members of their respective families. However, not all the scientists' parents were unschooled. In addition to the findings above described, the following is a contrasting feature found in this cohort: only one scientist reported that his parents had degrees in higher education:

> My father was a teacher who was an engineer. My mother was a kindergarten teacher. R6 This participant spoke English during the interview

Despite being first generation students, and other restrictions they might have had, most of these scientists were able to construct a solid, professional formation throughout their careers, allowing them to eventually change their membership status from "peripheral" to "core" members (Wenger, 1998) within their scientific communities. The participants identified early exposure to reading and writing as a principal means that contributed to their scholarly development and growth over the

years. Their parents' role as first facilitators of knowledge was, as well, an exceedingly essential contribution to scientists' formation.

The next section introduces the early experiences scientists had that might have aided to their professional growth later on in their lives. Here again, scientists' parents played a role of great significance contributing to the development of the scientists' future.

4.1.2 Childhood and youth experiences

This category presents the accounts scientists considered had an enormous impact on their future studies: 1) the early contact they had with reading and writing—actually before they even went to any school, and 2) the experiences that contributed to their overall process of choosing to become scientists. These accounts depict scientists' parents as the first facilitators of knowledge they ever had, regardless their limited education and economic background, which did not seem to hinder scientists' further education.

Additionally, these excerpts relate to experiences lived during their youth that could cause to lead the way for their coming scientific future. The next passages represent in more detail the two points argued above:

> *Quien influyó mucho y quien me enseñó mucho, las letras del alfabeto y las expresiones, fue mi mamá. Ella me ponía a escribir o me dictaba, como a los cinco años, cuando iba a entrar a la primaria, previo a entrar a la primaria. Se sentaba conmigo con un cuaderno, y nos poníamos a escribir, nada más. La segunda influencia que tuve fue mi papá. Por la secundaria, once años, doce años, yo había aprendido a leer y a escribir. R1*

> It was my mom who had a great influence and who taught me a lot, the alphabet and language expressions. She would put me to write or dictate, around age five, when I was to ready for elementary school, before elementary school. She would sit down with me with a notebook, and we started to write, that's it. The second influence I had was my dad. Around junior high, eleven, twelve years old, I had learned how to read and write. R1

> *Yo iba a ser cura, estaba estudiando para sacerdote. Andaba por el quinto año de estudiar en el seminario y decido que no. Entonces el porqué me dediqué a estudiar óptica tiene que ver con esa parte de la historia. Creo que tiene que ver con los tipos de profes que uno tiene. Es algo importante. Entonces yo tenia que trabajar, en ese momento yo decido estudiar medicina y decido que voy a ir a la escuela médico militar porque ahí daban becas para la gente que entraba a estudiar. Entonces descubro que me cansaba leer biología, me cansaba y me aburría. Y para descansar de lo que estaba leyendo de biología, o de química, me ponía a*

hacer algunos problemas de matemáticas. Entonces decido estudiar una carrera de ingeniería. R2

I was going to be a priest; I was studying to be a priest. I was on the fifth year in the seminary and then I decided not to. So the reason why I decided to study Optics has to do with that part of my story: I think it has to do with the teachers I had. It's important. Then I had to work, at that time I decided to study medicine and I decided that I was going to enroll to the military medical school, they offered scholarships to the people who enrolled there. Then I found out that I got tired reading Biology, I got tired and bored. In order to rest from the Biology reading, or Chemistry, I would solve some math problems. Then I decided to study in an engineering program. R2

Tenía una vocación para enseñar tremenda. Entonces era muy interesante cómo ella me indujo a pensar, sin ella saber realmente cómo resolver los problemas y todo ese tipo de cosas. Entonces yo aprendí con mi madre a leer, a escribir, y toda la matemática. Cuando me llevaron a la escuela por primera vez yo tenia siete años. Yo empecé la escuela en cuarto grado a los siete años. Para mi, una etapa muy importante fue mi niñez, esos primeros años de mi niñez fueron importantísimos porque fue donde yo realmente empecé a pensar. Eso fue algo maravilloso. Siempre digo esto, mi formación proviene de la actitud que tuvo mi madre conmigo. Eso fue determinante en mi vida. R4

She had a tremendous teaching ability. It was very interesting how she taught me to think; she didn't really know how to solve that sort of problems and other things. My mother taught me how to read, how to write and about math. I was seven when I went to school for the first time. I started fourth grade in elementary school at age seven. My childhood was a very important stage to me, those first years were very important because I started to think. It was something wonderful. I always say that my professional formation comes from the attitude my mother had with me. It was determining in my life. R4

Como yo era el menor de un buen número de hermanos, éramos nueve, entonces siempre había libros en la casa, de los mayores, de los libros de texto. Entonces desde niño los empecé a leer. Recuerdo que había un profesor allá en el pueblo que nos regalaba libros, y me los leía, principalmente de literatura. Yo estudié en una telesecundaria. De hecho a mí desde niño siempre me gustó hacer experimentos, construir cosas. Tenía unos diez años cuando empecé a hacer experimentos, todos los experimentos que venían en los libros. También en uno de los libros venía un experimento de un proyector de cine rudimentario. Eso a mí me gustaba mucho. Siempre tuve la inquietud de hacer ése tipo de cosas. Una de las anécdotas que platicaba mi papá era eso, de que desde niño yo decía que quería ser científico. Como que desde niño ya tenía como que esa visión. R5

I was the youngest of nine children, so there were always books at home from my older brothers. I started reading them since I was little. I remember there was a teacher in my town that would give free books; I would read them all, literature books mainly. I studied in a 'telesecundaria'. As a matter of fact, I always liked doing experiments, since I was little, all the experiments I saw on the books. There was an experiment in one of those books about a basic movie projector. I liked that a lot. I always enjoyed doing that sort of things. My dad would tell a story about me, that I said I wanted to be a scientist when I was little. I knew that since I was a kid. R5

In El Salvador the education is different from Mexico. In El Salvador we are forced to write, even in the primary school. R6 [This participant spoke English during the interview].

This section highlights the tremendous impact parents and early exposure to reading and writing had on scientists' elemental education and later professional formation. Learning had been present throughout most of their scientific lives; at first,

under parental guidance; then, through formal education that provided them with the necessary means to reach the objective of ultimately becoming elite members of their respective communities. R1 referred to having been taught how to read and write by his parents prior to enrolling in any school. R2 recalled a moment in his youth when he was actually studying to be a priest. He also tried devoting his life to other sciences such as medicine and biology; however, he finally made the decision of studying Optics. R4 told how he was able to start the fourth grade in elementary school due to the teachings he received at home. His mother was a great influence in his life: she taught him how to read and write. R5 experienced early contact with books, especially science books. He enjoyed reading these books and would try to perform some of the experiments he found. He said his father was always certain he would be a scientist. Due to educational standards in his place of birth, R6 was exposed to reading and writing from elementary education onwards.

Reaching core membership implies walking an arduous path that requires moving from the periphery of the community to its center. Such process is known in this study as: an immersion process (see Chapter 2). English language mastery is a must-have requirement in order to be at the heart of the scientific community; however, English did not come across scientists' education in a consistent fashion.

The upcoming section portrays the sort of contact scientists had with the foreign language while they were in different school levels.

4.1.3 Very little or late formal English language instruction

English language domain is a requisite of the essence in order to be, and remain as, an "inner-circle" researcher (Tardy, 2004). This section reports scientists' minimum exposure to the learning of English within a formal education setting. Only one out of seven scientists recalled being part of English language instruction during

their elementary education. Others reported having English classes later on in their educational formation. While most of the scientists stated that their first contact with the language was during high school, the majority remembered their English courses covering mainly basic grammatical structures—nothing related to composing texts whatsoever. Thus, most scientists did not have the opportunity to take a writing course before they actually needed to write an article so they could meet certain criteria, *e.g.*, getting their university degree.

These excerpts underline the deficient relation participants had with English language before being part of their community:

> *Llevé inglés en la secundaria, per fue muy, no sé como fue, no sé. El maestro escribía las palabras, y uno tenía que copiarlo y decir: 'chair', 'table', 'chicken'. Entonces fue más que nada aprendizaje de nombres. Llevé un curso de redacción hasta la preparatoria. No recuerdo muy bien como era el curso, creo que sí era importante y me medio gustaba. Este curso no influyó mucho en mí. El aprendizaje yo creo se da como a todos nos ha pasado, nos enseñan más que nada nombres. Quizá construcciones muy básicas como 'I am', difícil pasar al 'You Are'. Siempre así, muy básica. R1*
>
> I studied English at junior high, but it was like, mm, I don't know. The teacher would write words, and we had to copy them and say: 'chair', 'table', 'chicken'. So we learned names, mainly. I took a writing course until high school. I don't remember how it was, I think it was important, but I didn't like it much. It didn't have much influence over me. We all learn the same, they teach us names, mainly. Perhaps some basic structures like 'I am', hard to move to 'You are'. Always like this, very basic. R1
>
> *Yo aprendí a balbucear el inglés ya viejo, viejo a los 40 años. R2*
>
> I learned very Little English quite old, at age 40. R2
>
> I took English courses because I needed. I took several courses very quick, just to start saying 'Hello', 'Good bye', 'I ate my lunch'. Just a few things, it was quite informal, I didn't attend a regular course, ever. R3
>
> *La relación con el inglés empezó en Japón. Para sacar el doctorado, pues hay que publicar artículos. Desde la secundaria empieza uno con vocabulario, con cosas pequeñas. Después ya fui tomando cursos de inglés, principalmente en la maestría. Fue donde precisamente ya tenia el objetivo de irme al extranjero a estudiar el doctorado. R5*
>
> My relationship with English started in Japan. In order to finish the doctorate, we need to publish articles. Since junior high, we learn vocabulary, a few words. Later on I took other English courses, mainly during my master. It was precisely during that time when I had the objective of studying the doctorate abroad. R5
>
> I studied formal English in the high school and courses of English was basically my first contact. Then, when I was in the university, there were a technical English course using learning songs, movies. It was a more formal experience. R6
>
> *No hubo cursos o seminarios sobre escritura. R7*

> There were no writing courses or seminaries. R7

This section highlights the lack of contact with English during their basic, and even professional education. Not only did these scientists not have regular English language instruction, but also they did not have any courses that focused on developing and mastering writing academic or scientific texts. R1's experience with formal language instruction was not relevant; he learned only basic grammar structures. R2 had a formal educational experience with English as a 40-year-old adult. He did not mention any prior experiences with the language. R3 stated he attended informal English courses, never a formal one. Likewise R1 learned basic language structures. R5's relationship with English started while he was overseas studying a doctorate program. He was required to have a certain mastery of the language, so he decided to study formal English classes in order to be able to carry on with his doctorate. R6's first formal English course took place while he was in the university. In the same way as R1 and R3, he was taught only basic grammar structures. R7 claimed that there were no writing courses or seminaries during the time he was a student.

Non-proficiency of the language can prevent scientists from reaching the center of the community. The passages above shed light on the deficient English language instruction these scientists had when they were students. It also suggests that most of the formal instruction they received took place during young adulthood. Despite this shortcoming, these scientists were, and have been able to produce scientific texts that have been scrutinized by demanding editors of national and international science journals and magazines—the ways in which these scientists accomplish to publish in these journals will be discussed further on in this chapter.

Most learning of English language occurred through scientists' university education, as they enrolled in master and doctorate programs.

The next section offers information about the scientists' professional studies as well as some experiences they narrated while being interviewed.

4.1.4 Professional formation

This section considers scientists' professional studies and the experiences they lived before choosing what they actually wanted to study. Some of them reported changing from one university program to another, for various reasons, until they were satisfied with the program they really wanted to study. The objective of the current section is to make participants' professional education background available, such as their graduate and undergraduate studies.

Table 3.1 highlights scientists' main characteristics regarding their nationality, academic degree, research area of interest, SNI level, year and language of first publication and number of publications. The forthcoming extracts supply information on scientists' professional formation:

> *Entré como a los 20 años en la facultad de física en Jalapa, Veracruz. Terminando la prepa tuve que dejar de estudiar y tuve que entrar a trabajar durante esos años. Y ya después me metí a estudiar la licenciatura en física. Estudié la maestría y el doctorado en el INAOE, en Tonanzintla, Puebla. R1*

> I enrolled the university of Jalapa, Veracruz, in the faculty of Physics at around age 20. After finishing high school I stopped studying for a while because I had to work those years. Later on I studied Physics. I studied both the master and the doctorate programs at the INAOE, in Tonanzintla, Puebla. R1

> *Hice la licenciatura en la facultad de fisicomatemáticas de la BUAP. La maestría y doctorado en el INAOE. Entonces yo hacia las lecturas de los instrumentos de humedad, temperatura, etc. Yo no tenia interés en dedicarme a eso, pero con la meteorología hubo la oportunidad de irme como estudiante de laboratorio a fisicomatemáticas. Cuando entro al laboratorio estaba en lo mío. De hecho dice mi esposa que finalmente yo estoy en mi ambiente. Yo barría el observatorio, no trabajaba en él. R2*

> I studied at the BUAP Physics mathematics faculty, the master and the doctorate programs at the INAOE. Back then; I was in charge of the humidity and temperature readings. I didn't have any interest in doing that, but with meteorology came up the opportunity to go as a student to the Physics-Mathematics lab. When I was there, I felt very satisfied. As a matter of fact, my wife said I was finally doing what I always wanted. I used to be the janitor in the observatory I didn't work there. R2

I decided to make my graduate studies here in Mexico. R3

La novia que tenía en la preparatoria empezó a estudiar matemáticas y me jalo a matemáticas. Entonces empecé a estudiar matemáticas a los 17, 18 años. Yo fui del primer grupo de cátedras patrimoniales de excelencia CONACYT. Todos eran de Europa del Este y yo era el único latino que había. Yo había terminado el nivel más alto de doctorado que tenía la escuela rusa; yo había pasado un periodo casi de doce anos de formación continua. Hice la carrera de matemáticas en el año 68 en La Habana. Tengo dos doctorados en el sistema ruso de la universidad de Lomonosov de Moscú. A mí me interesó mucho las neurociencias, entonces pude vincularme con especialistas de muy alto nivel que hay acá para desarrollar modelos matemáticos. Lo que más me ha gustado es el arte. Recuerdo que en el instituto tecnológico de la Habana que era donde se estudian las ingenierías, llegó un profesor muy bueno, alemán, que empezó a trabajar en ingeniería mecánica y ahí estuve un tiempito. El mismo profesor me dijo: "Vete a estudiar otra cosa, para esto tú no sirves". Y entonces varios de mis amigos decidieron en aquel momento irse a estudiar a Rusia y yo me les uní. R4

My girlfriend in high school started to study Math, so she convinced me to study Math. So I started to studying Math when I was 17 or 18 years old. I was part of the first CONACyT elite teaching group. They all were from Eastern Europe, except me, i was the only Latin American in there. I had finished the highest doctorate level in the Russian school; I had finished a twelve-year period of non-stop studies. I studied Mathematics in the university of La Habana. I have two doctorates in the Russian system by the university of Lomonosov in Moscow. I was very interested in neurosciences, so I could get in touch with high-level specialists there in order to develop mathematical models. I remember that in the technological institute in La Habana, where they teach engineering, arrived a very good German teacher to the Mechanics engineering and I was there for a while. This teacher said to me: "Go and study something else, you're not good for this". Then, some of my friends decided to go to Russia to study, so I joined them. R4

Era cuestión de ir cubriendo etapas: terminar la primaria, la secundaria, la preparatoria, y ya ir a la universidad, pues era una meta, un objetivo ya concreto. Después hacer la maestría y el doctorado, que era cuestión de tiempo nada más. Hice la licenciatura en la universidad veracruzana. El doctorado lo estudié en Japón. Aprendí un poco de japonés, tengo reportes de investigación en japonés. R5

It was a matter of covering stages: finishing elementary school, junior high, high school and then go to the university. It was a goal, a concrete objective. After that, study the masters and then the doctorate; it was just a matter of time. I studied Electronic instruments in the Universidad Veracruzana. I studied the doctorate in Japan. I know a little of Japanese, I have scientific reports in Japanese. R5

But English is not my second language; I have studied Russian for 10 years or so. I spent one year studying Russian at preparatory departments. I started the university in El Salvador when I was 17 or 18 years. I was really disappointed because this was a lot of handbooks and I wanted to put my hand in something like practicing. And in those years I decided to move on to Physics. I finished my master degree when I was 28 years. R6

Estudié la licenciatura en física en la BUAP. La maestría y el doctorado en el INAOE. R7

I studied Physics in the BUAP. The master and the doctorate programs at the INAOE. R7

Most scientists' basic professional formation took place in Mexico, although all of them have been abroad for various reasons: e.g. further studies, congresses, conferences, research and work, among others. Most did not start their masters'

program immediately after they graduated from their undergraduate program due to various reasons, e.g. contributing to the family's economy. The professional formation they hold was the tool that first allowed these individuals to be part of their scientific community, which ultimately resulted in their transition from one sort of membership to the other.

The sections above sought to illustrate the common characteristics this group of individuals shared, and therefore, unify the whole cohort. The principal characteristics these scientists shared were: 1) similar family and socioeconomic background, 2) similar experiences lived during childhood and youth, 3) lack of formal, early English language education, and 4) professional formation. The only difference found in this section is that only one participant's parents (R6) were not first generation students: both had a university degree.

Chapter two provides a detailed description of the necessary elements to reach the center of a community of practitioners. Among such, there is the requisite of sharing their research work through a published means. As discussed on Chapter 2, English is the language for international dissemination of scientific knowledge, which demands scientists to produce and publish texts in English. As non-native speakers, managing to successfully compose scientific texts in English is an arduous task they eventually face.

The coming section presents the difficulties this group of scientists confronted during the process of writing a scientific text.

4.2 Emerging issues about their English publishing learning process

The people who participated in this project were scientists working in the mathematics and physics faculties of a public university in central Mexico. For all the participants in this study, English was not their mother tongue, but in the case of R6,

his third language. Not being native speakers of the language represented an extra challenge for these individuals who had the necessity to communicate, share their work, be up-to-date, interact and publish, all of this, in English.

In order to publish a scientific article in English, not only did these scientists need a research topic that was appealing to their peers, nationally and internationally, but also they needed to be able to accurately communicate their ideas in both languages: the one of their science and the one known as *lingua franca* (Tardy, 2004). To accomplish this, in addition to scientific knowledge related to their area of expertise, these scientists also needed to master other type of knowledge: that of the English language. Yet, the latter might hinder scientists' production of texts in the target language due to the basic domain of English they had at the beginning of their immersion. Section 4.1.3 indicated that most of their language learning did not occur during the early years of their education, but at the latest stages of their university program. Mastering the language eases the immersion and the publication processes within the community of practice; however, scientists attempting to publish also need to know the subtle requirements that particular community demand from its members.

The next section introduces some features regarding scientists' professional community, and deals with the process in which these participants experienced to have articles published in English within their international community of practitioners.

4.2.1 Characteristics of the community

Participants mentioned a number of compulsory characteristics that the professional community demands of its members. The nature of these requisites is varied. The ones considered by the participants include: the need for publication, highest educational degree of individuals seeking membership, and writing issues.

These excerpts depict some of the community's requirements that scientists must observe in order to qualify as members.

> We are part of a community. A scientific community that wants to work for growing knowledge. The best way to growing knowledge is to publish your ideas. R1
>
> *Para poder estar en el SNI, la investigación debe ser publicada en revistas de circulación internacional. Ése es el requisito si uno desea mantenerse en el SNI. R2*
>
> In order to be a SNI member, your research must be published in international magazines. That's a top requisite to continue being a SNI member. R2
>
> We have to publish at least one paper a year. In my field, when an experiment is running, we publish 20, 40 papers per year. In our field, the contributors always go in alphabetical order. That's one rule. R3
>
> *Lo importante es el resultado y decirlo de la manera más concreta posible. Debemos tener maestría y doctorado para poder ser parte del SNI. R4*
>
> The important things are the results and state them in the most concrete way possible. We must have master and doctorate degrees to be members of the SNI. R4
>
> *La escritura es muy directa. No se puede rebuscar tanto como en la literatura. La ciencia es así. R5*
>
> Scientific writing is very straight. You cannot use as many words as in literature. Science is like that. R5
>
> In your writing you have to defend every word you write. R6
>
> *Escribir en inglés es necesario; todos necesitan publicar en inglés. Deberíamos hacerlo en español, pero no está considerado correcto. Los científicos tienen la característica de actuar como profesores y como investigadores, y, como tales, publican al menos un artículo al año. R7*
>
> Writing in English is necessary; everybody needs to publish in English. We should do it in Spanish, but it's not considered right. Scientists have the characteristic of acting as teachers and as researchers, and, as such, they publish at least one article per year. R7

The requisites above permeate the inclusion and permanence of the most qualified individuals as members of the community. Writing and publishing in English are two of the most significant requisites that need to be executed. For non-native English speaking scientists this is a requisite hard to meet, yet, this cohort has proven that is an achievable task. These scientists have provided and shared their means to do it, which might ensure the continuity of the community and growth of its knowledge. These necessary conditions represent some of the guidelines that rule participation in the community.

4.2.2 Participating in the community

Individuals belonging to a community of practice can be classified as novice members and expert members (Wenger, 1998). Membership status can be changed through being 'immersed' in the community. This is accomplished by means of dynamic participation: active engagement in the community's activities. Wenger refers to participation as "a process of taking part and also to the relation with others that reflect this process" (ibid p. 55). Interaction among members is a desired form of participation; its ultimate goal is for novice members to learn, to gradually become expert members. Such interaction allows them to share points of view, ideas, knowledge and experience that facilitate reaching the core of the community to the less experienced members. Guidance and assessment throughout the writing process of a scientific article is an example of a conventional activity that takes place in this community.

The forthcoming section introduces a way in which these scientists coped with the arduous process of writing a scientific article in English by interacting with the more expert members of the community.

4.2.3 Sharing the scientific article with colleagues

As discussed above, participation entitles peripheral members to learn the community's every-day activities through actual performance of its practice. Section 2.1 asserts that learning is best acquired once individuals participate in dynamic activities that occur in their natural environment: in other words, novice members learn by doing. Writing and publishing scientific articles are examples of participants' community practice. New members learn the rules of writing and publishing their research work from core members of the community. Article writing is a common practice; doing so in small groups is, as well, a common activity.

The next excerpts illustrate how scientists use interaction as a tool to help them achieve the ultimate goal: having a scientific article written and published in English.

> *Generalmente somos varios autores. Escribo más o menos la primera versión, se la doy a otro coautor y él la revisa y le compone, y yo la vuelvo a revisar. Estamos en ese juego de estar revisando. Es un trabajo conjunto, como no somos hablantes nativos del inglés, pues tenemos que irnos corrigiendo nosotros mismos. R1*
>
> Usually we are several authors. I write a draft and give it to another author who goes through it and makes some corrections. Then, I check it again. We do it like that. It's teamwork, since we are not English native speakers; we have to correct each other. R1
>
> *Yo hacía el trabajo de investigación, y después mis colegas que sabían inglés lo ponían en inglés. Yo lo hacía en español, lo escribía en español. R2*
>
> I would do the research work, then mi colleagues who mastered English would write it in English. I did it in Spanish, I wrote it in Spanish. R2
>
> Draft it and draft it a lot. Write, check, write, check a lot. Show it to others, show it to others. That's one important part. R3
>
> *A veces lo que hacemos es hacer una versión en español de todo y ya nada más es pasarlo a inglés. Eso es lo que hacemos cuando lo hacemos en grupo. R5*
>
> We sometimes make a Spanish version of the whole article and then we translate it to English. That's what we do when we work as a group. R5
>
> *Estábamos intentando traducirlo al inglés, pensando que casi teníamos el escrito final, se lo dimos a mi amigo inglés para que nos diera una corrección adicional. Él cambió muchas cosas. Fue buena la ayuda de alguien del área. R7*
>
> We were trying to translate it to English, when we felt we had the final version; we gave it to my English friend so he could help us. He made many changes. It was good having help from someone who knew about it. R7

The above extracts presented the ways in which participants faced the challenge of writing a scientific article in English. For most, the first and hardest obstacle to overcome is the writing part; however, they have resources that have proven fruitful during the writing process. This sort of teamwork among members of the community is the basis for a greater, more ambitious way of working in teams: networks, which hold the potential to reach, and put together to work, national and international peers in the pursuit of a common given goal.

The following section displays how participants use networks to improve their own writing abilities, to enhance their knowledge, to make possible long-distance relationships with overseas colleagues and how they use them for their benefit.

4.2.4 Establishing networks

Reaching the center of the community is a process that takes time and requires individuals to go through different stages in which they learn the necessary means to eventually become core members. Participation is essential to know about the practice that occurs in the community every day. Participation leads to social interaction among members. Such interaction is used for different purposes: to know about other members' investigation, work together in a research project, share knowledge and experience, and to help one another in various tasks. These forms of cooperation in the community are the foundations of a collective way of work: networking.

Ibarra understands networks as "conduits for information and resources" (2004, p. 19), which offer members the opportunity to socialize and interact with their peers around the globe. This contact is of singular significance for this particular cohort: it allows them to create synergetic work relationships that contribute to increase the writing production of these non-native speaking scientists.

The next passages provide a panorama of how participants employed networks to facilitate the process of writing a scientific article:

> *Por ejemplo éste artículo, también me dijeron lo mismo, tiene que corregirse el inglés. Y me sugirieron que lo revisara un hablante nativo del inglés. Y conocía yo a un señor que estaba trabajando ahí donde yo trabajaba, en León Guanajuato. Él me lo revisó, me sugirió cambios. Y con esos cambios ya me aceptaron el artículo. R1*
>
> For instance this article, they told me the same thing, correct the language. They suggested having an English native speaker go through it. I knew someone who was working in the same place I was, in León Guanajuato. He revised it and suggested some changes. That's how I got the article accepted. R1
>
> I write in both languages, because I'm communicating the work that we do to my colleagues in the States or Europe, but also here to my colleagues in Mexico. I have almost ninety papers, but most of the papers are written in collaboration. R3

> *Tengo relación con especialistas de muy, muy alto nivel en Estados Unidos, en España, en Rusia, en Francia. Yo he invitado a todos los especialistas que han venido: a los rusos, a los cubanos, a los búlgaros, a los alemanes. Todos los he invitado yo. R4*
>
> I have relationships with specialists of very, very high level in the United States, in Spain, in Russia, in France. I have invited all the scientists that have come: the Russians, the Cubans, the Bulgarians, and the Germans. I've invited them all. R4
>
> *Nosotros nos reunimos mucho para escribir entre los tres, es ventaja porque salen ideas de todos lados. R5*
>
> We three get together, a lot, to write, it's an advantage because ideas flow from everywhere. R5
>
> *Había errores de escritura. Había que corregirlos. Tengo un amigo, es inglés. Con la ayuda de él se hizo la revisión de la parte escrita. R7*
>
> There were writing mistakes. We had to correct them. I have an English friend. With his help we revised the writing. R7

The next passage serves to highlight the importance of networks and their potential to meet individuals that might be helpful to achieve various goals. Without networks, many scientists would struggle greatly to have the necessary connections to flourish in the community:

> *Yo soy nivel dos del SNI…no estoy en el tres nada más porque me faltan contactos. R4*
>
> I'm SNI level two…I'm not level three just because I lack contacts. R4

On the other hand, the coming passage illustrates the amazing capacity networks have to put to work together thousands of scientists for a single purpose:

> This is the last paper. Is one thousand and ten collaborators. This is small collaboration, small experiment. ATLAS has three thousand four hundred collaborators! R3

Data analysis from this section depicted a favored usage for networks: English language correction. Scientists wanting to have an article published in English need language mastery for two purposes: first, to clearly communicate their thoughts, findings and contributions to the community; and two, to fulfill the established language criteria of the intended journal or magazine. To meet this objective, it is of great aid to count on colleagues who are either English native speakers or possess

higher mastery of the language. Seeking more skillful members' expertise is a practice that is rather common within the community of these scientists, which has demonstrated to yield the desired individuals' outcome. Networks are tools that magnified participants' ability to write scientific articles. Through networks, scientists corrected and improved the discourse used in their writing. Networks served as a means to meet other members of the community—even foreign ones—establishing national and international bonds that might be powerful assets for collective work. Being in contact with international peers offered these scientists the possibility to increase and improve their technical repertoire as well as their English language, and, also, communication allowed them to be aware of their field's current work in global grounds/terms. Networks provided, too, an opportunity to learn from more experienced colleagues opening the doors to collaborative work among members from different countries.

Being at the point in which an individual requires language assistance is but a stage within the writing process of an article. The following section presents the various methods participants go through in order to start and finish a scientific article.

4.3 The writing process

Scientific article production is a practice that members seeking to be at the center of the community must observe. This process involves a variety of valuable activities that contribute to scientists' professional growth, social recognition and acceptance as members in the community. It is, as well, a highly demanding process for those scientists whose native language is other than English. Non-native speaking scientists must have mastery of the language in order to: 1) write the scientific article; 2) make themselves clearly understood by the community; 3) successfully meet the set criteria of the desired scientific journal or magazine. It is at this point of the

process where most individuals meet an obstacle that could slow down, even stop, their writing progress. Nonetheless, sections 4.2.2 and 4.2.3 displayed how scientists effectively face such situations through the mastery of more experienced members.

Transcription analysis shed light on the method these participants followed to produce a scientific article in English. The following section presents insights into the sort of feelings scientists experienced throughout the writing process.

4.3.1 Emotional process that generated mixed feelings

Writing an article, from beginning to end, for a scientific community might represent a challenge for most members, particularly for the non-native speaking scientists. There are requisites to comply with, i.e. innovatory, appealing research topic and outcome, submission deadline, and flawless writing, among others. Meeting these writing demands might engender diverse feelings in the writer. Such mixed feelings might either facilitate or hinder the development of the writing process.

The following excerpts depict the variety of feelings that the writing process created on the study's participants:

> Yes. I like to write. I don't hate writing, more or less; I actually don't enjoy it because I don't know everything about writing. I know that I need some preparation, some improvement. Sometimes I think that I don't have the knowledge to write. So I am not happy because I need more knowledge. R1

> *Frustrado, uno tiene que escribir párrafos completos con maestría en el inglés. Cuando uno intenta poner maestría en inglés, uno hace el ridículo cuando su idioma no es ése. R2*

> Frustrated, you have to write complete, well-written paragraphs in English. When English is not your first language, you have to be extra careful not to make mistakes. R2

> I hold a lot of emotion when I write. I think a lot and sometimes because I cannot find the correct words to express something, and I say: how can I do it? How can I express this? And I think it's not because of the writing, it's because of what I want to express, to say better and better. I get tired, exhausted when I write, in English and in Spanish. R3

> *Alivio cuando está terminado, pero inquieto de que algo faltó, o de que pudo perfeccionarse. Sí me gusta escribir, escribir en inglés, escribir artículos me gusta. Me siento bien. R5*

> Relief when it's done, but restless that it might miss something, or that it could be better. I do like writing. I like writing in English. I like writing articles. I feel good. R5

> During high school, I wrote just because it was homework. I didn't feel excited about it. I had to do it. It's difficult because you have to defend every single word you write. It's amazing to see your name. This was one of the most important moments. R6
>
> *Satisfacción cuando el trabajo termina siendo muy referenciado. Yo creo que la satisfacción es mayor. Y a veces no es tan referenciado, entonces pues terminó siendo un trabajo más. R7*
>
> Satisfaction when many people cite the article. I think the satisfaction is greater. And sometimes, not many people cite it, then, it's just another piece of work. R7

The excerpts above provided a picture of the set of different mixed feelings that writing produced to participants in the study. Broadly, writers sensed positive and negative feelings when involved in the article construction. R5 and R7 reported to actually enjoyed writing articles. On the other hand, R1, R5 and R6 did not enjoy the writing process; still they went through it due to professional reasons—having the article ready for editors' scrutiny. Negative feelings might result in undesired performance: R2 felt frustration because English is not his first language and he is not a proficient user, yet, they might also have a positive outcome: R3 found in adverse feelings a driving force that encouraged improving himself. R7 summarized the definitive aim of scientific writing: being quoted. Article citation—measured in quantity—could reflect the significance of scientific publications and scientists' prestige within the community: the higher the number of citations, the greater impact and status of the publication. Writing a scientific paper is an activity that creates a diversity of feelings on scientists that might deviate them from the conclusion of the article. Notwithstanding, in addition to their networks, scientists make use of more resources to manage the process of writing a scientific article.

The following section introduces the various strategies the scientists employed when writing for publication. Also, this section presents the procedure that helped the scientists to organize the components of the article while writing.

4.3.2 The article construction (not a lineal process)

The previous sections dealt with the resources scientists employed in order to write a scientific article. Those resources were useful and applied once the writing process was ongoing and at a point in which writers had an initial outline of the article. Even though the sections that constitute a scientific article are presented in a fixed order: the introduction the first section and the conclusions the last one, these scientists did not follow such order while constructing the article. The writing process varied from one participant to another: most might start with a section other than the introduction drafting some thoughts and then work on other sections to eventually finish the whole paper.

The following section presents the procedure to construct scientific articles followed by the study's participants.

4.3.3 The parts of the scientific article

There are multiple formats to a scientific article. Mostly, due to two main reasons: the science for which the article is being produced, and the particular requirements of the specific community of practice. However, most scientific papers do include the same sections/information and do follow a fixed set out. The next table provides the arrangement of the scientific article from two formats:

Sections	Purpose of the section	Sections	Purpose of the section
Title	Briefly states what the article is about	**Title**	Attracts potential audience, aids in indexing
		Byline and affiliation	Includes everyone who made significant contributions to the research
Abstract	Summarizes article results and conclusions	**Abstract**	Presents the problem, method or experimental basis, major findings, principal conclusion
Introduction	Establishes the context for the research: the area where the research takes place, The research problem, the importance of the research and the research questions	**Introduction**	Provides a clear and concise statement of the problem, brief summary of previous work, States why/how the present work is different or extends the previous work
		The research problem, the importance of the research	
Materials and methods	Describes the research procedure	**Experimental methods**	Gives enough information for other experienced workers to repeat the experiment
Results	Reports the outcomes of the research procedure	**Results**	Summarizes the data that was collected and any statistical treatment. Includes details to justify the conclusions made

Discussion	Interprets results, explaining and comparing the results of other experiments	**Discussion**	Interprets and compares the results to previous work. Suggests further research or applications of the work. Points out limitations of the data and interpretations
Conclusion	Focuses the reader on what is important about the research, its contributions to the larger area of study	**Conclusion**	Discusses why or why not the data addressed the problem stated in the Introduction based on the evidence presented
		Summary	Included if the paper is exceptionally long. Highlights the main points only
		Acknowledgements	Optional. Acknowledges people or organizations that provided funding. Thanks to individuals that helped with technical details or provided significant assistance
References	Lists the sources used in the article	**References**	Lists the citations made in the article

Table 4.1 Two approaches to scientific article formats (adapted from UC Santa Barbara web site). Scientific article sections vary from one approach to another as shown above, however both approaches include the same main elements.

Table 4.3 presents two different ways of organizing the parts of the scientific article. As stated before, there are many formats to display the content that include less or more sections or that include the information under a different section title. However, the preferred format for this community includes eight features that cannot be neglected/left aside: title, abstract, introduction, methods, results, discussion, conclusion and references. The latter is the set out most commonly used by the participants in this study. Having a format to focus on does not mean constructing the article step by step as the format dictates. The procedure followed by these scientists varies from one individual to another: scientist A may start writing the introduction, while scientist B may start with the abstract.

The following passages show participants' individual way of constructing the scientific article, that is, the sequence they followed:

> *Lo construyo por partes. Entonces en la introducción, quizá la primer vez que yo escribí esa introducción, habrán sido dos párrafos, y ya. Entonces escribo un ejemplo así, quizá el esqueleto. Y así me voy con las demás secciones. Después la introducción que nada más era un párrafo, la empiezo a modificar, y ya se va ampliando. Luego se hacen escrituras adicionales, a veces me sale hacer escrituras adicionales, a veces no. R1*

> I do it by sections. For instance the introduction, the first time I drafted that introduction it was maybe two paragraphs, that's it. Then, I draft more, like an outline. Then I start modifying the one-paragraphed introduction, it gets bigger. After that I include additional writing, sometimes I do, sometimes I don't. R1

> In my case I write in a draft the conclusions, then the introductory part and then carefully describing the procedure, which we used in order to obtain those, physics results. Sometimes we decide not to publish a draft because the conclusions are not that strong. I like to think what I want to express, what I want to communicate, then I sit and I start writing. R3

> *Lo que yo hago es tener primero la idea de la estructura del artículo. Generalmente la estructura es digamos el título, el resumen, lo que es el "abstract", luego viene la introducción, una descripción de los experimentos, la discusión de los resultados y las conclusiones. Entonces básicamente esa es la estructura que tienen todos los artículos, entonces pues comenzamos por eso, la estructura. La introducción generalmente es un poquito más difícil porque hay que trabajar un poquito acerca de todos los antecedentes científicos que hay en el trabajo. Y generalmente con lo que empiezo es describiendo el experimento, luego básicamente discutiendo los resultados, llegando a las conclusiones y ya luego la introducción es al final. Generalmente uno empieza la introducción y la modifica casi completamente. Y ya en base a eso se va a poner el título y se acaba de pulir. R5*

> What I do first is try to have the idea of the article structure. Usually the structure is, the title, the abstract, the introduction, a description of the experiment, the discussion of the results and the conclusions. That's basically the structure of the articles, so we start with the structure. Usually, the introduction is hard because previous scientific work on the area needs to be included. I usually start describing the experiment, and then I discuss the results, then the conclusions and finally the introduction. Usually the introduction is completely modified at the end. Then I work on the title and on whatever needs to be polished. R5

The excerpts above provide a panorama of how participants began the process of writing a scientific paper. They must observe and include various discourse elements throughout the article that systematically describe the research work. These excerpts also showed that every scientist has his own way of starting the writing process and the elements they kept in mind while doing so. Scientists have different resources to accomplish the completion of a paper: networks and other members' expertise. Therefore, once they have a complete draft of the article, and even before reaching this point, they might start using such resources to successfully end the writing process.

R1 starts with the introduction of the article writing initial thoughts about it, and then he continues doing it until he is ready to include more information that enriches his work. On the contrary, R3 begins drafting the conclusions—one of the very last sections of the article. He then writes the introduction, and after it, he pays attention to carefully describe the procedure. To do this, he takes time to organize his thoughts. Furthermore, R3 highlighted the importance of having strong conclusions

that support the results of the research: without strong conclusions, a promising article cannot be published. R5 focuses attention to the general structure of the paper. He starts with a description of the experiment, then the discussion and the conclusions, leaving the introduction as the last section to work on.

Up to this point in the process of writing a scientific article, participants have successfully managed language proficiency issues and mixed feelings created throughout the writing stage. Additionally, they shared the approach in which they began with the writing process of the scientific paper.

The following section introduces the strategies participants use to actually write, the resources employed to overcome the writing *per se*.

4.3.4 The writing strategies

Throughout the writing process, participants have faced various difficulties that emerged, threatening their course of action as they continue to work on the different sections of the scientific paper. While being engaged in this stage, the nature of the issues non-native speaking scientists faced is, again, language related, as their English writing ability is being tested.

Being non-proficient users of English is a fact worth mentioning about most participants in the study. Despite this setback, they have found the necessary means to write and publish scientific papers for highly demanding journal and magazine editors, readership and community.

The strategies utilized while writing are presented in the next series of excerpts taken from the transcriptions of participants' interviews.

> *Yo he aprendido a escribir leyendo. Me fijo en las estructuras que hacen Carlos Monsiváis, Jaime Sabines, José Emilio Pacheco, entonces me fijo en eso. Eso lo trato de trasladar al inglés, no es tan sencillo. Leyendo, leyendo a doctores. Eso es lo que yo he hecho. Pero también leyendo en inglés. He leído literatura científica, artículos, me fijo en las construcciones que hacen los autores. La lectura de autores ayuda bastante, son patrones que uno puede aprender. Al principio lo que hago es escribir sin evaluar, para que no se me vaya la idea. Escribo en inglés, empiezo a redactar una idea y sigo con la idea, la idea general. Se*

construye el argumento y ya después empieza uno a revisar la gramática y la redacción. También me pongo a estudiar un poco la gramática y vocabulario, eso es después. Luego se hacen modificaciones con ayuda de lecturas de otros artículos, como cimientos. Lo importante es justificar lo que estoy diciendo, es lo primordial. Buscar argumentos, buscar razones que den sustento a lo que yo estoy diciendo. Lo que otros autores ya probaron, que eso generalmente es la introducción. Tengo que dar un argumento, razones para mostrar que lo que estoy diciendo es cierto. R1

I've learned to write by reading. I pay attention to the structures Carlos Monsiváis, Jaime Sabines and José Emilio Pacheco do, I pay attention to that. I try to translate that to English, it's not easy. Reading, reading scientists. That's what I've done. Also I read in English. I've read scientific literature, articles; I pay attention to the structures made by those authors. Reading other authors help a lot, there are patters that anyone can learn. At the beginning, what I do is write, I write without evaluating, so I don't lose the idea. I write in English, I start to write an idea and I stick to it, the general idea. The argument is constructed and then I start checking grammar and style. I also study grammar and vocabulary, but that's later on. Then I start modifying the text with what I've read from other articles, these are the foundations. What is important is to justify what I am saying, that's the most important thing. What other authors have already proven, that's usually the introduction. I have to provide an argument, reasons to demonstrate that what I'm saying is true. R1

Algunas partes las escribo en inglés y otras en español. Un champurrado decimos en México. A veces uno escribe ideas y conceptos que ya están previamente hechas, entonces uno tiene que ser consistente. Uno agarra pedazos de otros autores o de uno mismo que ha escrito en inglés, y entonces los copia, los reformula, los escribe. Y otros que son la idea originales, uno las escribe y las traduce. Originalmente los artículos en español, uno contrata gente para que los ponga en inglés. Comúnmente la gente que los pone en inglés no sabe del tema. Entonces cuando se quiere traducir, tienes que entender, no es tan simple como poner en inglés algo. Uno tiene que destinar un buen rato platicando con el traductor para que le traduzca uno los sentimientos. Los traductores de la computadora pueden hacerlo, pero ahí uno se da cuenta que no. R2

I write some parts in English and others in Spanish. A mixture, we can say. Sometimes I write ideas and concepts that already exist, so I need to be consistent. I take pieces from other authors, or mine, that I've written in English, and then I copy them, rephrase them and write them. And other original ideas are written and translated. Articles are in Spanish, so I hired people to translate them in English. Usually, people who translate the articles don't know about the area. When you want to translate, you have to understand, it's not as easy as translate it to English. I have to devote some time talking to the translator so there are some feelings in it. Computer translators can do it, but then you realize they cannot. R2

I have a kind of schematic procedure. I know that I have to write an introductory part, describe the tools used to get these results, and always thinking in the conclusions section. We know we have to be very firm, clear about what we want to transmit. I write, well, draft and draft a lot. We learn a lot when we read. I found out that it was very good for me to have my writing documents well written. I learned, some years ago, not to start writing or to sit in front of the computer. First, I like to think what I want to express, to communicate. In my mind I just construct the argument of the paper, and then I sit and I start writing. I have thousands of documents with the same structure, the same philosophy. When I write, I like to have a silent environment. Anything not related to my work disperse my attention. Sometimes I decide to switch off the Internet communication. I do better when I have pressure, because it force me to concentrate myself and I start. Because I concentrate myself I start to have more words, more ideas. In my case, if the deadline is tomorrow, I say ok, I spend three or four hours to read, to talk with people. But on pressure I think it's much better for me. When I want to say something very formal, writing to a Nobel Prize or the head of the laboratory, if I'm home, I ask them to check my writing. They (talking about his children) always, not correct, they suggest: change this word to this other, and at the end, I have a nice version of my writing. R3

Cuando estoy escribiendo en inglés siempre tengo abierto mi diccionario inglés-español y siempre estoy con las palabras. Describir el experimento implica entenderlo completamente.

> *En la descripción de las figuras, uno debe tener la capacidad para ver una serie de datos y saber qué es lo que se puede extraer de ahí, hacer una lista de qué información puedo sacar de esa figura y en base a esto ya a escribir esa parte. Para aprender, hay que ver artículos, cualquiera, y ver cómo la describe el autor. Ir a otro artículo, tomar otra figura, ver cómo se describe y comparar qué partes está resaltando de la figura. Se pueden ir viendo diferentes artículos, cómo están escritos y a partir de eso aprender. La cuestión es ir buscando las frases para comunicar. Generalmente uno las busca en la cabeza, y a veces se va uno también a referencias, y uno dice, ah bueno, necesito saber si esto se dice así, qué palabra se usa. A veces voy sacando frases de otros artículos y entonces las voy utilizando. Cuando yo me atoro en algo lo dejo un rato, hago otra cosa y luego pues me pongo a pensar en por dónde podría ir, qué parte de los datos podría resaltar.* R5

> When I'm writing in English I always have an English-Spanish dictionary with me and I always look up words. To describe the experiment requires understanding it completely. About describing figures, you have to have the capacity to see a series of data and know what you can use from it. Make a list about the information that can be used from that figure and start writing. To learn this, you have to look at articles and see how the author describes it. Go to another article, take another figure, see how it's described and compare which characteristics are highlighted. You can look many articles, see how are written and learn from them. The point is to find phrases you can use. Usually these phrases come from your mind, and sometimes from references that give hints about how to state something, which words to use. Sometimes I identify phrases from other articles and use them. When I got stuck, I stop the writing for a while, do something else and then come back to figure out how to work on it. R5

> I do a mimic of the language in international papers. All the time I'm reading papers. R6

> *Yo lo que hago es, siempre ha sido primero en español. De ahí intento traducirlo al inglés, y me ayudo mucho de textos y revistas, artículos que tienen mucha terminología, entonces lo va uno adaptando. Yo creo que es un proceso de pegar cosas. A veces uso traductores electrónicos, dan un montón de opciones. Yo creo que es difícil en general todo. Muchas veces me apoyo de artículos ya escritos, como modelos. Copio el texto y lo digo como lo dijo él, porque considero que está bien dicho*. R7

> What I do is always in Spanish. And then I try to translate it to English; I consult texts, magazines and articles that have scientific terminology, then I adapt things to my article. I think it's a copy-paste process. Sometimes I use electronic translators, they give a lot of options. I think the process is hard, in general. Most of the times I use published articles as models. I copy the text and say it as the author did, because I think it's well done. R7

The excerpts above provided insight into the different strategies participants used to address the actual writing while constructing a scientific paper. Issues vary in nature, some relate to grammar aspects, correctness of the language, conveyance of ideas, results and conclusions, while others relate to the use of other authors' work as models, patterns and structures to be followed. The strategies employed by these participants have proven to be of great aid during the writing process. They also contributed to the acceptance of the article by a publishing house. Moreover, these

passages allowed us to have an intimate look at the overall writing process of the scientists in the study.

Most participants, R1, R2, R3, R5, R6, R7, agreed that reading scientific literature and fiction have greatly contributed to improve their writing ability. Understanding, getting ideas and constructing their work based on other authors' writing is a popular practice within this community that has helped scientists to develop a valuable procedure to successfully write scientific papers borrowing phrases from other articles.

R1 stated that he learned to write through reading and paying attention to structures made by other scientists, writers and journalists. He discovered and learned patterns that ease his own writing and give support to his work. R2 used concepts and ideas from his own previous work and from other scientists' as well, and adapted the information to his research. He used both, electronic and human translators to have his whole article written in English, although machines could not transmit feelings into the text and most human translators are not part of the community of practice, which might slow down his scientific production. R3 started his writing with a clear idea of what to do. He devoted some time to carefully think about what he intends to accomplish before he even wrote the first word. Also, he stated to work better when he is under pressure, though he needs a silent atmosphere with no distractions. R3's unique strategy was his children. They helped him improve his writing. R5 also started to construct his scientific paper based on other scientists' work. He provided various ways to describe figures inspired by other authors. R6 stated that he also read as many scientific articles as possible and tried to emulate the language. R7 relied completely on other scientists' work. He also used articles as models and called his technique: 'a copy-paste process'.

Non-native speaking scientists addressed the challenge of writing scientific articles by means of different strategies. Most participants agreed that reading articles from other scientists is a powerful tool that eases their own writing process. This strategy allows them to learn the scientific discourse they need to meet journals' language criteria. In addition, it enables scientists to increase their technical repertoire. Essentially, participants' writing has blossomed by reading scientific papers. They developed ways to enrich their own work using other authors' phrases, imitating the scientific discourse and paying attention to the different structures of the articles. Additional to the improvement of the language, sharing other authors' thinking and work also provides solid support for their own research findings.

The following section deals with the process of publishing an article in a scientific international journal or magazine.

4.4 The publishing process

Publishing a scientific paper is, perhaps, at the top of the different ways of participating in the community. Publishing allows scientists to share their latest work, which in turn allows the community to widen its area of knowledge. It also allows scientists to gain recognition as both: researchers and members of the community. Additionally, publishing serves as a way of contributing to the community's progress; research-based scientific findings have the potential to provide answers to unsolved interrogations and open paths to new ones.

Meeting journal and magazine criteria does not only refer to issues related to science, it also represents another challenge: language mastery. Section 4.3 addressed the challenges scientists faced when attempting to write a scientific paper. It also presented the resources they employed to successfully overcome writing obstacles during the construction process. Having a written scientific article is but half part of

the endeavor: it requires passing editors' scrutiny so it can be approved for publishing.

The coming section presents the challenges participants faced while attempting to have a scientific paper issued.

4.4.1 Issues regarding article submission

Prior sections of this chapter presented assorted strategies utilized by study participants in order to address diverse issues that emerged in the process of writing a scientific paper. These strategies contributed to supply means to accomplish a well-written article. As stated above, a written paper is half part of the process of issuing a scientific article.

At this stage of that process, scientists confronted another challenge: meeting the established criteria of journal editors—which may vary from one journal to another. In addition to issues related to the area of knowledge, editors analyze writing aspects of the article identifying flaws regarding mastery of the language, which might prevent articles from being published. Flawless manuscripts have greater opportunities of being published; thus, a scientific paper might be dismissed due to language weaknesses.

The next excerpts reveal editors' principal motive to reject non-native speaking scientists' manuscripts: language flaws.

> *Entonces se envía, y en muchos casos me ha sucedido que se acepta el artículo, pero tiene que corregirse el inglés y me sugirieron que lo revisara un hablante nativo de inglés. R1*
>
> So it is sent, and in most cases it's happened that the article is accepted, but the English needs to be corrected and they suggested to have it reviewed by an English native speaker. R1
>
> Sometimes the journal editor says: "This argument is not good. Please, you need to explain another way or you need more evidence that what you are saying is true." R1
>
> *Yo hago la investigación y lo escribo en español; después mis colegas lo ponen en inglés. Uno lo envía y espera la famosa respuesta de los editores, el famoso 'rewrite'; párrafos completos uno tiene que reescribir. R2*

> I do the research and write it in Spanish; then my colleagues translate it to English. You sent it and wait for the so-called editors' reply, the so-called 'rewrite'; you have to rewrite complete paragraphs. R2
>
> It's difficult to publish something with grammar mistakes. R3
>
> *Cuando contestaron los árbitros, sí venían algunos comentarios, había errores de escritura que había que corregir. He tenido muchas publicaciones en inglés, algunas duras. Casi siempre han sido permanentes las sugerencias, la escritura no es buena, no es correcta. Siempre en cada trabajo que se envía vienen las mismas observaciones: trabajo mal escrito, hay que corregirlo. Yo creo que eso es lo más frecuente. A veces hay árbitros que te dan alguna sugerencia. Algunos son muy duros. Algunos dicen: "Saben que, no se acepta por muy, muy mala redacción." Entonces dice uno: "Pues ya lo mando a otro lado, donde no sea tan difícil*." R7
>
> When the referees replied, there were some comments, there were writing mistakes that needed correction. I've had lots of English publications, some of them tough. There's always been room for suggestions. The writing is not good, not accurate. Every article sent, always comes back with the same observations: badly written, it needs correction. I think it's the most frequent comment. Some of the referees give you suggestions. Some others are very tough. They say: "You know what, it's rejected due to very, very poor writing." So I say: "I'll try someplace else, where they're not so demanding." R7

The passages above indicated that most of the times scientific papers authored by non-native English speakers were rejected due to lack of language mastery. These passages might also indicate that the content of the articles *per se* complied with the journal or magazine criteria. Thus the main cause of article dismissal was language related. R1was persuaded to contact an English native speaker so he could review the article and aid with language weaknesses. He was also told to include more evidence to support his argument. R2 sometimes has had the necessity to re-write whole paragraphs so his writing could fulfill editors' criteria. R3 stated that scientific articles seeking publication must not have grammar mistakes. R7's experience with editors' feedback has been the same: improve language, article badly written. Article rejection is part of the process of attempting to publish in international journals and magazines. The principal reason of it, for non-native speaking authors, is lack of English mastery. Fortunately, these scientists have the opportunity of having their manuscript reviewed by their peers, who might be native English speakers, or possess mastery of the language. This unique tool has proven to be fruitful, allowing members of the

community to overcome the language barrier and so reaching the goal of publishing a scientific paper in international journals.

4.5 Chapter conclusion

The purpose of this chapter was to shed light on the overall panorama of the scientific community being studied, its members and the various challenges they met in order to gradually change their status from novice to expert members by means of accomplishing publication. The chapter sought to provide answers to the three research questions formulated to this study. Data analysis yielded findings that contributed to the better understanding of the immersion processes of these participants, also it provided comprehensive, thorough information on their different strategies employed to address the challenges of writing and publishing scientific articles in English. In addition, the value and potential of professional networks was highlighted throughout the participants' excerpts regarding seeking help from others.

The following chapter presents the implications of the findings, the limitations of the study as well as its contributions.

CHAPTER FIVE: CONCLUSIONS

5.0 Chapter overview

This chapter presents a summary of the findings of the three research questions underlying this research work, its limitations and recommendations for further research, as well as a reflective account throughout the process of my experience as writer.

> RQ1 Who are these successful scientists who publish in English?
> RQ2 What stages did these experienced researchers identify in their immersion processes as contributing to become experts in their field in this setting?
> RQ3 What specific writing and publishing strategies appear to ease the immersion processes?

5.1 Findings of the study

RQ1 explored the scientists' professional background. As originally thought, its purpose was limited to yielding data about the scholarly growth of the participants, yet, the results it produced surpassed its first purpose. Thus three more categories were created in order to properly classify the data available. There were two notable findings from this research question. The first, revealed the scientists' contact with reading and writing during childhood; the second, revealed the minimum exposure to English language instruction these scientists had throughout their formative years.

5.1.1 Participants' childhood formative experiences

Data collected served to report on the significant education participants received from their parents. Childhood seemed to be a determining stage in the participants' formative years allowing acquisition of the fundamental knowledge that helped them to read and write before attending school. It is worth mentioning that participants in the study were first-generation higher education students—only one of them was a second-generation student.

Early exposure to reading and writing materials and teachings was a common characteristic among these participants, and so was the fact that their parents were the first 'teachers' they ever had. R5 recalled being surrounded by books since he was little: "…there were always books at home from my older brothers". R4 considers his mother as the most influential person in his childhood: "…my professional formation comes from the attitude my mother had with me. It was determining in my life."

The significant exposure participants had regarding reading and writing contrasts with the little contact they had with English language instruction, not only limited during their childhood, but also through higher education.

The next section presents participants' relation with English in formal education settings.

5.1.2 Little or late formal English instruction: the restrictions

Contrary to participants' early exposure to essential first-language abilities, English instruction occurred either late in their formative years or it happened at a minimum level. As reported in section 4.1.3 most of the participants reported the same situation: they had none or very little formal English language instruction in school. The lack of thorough English instruction was a limitation that led to complications later on in their professional careers hindering—or delaying, in the best scenario—possibilities of research, work and study overseas. R3 referred: "When I was trying to go abroad to do my masters' I couldn't because I was not able to speak."

Scarce mastery of the international language for dissemination of knowledge is a gigantic limitation for individuals seeking publication and the center of a scientific community. English deficiency could restrict scientists' contributions to their science; it could also restrain their networks as well as their possibilities of writing articles for publication and membership.

On the other hand, command of the language is a tool that expedites the immersion process empowering individuals to accomplish membership, to work collectively with colleagues around the globe thus creating networks and to publish in English contributing to the overall progress of the community. The latter represented a challenge for non-native speaking scientists who managed to have a number of strategies to face this situation.

5.1.3 English writing and publishing strategies and practices

Participants employed diverse means to address the process of writing and publishing a scientific article (see section 4.3.4). Multiple strategies allowed them to obtain different results: acceptance of article manuscripts by journal and magazine editors and eventual publication. Establishing relationships with colleagues allowed them to initiate collective work, which ultimately produced networks. Through networks, the scientists managed their English language needs by having native speaking colleagues, or fluent users of English, review manuscripts and help them with language-oriented issues.

In addition to proper, accurate usage of English, the scientists faced the challenge of writing in a manner acceptable to the community: achieving scientific discourse. The participants relied on emulative strategies to meet the established scientific discourse of their community. All participants in the study acknowledged referring to other authors' writing to imitate the discourse and include whole phrases of other texts in their own writing process. The participants emphasized the benefits of reading other scientists' work as means to improve their own writing ability, learning to use—as foundations of their article construction process—their peers ideas and expressions.

CHAPTER FIVE: CONCLUSIONS

After facing the challenge of writing their articles in English, the participants' manuscript was a subject of another analysis: that of the publishing houses editors. Non-native speaking scientists' manuscripts are often questioned and even rejected due to language flaws. As a matter of fact, the participants mentioned having experienced this sort of situation a number of times when submitting manuscripts throughout their professional career (see section 4.4.1). The scientists sought to avoid this downside using peer-review, yet, editors' rejections might still occur; if it did, the scientists had the opportunity to submit the manuscript again observing editors' suggestions. In the event that editors' criteria seemed harsh. R7 had a last-resort strategy: "I'll try someplace else, where they're not so demanding."

Data from participants' curriculum vitae (CVs) revealed that their first publication was in Spanish in a Mexican journal—with the exception of R4, whose first publication was in Cuba as a degree requirement. Data from the CVs also evidenced that scientists started to publish in English co-authoring usually with their doctoral thesis directors.

The participants' writing and article construction processes evolved and improved from the time they depended on a mentor to the time they became capable to write their own articles. Data analysis shed light on the process of writing a scientific article, indicating that when engaged in this enterprise, participants did not write the article in a fixed fashion. Therefore, some scientists might start with the introduction, while others with the general argument of the research work. Whatever procedure the participants favored, it is clear that their way of doing it had developed over the years, sometimes with the help of more expert members of the community, resulting in greater possibilities for publication.

Scientific writing generated a number of feelings while scientists were on the process of constructing the article.

5.1.3 The writing emotions

The writing process of a scientific article also caused feelings among participants, in addition to the diverse challenges it might represent. Varied, mixed feelings such as: enjoyment, happiness, frustration, ridiculousness, exhaustion, relief, restlessness, excitement and satisfaction were among the ones recalled throughout the writing process. Feelings could be classified in two broad categories, positive and negative feelings. Positive feelings might have the potential of encouraging individuals to work, while negative feelings might decelerate the process of reaching their objectives, yet R3 discovered in adverse feelings a driving force that encouraged him to improve his writing. The probable cause for these feelings might reside on the different requirements a scientific paper must meet: a research project attractive to the international community, submission date, and flawless of language—the most pressing requisite for non-native speaking scientists. Maintaining these mandatory details in mind could result in the creation of various feelings on the writers.

Mastery of the language, writing, and publishing scientific articles in English were significant tools that eased participants' membership in their scientific community.

5.1.4 Networking: learning as socially constructed

Individuals seeking to be at the center of their scientific community must go through different stages to change their status from peripheral to core members. This evolution in the community is known in this study as: immersion processes. A vital stage within this process is participation. Participation in the community allows its members to learn the every-day activities that take place, additionally; it produces

relationships among members, thus creating social bonds. With this interaction, members have the opportunity to reach overseas colleagues resulting in international cooperation, and, eventually, in the creation of networks. Particularly for this cohort, networks served as a means to communicate and work with English-speaking colleagues producing a number of benefits for these individuals: know about other scientists' research; work together in investigation projects, share knowledge and experience expanding scientific progress, and namely, networks provided resources for participants' fulfillment of flawless writing in scientific articles and eventual publication.

This interaction among members of the same international community promoted mutual cooperation, interaction, understanding and learning, which is "an intrinsically collective and collaborative process" (de Saint-Georges & Filliettaz, 2008, p. 215).

5.3 The reflective account

As part of my thesis, I want to state my personal experiences in the fulfillment of my thesis project. My reflection considers three stages of the research project: a) the origins of the research, b) the project development period, and c) the personal changes I experienced as the outcome of this scholarly work.

Doing a thesis project is the major requisite in order to receive a university degree. It might also be the most challenging and an activity that is subject to procrastination. Having to select one research topic to work on among the vast issues of a particular science is an arduous task. I was lucky enough to be asked to collaborate doing interview transcriptions for an actual research project. Two of my M.A. teachers allowed me to use the data they would collect for my own thesis project.

CHAPTER FIVE: CONCLUSIONS

As I started with the transcriptions, I became more involved and interested in the life and achievements of these scientists— I enjoyed listening to some very meaningful and touching anecdotes. Additionally, I was amazed at how these scientists forged their way in life. I simply think they all are awesome people and worth following their life examples of perseverance and hard work.

Having the opportunity of getting to know about the life and deeds of these individuals (who usually work with top scientists in great experiments in many parts of the world) was an incredible and profitable experience. The journey of writing this project from beginning to end has represented both a challenge and an accomplishment. Prior to this scholarly involvement with my M.A. teachers, I did not have any notions about communities of practice, nor that there would have stages that provide members with the necessary tools to evolve their scientific capacity to ultimately reach the center of the community. Reading Wenger's Communities of Practice (1998) book was very useful in the comprehension of that concept; it was certainly an asset to rely on throughout my writing process. Once I became familiar with the CoP concept, I began to notice it in even the smallest clusters of people. I remember observing a group of merchants and the different activities each member performed. At that moment, I could discern the individuals' roles being executed as illustrated in the book. I was able to understand the theory in a deeper way increasing my consciousness of the immersion processes of my study participants. The many meetings and the electronic communication I had with my thesis advisor were also highly fruitful; they guided me through all my writing process, helped me to understand certain theoretical aspects, and to clarify doubts and the aims I intended to achieve.

Experiencing a process of this nature, with the people who were part of it—teachers and participants—has certainly meant significant learning in my personal and professional lives. First of all, knowing about participants' background and family served me as a clear example of unflinching determination: a sort of determination I want to apply to my life. Second of all, this process helped me reconsider my concepts of 'a scientist' and synergetic work. I had the notion that scientists were isolated people, wearing glasses, messy hair and a white coat working all by themselves in a laboratory surrounded by all sorts of equipment and scientific notes. By listening to the interviews and reading the transcriptions I realized I was wrong: based on my work, I can state that scientists, at least the ones I worked with, are among the most cooperative, and collaborative professional people. This new idea of 'scientist' is rather linked to the latter concept: synergetic work. I was aware of the meaning of synergy, however I had not had the opportunity to see its full potential put into use before. I witnessed how combined cooperation among scientists, working in different places, even countries, produced greater benefits for all the individuals involved in the enterprise, *i.e.* a research project. I can now affirm that these scientists are sociable beings that understand and value the worth of synergetic work through the use of networks and social relationships existing within their community.

After finishing this research project, I do not consider myself the same. There has been growth as a person and as researcher. I now possess actual research experience and a desire to continue doing investigation and improving my professional development.

The state of being free of flaws or defects is a difficult to reach enterprise, especially in a research project. Different sets of eyes might identify various weak

points in this study. The coming section presents the limitations associated with this scholarly work.

5.4 Limitations of the research

The major limitation of this study was the number of participants (seven). The results were limited to this particular cohort, for these two specific fields of knowledge—Physics and Mathematics. Another limitation relates to the writing strategies participants mentioned. In order to obtain more trustworthy results, more data about participants' writing strategies is compulsory. However, the limited data was due to participants' restricted availability of time.

Identifying and knowing weak points of a research project might serve to strengthen future efforts seeking greater understanding of the problem concerned. The following section deals with suggestions for coming research.

5.5 Possibilities for further research

As stated in the limitations section above, further research would need to increase the number of participants, resulting in the provision of more reliable data for more complex and complete analysis. Regarding the two scientific areas investigated, it is probably a good idea to focus only on one, so it could be understood and analyzed in greater detail and, even explore if the results obtained can be applied in different areas of knowledge with the same, or better, outcomes. Also, questions addressing exclusively the particular issue of writing strategies would need to be included in an additional round of interviews.

Some of the findings of this study could inform English language teachers about these scientists' writing and publishing practices, in order for them to design and develop workshops, courses and materials to support these processes. Additionally, findings might provide non-native speaking scientists seeking to write

and publish scientific articles in English with meaningful resources to manage such undertaking, nonetheless, this sort of information is limited in the manners above discuss. Thus, another possibility for future research might address the development of a program to implement and evaluate in real-life situations the writing strategies provided by study.

5.6 Conclusion

As mentioned in the introduction, knowledge is in motion and constantly evolving. People dedicated to science are the ones that make this possible. Learning is a given in this process. Novice members of a community learn what expert members are willing to share. Individuals seeking to learn, grow and become wise need to associate with wise and knowledgeable people. Modeling other authors' work is a favored practice among participants in this study that leads to improvement of functioning, outcomes, and to the eventual achievement of writing and publishing scientific articles in English.

Networks are also fundamental to the writing-publishing process of scientific texts. Furthermore, networks connect colleagues around the world providing assistance to non-native English speaking scientists with language and science issues. Additionally, networks nurture cooperation and collaboration among scientists. Ferguson (2011) contends that all creation requires influence. We learn by coping others; we emulate to acquire knowledge. All great work is the outcome of someone taking existing material and transforming it into something new: everything we create is a remix of existing creations (ibid). In the same vein, Shenk (2014) dismisses the conception of solitary genius by proving that our finest art and science come from collaboration. Modern knowledge is based on the use of pre-existing ideas, their

transformation and combination: creativity is a social process (Ferguson, 2011; Shenk, 2014).

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