Chapter 13

Facilitated Immersion at a Distance in Second Language Scientific Writing

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With the emergence of English as the dominant language of international science (Ammon, 2001), non-native English-speaking (NNES) scientists who have not had extensive experience in an English-speaking country are caught in a bind. To participate in international science — that is to communicate findings and discuss latest research developments, methods, and theories with colleagues in their specialties globally — they need to have written and spoken fluency not only in English, but the scientific English of their specialty, with the idioms of the specialty that both signal expertise and facilitate rapid, precise mutual understanding. That is, they need a clarity and univocality of expression using the specialized lexis and phrasing so as to make their ideas understood with enough ease so to allow the readers to maintain focus on the scientific issues rather than problems of language and translation. No general course in English, nor even a specialized one in scientific writing, nor even one that uses authentic materials and tasks, can provide enough depth in the language of their specialty. Nor can any course provide enough hours of motivated practice of sufficient challenge to develop the level of competence and fluency necessary for high-level participation in their specialty in English. Language courses can only provide preparation and support to facilitate actual practice in immersive situations, but at some point, those immersive situations must become the site of writing practice and development.

The bind goes even deeper, in that learning and doing the science within a particular linguistic context is the actual means for learning the specific language that embodies the ideas and reasoning of the field. Conversely, gaining ease with the language is also gaining facility in recognizing and formulating the thinking of the field.

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The language is a means of talking about and expressing what one is doing, elaborating specialty-appropriate thought and argument, so one learns the language hand in hand with doing the science. This is a process even native speakers must go through as they move from introductory courses to the more intense, nuanced, and refined discussions of graduate work and then practicing science, situated not in the authoritative certitudes of lower schooling, but the emergent, uncertain, and contended world of the research front or unsolved applications (see Prior & Bilbro, this volume, for elaboration of the academic enculturation process.). Second language speakers, even though they may be highly talented and have advanced in their science as far as schooling and scientific practice in their native language allows, may be able to access the most current finding and ideas, as well as the most current framing of research questions only within international discussions likely to be in English. Since most specialties of science are conducted as international inquiries relying on international communication, communicated in English, full participation is dependent on the ability to read and write scientific English with a nuanced understanding of the language of the specialty. Of course, this problem is most severe among graduate students and scientists working within languages that have only regional presence (such as the Eastern European languages), but even within scientific communities using the largest and most robust international languages other than English (such as Spanish and Chinese), students in many disciplines must learn to read the English language literature of their fields, and publication in English becomes an important advantage, if not a requirement as their careers progress (see Meneghini & Packer, 2007, for a recent discussion of this problem with alternative solutions). The language shift disrupts their ability to talk and write about what they already know and places obstacles in engaging in and learning from the most advanced discussions (see Chitez & Kruse, this volume, for the complexity of scientific cultures and the role language plays in it).

The language difficulty may have a further effect of increasing anxiety about one's ability to participate adequately and not be judged poorly, an anxiety that further impedes the ability to step forward into the discussion to advance one's science and one's experience as a scientific communicator. The problem is further compounded for those who have limited opportunity to participate in international laboratories, and must learn to participate in international English medium science at a distance, only through the virtual worlds of texts and the Internet (setting aside further issues of connectivity and bandwidth). In short, those at the fringes of English language international science must make the most of limited and distal opportunities to interact.

In this chapter, we offer some conceptual resources to understand the challenges facing NNES scientists in participating international scientists. We then describe an intervention we developed to help a group of Mexican scientists to face these challenges. The concepts and intervention were based on a research study of the attitudes and histories of NNES scientists who have successfully been able to publish regularly in English (more elaborated findings from this study are to be found in Keranen et al., in press, and other forthcoming publications).

Prior Studies of the Position on L2 Scientists

A growing literature in English for Specific Purposes and English for Academic Purposes has examined the difficulties and strategies of NNES scientists attempting to publish in English. Flowerdew's series of interview studies, in particular, reveal both the dilemmas and strategies of NNES scientists needing to publish in English despite limited English writing abilities. Flowerdew's initial quantitative survey (1999a) and a follow-up interview study (1999b) identified obstacles faced by Hong Kong scholars in making effective arguments in English, including limited vocabulary, rudimentary style with little nuance or flexibility of expression, with special problems in introductory and discussion sections along with qualitative articles in general. In a further in-depth study of a single subject in attempting to publish a single article, Flowerdew found that the obstacles went beyond language proficiency, to difficulties in maintaining ongoing engagement with the relevant research communities (2000). The subject had done both his masters and Ph.D. work in an English-speaking country and had substantial comfort in English as well as some of the specialized lexis and locutions of his field, though his eventually accepted essay did need some language revisions. The greater revisions, however, concerned the structure and argument, issues not that different from those faced by L1 scientists seeking their first publications. The revision process, however, was exacerbated by the distances and communicative obstacles, including lack of access to his advisor. Flowerdew invokes Lave and Wenger's (1991) theory of communities of practice to explain the problem of being on the periphery without regular communications that would support legitimate peripheral participation (LPP), despite extended experience within an English-speaking research unit.

The problem of being at the scientific periphery again surfaced in Flowerdew's (2001) interviews of applied linguistics journal editors. Although these editors were sympathetic to the plight of NNES scholars and provided editorial support, they found difficulties with submitted manuscripts not just at the surface language level (which could be remedied by editorial support) but also with parochialism and absence of authorial voice, both of which could have their origins in the limited engagement with scholarly discussions. Nelson and Castelló (this volume) consider in AU :3 greater depth the difficulties in developing academic voice. An even greater obstacle to engagement occurs when editors and reviewers stigmatize the capabilities and quality of work of writers whose texts show evidence of EFL difficulties (Ammon, 2000, 2001; Curry & Lillis, 2004, 2009; Flowerdew, 2008; Flowerdew, 1999a; Li & Flowerdew, 2007). Authors' perception of stigma creates a further psychological burden (Flowerdew, 2008). Similar problems have been found with Korean scientists (Cho, 2009) and Spanish-speaking scientists in Spain (St. John, 1987) and Mexico AU :4 (Englander, 2008, 2009).

In order to overcome these difficulties and to begin to engage in international science, some NNES scientists have been found to use a variety of techniques and strategies that indicate they are not just victims of marginalization. Rather, they can be self-conscious, strategic, persistent actors (Belcher, 2007; Okamura, 2004, 2006)

attempting to improve their position and interaction within a social system through a variety of supports. Some of the supports include seeking the help of other people who can assist them in overcoming the language barrier, such as editors and proofreaders (Burrough-Boenisch, 2003; Flowerdew, 2001; Harwood, Austin, & Macauley, 2009; Li & Flowerdew, 2007; Lillis & Curry, 2006; Misak, Marusic, & Marusic, 2005.) The contributions of editors, however, sometimes lead to significant changes in text and intention (Hartley, Branthwaite, Ganier, & Heurley, 2007).

Other strategies involve attempting to understand the norms, genres, practices, and patterns of language use within the articles in their specialties (Buckingham, 2008) and developing reading strategies that overcome language difficulties (Burrough-Boenisch, 1999). One language-based strategy is to reuse phrasing found in the literature — this ranges from writing new sentences and sections using sentence and phrase patterns used by other authors to patching together existing phrases (or "patchwriting" as termed by Howard, 1993) to totally copying of entire sections, varying only to present their specific methods and findings (Abasi & Graves, 2008; Flowerdew, 2007; Okamura, 2004, 2006; Pecorari, 2003) AU :5

On the other hand, others have a more passive attitude, not understanding their challenges and not seeking to improve their language skills and engagement, thereby entrenching their marginal positions (Wang & Bakken, 2004).

Our Larger Project

The ideas and applications presented in the remainder of this chapter were developed in conjunction with a research study (described more fully in Keranen et al., in press and other forthcoming studies) aimed at understanding how some NNES scientists nonetheless come to have successful publication careers in English. For this purpose, we conducted a series of interviews with professors and graduate students in physics and mathematics at a major research university in central Mexico. These researchers and theorists were at different stages of their careers, from young researchers just starting out to publish internationally to senior scholars with long lists of international publications. What we found among our interviewees were varying histories, but most containing increasing interactive engagements with English language scientists early in their careers, which bootstrapped their opportunities to learn and practice English in the context of their science. These included international residencies early in their careers, working in English-speaking laboratories and regular attendance at international conferences. They also reported continuing collaborations with international English-speaking teams along with ongoing correspondence with English-speaking colleagues. While some had near native English fluency, others reported regularly having difficulties in English, ranging from patterns of errors to difficulties in expressing ideas clearly — but those with difficulties relied heavily on their collaborators and editors to either produce or correct the prose. High levels of English language publication seemed to correlate with higher levels of immersion in social and collaborative networks of English

language scientists, who provided language opportunities and support as well as scientific. Those earlier in their publication careers were just starting to build those networks and engage in such interaction.

In a workshop based on our analysis of these findings, some of the participants had barely begun this international engagement and showed the kinds of problems described elsewhere in the literature: limited language skill, lack of confidence, obstacles to publication, little conference attendance and little visiting experience in English-speaking labs and universities. While they had advanced well within the academic word of Spanish-speaking Mexican undergraduate and doctoral programs, and also were able to read research publications in English, they had not found a way to enter into the international communication system. They also seemed to lack much of an understanding of how to proceed to engage in international science and seemed to suffer from a kind of timorousness and passivity (as Wang & Bakken, 2004, noted in their subjects). In short, the non-publishers were at the social margin while the high English publishers seemed immersed in the world of international science.

The Problem of Immersion

As the study and workshop developed, we found it useful to describe the fundamental problem as one of gaining immersion in the rich and motivated language experiences that would lead to further specialized L2 language learning that would then support further immersion and engagement. NNES scientists seem to have high practical, experiential and emotional barriers keeping them from those bootstrapping interactions that would lead to communicative fluency and publications, and they need to find ways to overcome those barriers. Those that have overcome these barriers have had fortunate early experiences that have helped move them from the periphery to more central roles in the relevant networks of scientific activity of their field — where they are able to further build their knowledge, language skills, and engagement with cutting edge problems.

In second language learning, Krashen (1981) has hypothesized that the amount of comprehensible input within intensive interaction (which would be concomitant with immersion) facilitates fluency and high levels of performance. Similarly, Long (1996) has hypothesized that interaction is central to acquisition. Schmidt (Schmidt, 1983; Schmidt & Frota, 1986) also has long argued through detailed case studies that while high levels of interaction facilitate fluency, targeted instruction still has a role in focusing attention on grammatical precision. While such studies consider the degree of learning under immersion conditions, they do not examine what immersion means, what its social mechanisms are, what drives people to engage in it, and how immersion is experienced by the language learner (Cummins, 1998). Immersion has also been invoked as a justification for various Internet-based innovations that support engaging interaction between second language learners and native speakers (Oliva & Pollastrini, 1995), but again, there is little consideration of the meaning of immersion. A few topics

within the applied linguistic research world do bear some relevance — such as the value of time on task (Collins, Halter, Lightbown, & Spada, 1999), frequency of processing (Ellis, 2002), and correspondingly the amount of input and output; yet, even these tend to be studied only within a controlled classroom experience.

The concept of dual immersion has, similarly, been adopted as an innovation in primary and secondary education, originally developed to meet the particular cultural and political needs of Canada, but adopted in many other regions with a variety of heritage languages (Johnson & Swain, 1997). Dual immersion (where students study at least two languages both of which are used throughout the rest of the curriculum) is largely defined by school hours using each language and other curricular measures. The benefits of dual immersion have been documented with educational assessments (Cummins, 1998), and the sociopolitical dynamics on the effectiveness of dual language for immigrant children have been examined (Valdes, 1997). Yet, the social and psychological processes that form the immersive experience remain little understood.

A lack of in-depth understanding of immersion limits our ability to consider ways to help people engage in it — particularly adults who face obstacles to naturally occurring ambient immersion. Further, since few NNES scientists have the opportunity or resources for extended residencies in L1 English-speaking scientific environments, it would be useful if we could find ways to consider how interactions at a distance through traditional print and newer digital technologies could provide some degree of immersive experience at a distance. As we will elaborate below, we believe immersion is constituted on both a psychological and a sociocultural level. Accordingly we will examine the psychologically based studies of immersion that have arisen out of the virtual realty and gaming worlds, sociocultural theories from education, and sociological studies of the organization of science. We will then draw an analogy to social networks to synthesize these strands and apply them to the interactions at a distance available to the NNES we studied. We end with a description of a workshop we designed on the bass of this analysis.

Research into Immersion in Gaming

As the study and workshop progressed, we found ourselves using the analogy of immersive virtual reality to consider how one can become immersed in a situation not physically present, When we in fact investigated the literature on computing and virtual reality, we found research that associated an intense immersive experience with a sense of presence (Dillon, Keogh, Freeman, & Davidoff, 2000; Freeman, Avons, Pearson, & Ijsselsteijn, 1999) or actually being in a live, materially embodied situation AU :6
(Pine & Gilmore, 1999). This idea of potentially very broad application has been most AU :7
explored with respect to digital gaming. The gaming literature perceives the concept of immersion as underdefined, but has begun to explore its psychological components (Brown & Cairns, 2004; Ijsselsteijn, de Kort, Poels, Jurgelionis, & Bellotti, 2007). AU :8
Interviews with gamers reveal three levels of involvement: engagement, engrossment

and total immersion (Brown & Cairns, 2004). The first level of engagement requires access (including the necessary skill to participate) and the desire to spend time with the environment, which in gaming is associated with the task being interesting and providing adequate response and rewards to the players' actions. Engrossment, the second level, adds an emotional component that is correlated with an investment of time, attention and effort, giving rise to a state of concentration described as "zen-like" and that leaves one drained after stopping. In the final stage of total immersion, the players lose sense of the reality around them and all they think about is the game; moreover, this tends to happen only when they empathize with the game characters, seeming to take their part or transfer their consciousnesses into the character. The authors associate these higher levels of involvement with the concept of flow (Csikzsentmihalyi, 1990).

Ermi and Mäyrä (2005) and Douglas and Hargadon (2000) also associate AU :9 immersion with flow and identify three components contributing to high degrees of immersion: sensory, challenge, and imaginative. Challenge exists in relation to level of skill, pushing one's limits but not beyond, as in the Zone of Proximal Development (Vygotsky, 1978). High levels of challenge are also associated with high use of working memory, taxing one's resources (Grodal, 2003).

Several authors have also noted the importance of familiarity of environment or "discernability" allowing the player to recognize the meaning of stimuli and the anticipated effect of their actions (Douglas & Hargadon, 2000; McMahan, 2003; Salen & Zimmerman 2004). This is also a theme of flow research that sees necessary conditions as skill, challenge at the limits of skill, a recognizable and limited environment, and rewards coming directly from actions (Csikszentmihalyi, 1975, 1990). Within flow states there is rapid problem solving and maximum learning. This coordinates with neurological findings that associate learning with heightened emotional states (Hinton, Miyamoto, & Della-Chiesa, 2008). But if there is little appropriate skill, worry, or anxiety sets in, interfering with engagement, and if there is little challenge, boredom or relaxation may keep engagement low, mitigating the kind of attention that would lead to learning and deeper involvement.

Immersion in Language Learning in Real Life

So what does this gaming research have to do with language learning? Of course, this research about gaming is seeking to recreate the kind of presence that occurs in real situations where flow occurs simply by being part of the events that surround us. The prototype of language immersion is an adult second language speaker living and working in a second language situation in which all transactions must be carried out in the second language. One must constantly listen, speak, read, and write in the second language and give up dependence on the first language. Beyond time on language learning tasks and extensive practice, one's interactions are framed in the second language — directing one's thought, motives, and spirit toward a way of life within that second language.

When we negotiate meaningful life activities, we are fully attentive as we produce language to meet challenges that provide us immediate feedback and rewards. Further, most of us (not having delusional dissociation) identify with ourselves in our actual situations even more than we do with the most engaging fictional game characters. Our communications are accompanied by the many emotions of success and failure of interaction. Fortunately, the good will of interlocutors and the flexibility of situations often allow us to repair failures and to improvise alternative solutions — both of which support maximum learning. As we warm to situations, language may flow, and we produce more meaningful language than we thought possible. As situations succeed, our attention turns more to the engaging, immersing activities that motivate us and less to the language that was a barrier.

All this is consistent with what the gaming research tells us about the psychological attention and emotions associated with immersion. However, real situations are composed of social relations and activities and not just synthesized audio and video, and we have important material and social stakes in the outcomes of the interactions. As very young children, we may be shy in front of others, but most of us learn to stand straight and give socially acceptable responses. While many of our interchanges may with time become routine and unchallenging, we seek spontaneity, discovery, and fun through friendships, play, and engaging works. When we are met by challenge, our language grows as we incorporate language we hear around us, discover new things to say, and reach toward new formulations and ideas. If we are not overwhelmed and far beyond our skills (which may leave us worried or even anxious and less able to think), we enjoy the thought and excitement so we do not feel the work — rather we are attempting to relate to others and communicate with them at the limit. As our social networks grow, so do the variety of relations, differences in roles and activities, linguistic needs, and the possibilities of growth and discovery.

Particularly as we interact with specialized groups with unusual activities requiring special knowledge and language skills, we can become engaged at ever higher levels, once we get past the entry barriers of skill, knowledge, and anxiety. This process of entry, particularly in inviting communities of specialized practice and language, has been captured well by communities of practice that provide limited participation roles for newcomers, which Lave and Wenger characterize as LPP (1991). Such situations provide pathways for novices to take on greater roles and responsibilities as their skills and confidence build — a gradient of participation that correlates with engagement and challenge.

Language interactions are particularly well characterized by this LPP model as language use is typically constructed dialogically with interlocutors who are supportive in accommodating and calibrating to the language competence of the less skilled speaker — within material circumstances that themselves provide deictic support. As language skills grow, both participants are able to enter into more articulate, delicate and complex communications. Increased language skills will likely lead to increased interaction with more speakers of the language, as one enters the community of practice. This can also be described in network terms as building more and denser connections with larger groups of people (or nodes), thereby moving one more centrally into the network with all the increased information and practice that

is likely to come with that (Breiger, 2004). In these various ways, linguistic immersion provides especially sensitive mechanisms of moving from peripheral participation to centrally engaged skilled communication within large networks of interlocutors.

Immersion in Groups with Barriers of Social Evaluation

Of course, not all groups are inviting and open. Some set up barriers to the uninitiated and stigmatize them in ways that impede participation and growth. The uninitiated may be left at the margins with only the initiated being given access to consequential events. We can see this in sciences that make judgments about the skills and knowledge of people who want to participate, even at the fringe. Pathways to higher levels of participation are usually mediated through educational and mentoring processes, employment in laboratories and academic departments, and meetings and publications — access to all of which are likely to be controlled by gatekeepers (Merton, 1973). Initially, processes of induction may be impersonal in the form courses and exams (though even student activities are mediated by language and writing, both in discussion and in exams). These entry points eliminate many from further engagement, through both formal evaluation and self-selection influenced by formal assessment. As induction continues, the processes become more personal in small seminars and tutorials, working in labs together, attending meetings, and collaboration on papers.

Each of these steps advances one's knowledge of science and the language of science and adds intellectual challenge and emotional commitment as one becomes deeply engaged in problem-solving work with close colleagues. While big rewards may be rare in terms of major discoveries, every time a piece of equipment works, an experiment produces results, a set of equations make sense, or a calculation is correct, one receives an intrinsic reward, pushing one further. Immediate and socially intense rewards come from every successful conversation where scientific information, ideas, and thinking are interchanged. The stories of the pleasures of intense discussion are legion as well as the excitement that comes in collaborative thinking. The possibilities of having smart colleagues one could learn from and share ideas with influence both new and experienced researchers in make choices of where to work and which conferences to attend.

The more elaborate rewards of successful experiments, discoveries and theoretical advances are the consequences of collaboration and communication, and these successes provide access to further opportunities to communicate and work with others in a process labeled the Matthew Effect (Merton, 1973). Citations are outward manifestations of the circulation of one's discoveries and theoretical innovations throughout the network and provide another level of reward (Merton, 1957) and credit for playing the game at a higher level (Latour & Woolgar, 1979). Citation and co-citation networks indicate one's place within various conversations of the field and one's relation to other researchers (Griffith, 1974; Small, 1973; Small & Griffith, 1974). That in turn can generate more communication and network density. The adoption of modern practices of citation beginning in the late eighteenth century has

been explicit strategy to draw scientists together in social cooperation through intertextual networks (Bazerman, 1991; see also Bazerman, 1993 for how the representation of such networks show rhetorical intention.)

We can think of the process of entering into the engaging communications of science in terms of an emergent and evolving network, where communication, achievement, and recognition are intertwined as one becomes more intensively involved in the work of science. Every successful communication strengthens existing connections and builds new connections, drawing one further into the flow of information and ideas — as well as building skill and confidence (see Nelson, 2008, and Rinck & Boch, this volume, for reviews of research into how students learn to engage with academic intertextual systems.) Psychologically, as one becomes more connected, not only does one feel rewarded, but one's mind becomes more and more engaged by the work of the field being carried out in the network to which one is contributing. Scientists most connected and most central within the networks are most intensively involved in contributing to or communicating with others about the latest work and to have access to the most resources. They are most likely to be described as people who "eat, drink, and breathe science."

One unusual aspect of this network is that it depends on the positive actions of the participants — most specifically their communicative actions. Communicative actions, particularly written communications, often have a thoughtful self-reflexive design and require conscious initiative. Beginning to write is always a conscious choice and effort, even though the words may sometimes flow rapidly as the difficult problem falls in place. Spoken interactions may have more of a sense of spontaneous flow, as thoughts that have been on one's mind resolve and words tumble out. Yet, these are words laden with thought and significant information for the problem, and they are new formulations that extend one's communication potential.

NNES scientists working in a non-English setting, however, frequently have many barriers to being well connected in the network, including the necessity of working though written language without the immediacy and spontaneity of spoken interaction; having fewer and more distant professional connections; feeling stigmatized for language and for being at the periphery; and not being energized by the most current problems. These barriers mitigate the information, energy, focus, and spontaneous cause for action that scientists get from being more central in the network. In sum, NNES scientists' attempts to connect to the network are likely to be through written language, which facilitates precision, reflection, and strategic action because it is visible for careful and repeated examination (Goody, 1977), but which is also conscious, effortful, and anxiety provoking.

These scientists would gain by reflectively understanding the dynamics of networks and their position within them, so they could reach out strategically and act in effective ways. Also, they need to seek all the supports they can get and use them efficiently to make the connections that will give them the practice, motivation, interest, and opportunities to develop as international communicating scientists in English. Because they may have few well-connected sponsors, their writing must be more self-sponsored and self-directed (for the concept of writing sponsorship, see Brandt, 2001).

A Workshop to Support Self-Directed Immersion at a Distance

Traditional language instruction including English for Specific Purposes establishes a precondition to the actual engagement and practice that will build fluency and competence, but then engaged practice is needed within highly motivating situations to develop the fluency and precision needed for full participation. To foster self-monitoring and self-sponsored reaching out, we developed a five-day workshop for about 15 physicists and mathematicians at a major research university in central Mexico who were interested in increasing their English language publication. All of the participants had substantial English language instruction and were able to read articles in their specialty in English. Their oral and written skills in English varied from struggling to near fluent. Several of them as well were multilingual, as immigrants or having had residencies in various European and Asian countries. Yet they all found barriers to their international publication in English. The main goal of the workshop was to increase self-directed immersion and to provide strategic supports, including self-guided tools for specialized language learning and editing. Each day included hands-on composing and editing activities, including peer group processes.

The first day was devoted to the presentation of the concepts of immersion and network engagement (in both Spanish and English, as well as any other languages they may have worked in), which we then explored in relation to their professional experiences. In this day and each subsequent one, we presented our data including quotations from the interviews to foster discussion.

The middle three days considered supports that could be used to develop appropriate contributions to disciplinary communications: the literature, digital language tools, and collegial interaction. One subtheme of all days was that different supports were useful at different points in one's learning, and one should learn when to let go or transform the use of some supports, and when to seek new supports. Day two considered what one could learn from examining other articles in one's field beyond the actual findings or intellectual content. We looked at how to analyze the textual argument structure of varieties of scientific writing, including genre organization and function; the way evidence, theories, and reasoning were presented; and intertextuality in relation both to reference and to use of specialized language.

The third day focused more centrally on digital tools to support language, with a particular focus on precise and appropriate phrasing within the scientific context. Phrasing is a struggle for advanced second language writers, as they many know what is correct and even idiomatic in most circumstances, but they have difficulty in expressing their scientific reasoning in a way that would be understood precisely and accurately and would not leave them with the stigma of awkward second language expression. We considered the strengths and weaknesses of spelling, grammar, and usage checkers and how their suggestions need to be monitored and used heuristically. We also explored the various search engine tricks they used, such as seeing whether certain phrases were used frequently and in what meaning contexts. Following the work of a number of applied and corpus linguists (Charles, 2007; Flowerdew, 2005; Gilquin, Granger, & Paquot, 2007; Hafner & Candlin, 2007;

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Krishnamurthy & Kosem, 2007; Lee & Swales, 2006), we then examined specialized corpora, such as PERC (http://www.corpora.jp/~perc04/), and one we assembled from English language articles in the *Revista Mexicana de Fisica*. We then presented procedures to create personalized corpora using texts most relevant to one's specialty and the genres one is working with, using for analysis the open access program ANTCONC (http://www.antlab.sci.waseda.ac.jp/antconc_index.html) (see also Anthony, 2006).

Most controversially, we examined the value and uses of various machine translation programs. We all recognized the often comic inadequacy of current machine translators and the problem of evolving specialized terms and phrasing within research front areas. Yet, we all abashedly admitted our heuristic uses of them, such as to get quick and dirty first pass approximations, to identify possible terminology and phrasing, to catch spelling and morphology of loan words, and to avoid false friends. We also were aware that translation tools were constantly improving, though none was likely to emerge soon with a true understanding of meaning or with the interpretive frame of a specialist in a scientific field. We did double translations of short passages from Spanish to English and back to Spanish to highlight the strengths and weaknesses of current programs. We again discussed reflective use and ultimate responsibility for revision and editing no matter what tools or supports we may use.

The fourth day, to review the practical implications of all we had worked on, we began with a discussion of the revision and editing processes used by the various participants. From there, we discussed the various human and personal supports that were part of an extended composing, revision, and editing process and the different contributions they might make to our writing. From the educational contexts of seminars, faculty mentoring, and writing centers, we moved to the composing dynamics of collaborative groups, in both local labs and large international teams. We considered the problems and benefits of paid editors and translators (whether employed by the laboratory or hired personally) and again how these could be used as opportunities for growth rather than substitutions for individual responsibility. We considered the potential roles of local and international colleagues, discussion groups, and journal review and editorial processes. With respect to each of these, we considered how to build dialogue and networks of communication and support.

On several of the days, we did demonstration consultations with individual authors, working on the revision of manuscripts. Some of these consultations were conducted by the workshop leaders, and others were carried out virtually with science writing tutors in the United States through Skype and e-mail exchange of documents. While more sophisticated software might facilitate the interchanges, we found these tools simple, adequate, and at hand.

The final day we considered two new topics. One was to consider from a Bakhtinian perspective the relationship of the language they use to that of their larger community (Bakhtin, 1981, 1984; Bazerman, 2004; Vološinov, 1986). Specifically, we discussed the formation of specialized language activities and the language developed for those activities, along with the individual responsibility for originality (Bazerman, 2010). We considered the fraught issue of plagiarism and the subtle, local distinctions

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in what needed to be cited, what was the received knowledge and phrasing already absorbed into communal practice (or what sociologists of science have called obliteration by incorporation — see Cozzens, 1985; Merton, 1973), and what was the obligation for original contribution and how that could be marked.

Second, as the conceptual payoff for the whole workshop, we considered personal trajectories of language and scientific development within relevant communicative networks. We reflected on what immersive experiences they have had, how current experiences may be made more immersive, and what opportunities were available to engage further in international science discussions. We considered both the experiences available at a distance (such as virtual participation in virtual groups and projects) and the opportunities for spending time in English language environments.

Final Thoughts

While, of course, fluent language use requires learning many language skills and acquiring much linguistic knowledge, formal language instruction only gets one part of the way. Situated practice in significant, immersive, accountable, and consequential activities leads to motivated problem solving and habituated use that advances fluency and accuracy. Thus, as language professionals, we ought to consider providing the means to engage in more regular and more intense language experiences, which will be rewarding, reinforcing, and part of a trajectory of deeper engagement.

There are opportunities for degrees of such immersion, even if participants are not in a face-to-face L2 environment, as long as they can recognize, access, and reach out to these opportunities. Facilitations or supports can be an important part of getting the dynamic of engagement going. As digital communication follows its rapidly expanding course, we will have ever-increasing opportunities to communicate ever intensively with each other at great distances, in ever richer environments. In part, digital gaming is starting to show the way toward the intensity of multi-person interactive experiences, but scientific communication has further advantages of real, motivating stakes, a communal commitment to discovery and critical evaluation, existing networks of communication, and an expanding access to data of the real world, which is represented in the same world of virtual communication.

Immersion at a distance need not be a problem, and in fact is not for those who are already most deeply engaged in scientific work. They live within self-reinforcing and self-nourishing networks. For those who have not yet achieved this level of connection, however, we can provide facilitations for them to increase access and engagement in potentially immersive worlds at a distance. By helping each individual build the reflective and communicative skills to make connections and gain conscious control of the immersion process, we can help them move from the professional margins into the heavily networked center of Matthew Effect rewards.

Uncited References

AU :12

Andriessen, Erkens, Van de Laak, Peters, & Coirier (2003); Atkinson (1999); Barré-deMiniac (1996); Bartholomae & Matway (2010a); Bartholomae & Matway (2010b); Bazerman, Bonini, & Figueiredo (2009); Bazerman et al. (2005); Bazerman & Russell (2003); Beaufort (1999); Bennati, Fanfani, Palesi, & Zunino (2011); Bourdieu & Passeron (1977); Camps & Milian (2000); Carlino (2005a); Carlino (2005b); Cavalla & Tutin (forthcoming); Chartier & Hébrard (1994); Cohen (1993); Cope & Kalantzis (1993); Delcambre & Boch (2006); Delcambre & Lahanier-Reuter (2009); Dérive & Fintz (1998); Donahue (2008a); Donahue (2008b); Dong (2009); European Council (2008); Fahnestock & Secor (1991); Fishman & McCarthy (2007); Flowerdew (2008a, 2008b); Flowerdew & Li (2007); Gale & Wyatt (2006); Griffith, Small, Stonehill, & Dey (1974); Haas (1994); Harwood (2005); Harwood, Austin, & Macauley (2007); Howard (1999); Hyland (2005a); Hyland (2005b); Igland & Ongstad (2002a); Igland & Ongstad (2002b); Ivanič (2009); Keranen, Encinas, & Bazerman (forthcoming); Kuhi & Behnam (2011); Langer (1986); Lea (1994); Lea (1998); Lea & Stierer (in press); Paré, Starke-Meyerrin, & McAlpine (2009); Purser, Skillen, Deane, Donohue, & Peake (2008); Purser, Skillen, Donohue, & Peake (2008); Reuter (1998a); Reuter (1998b); Rienecker & Stray Jörgensen (2003); Rinck (2006c); Rivard (1994); Rogers (2009); Russell (1991); Schleiermacher (2004); Schutz (1989); Sljuismans (2002); Swales (2009); Taylor et al. (1988); Tolchinsky, Rubio, & Escofet (2002); Tuck (forthcoming, 2012); Tutin (forthcoming); Venohr (2009); Vergaro (in press); Webb, English, & Bonnano (1995).

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