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Translanguaging practices of Chinese/English bilingual engineers' communications in the workplace

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Abstract: Existing literature argues for the urgent need to improve workplace and professional communication in the engineering field across the world. This paper reports on a study examining Chinese/English bilingual engineers' translanguaging practices in their communications in English-speaking high-tech corporations in the United States. Evidence showed that bilingual engineers translanguaged extensively to construct meaning to meet the diverse communication needs at their workplace, which enables them to demonstrate their professional talents and skills. However, when English was the sole language for the interaction, they struggled to sound like English native speakers to convey their ideas and present their work, which disadvantaged them professionally, socially and emotional as professionals. Therefore, this study calls for a creation of a translanguaging space in the workplace to empower bilingual engineers and also a need to modify engineering education programs that recognize multilingual competence of bilinguals and enhance the development of their English professional communication ability (speaking and writing) in higher education.

Keywords: bilingual/Chinese engineers; engineering workplace; translanguaging

According to the National Science Foundation's 2019 Science and Engineering Labor Force Report, foreign-born individuals make up almost 30% of the US science and engineering (S&E) workforce. Notably, "in 2017, half of the foreign-born individuals in the United States with an S&E highest degree were from Asia, with India (23%) and China (10%) as the leading countries of origin" (Burke 2019). Despite the significantly diverse language backgrounds of S&E professionals, the English language remains the dominant medium of communication among

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engineers in high-tech corporations in English-speaking countries (Gimenez 2014) and beyond (Rajprasis et al. 2015). Past research (Hart-Rawang and Li 2008; Reave 2004; Winsor 1996) suggests that engineers, both native and non-native speakers of English, are liable to feel frustration with on-the-job communication requirements in these settings. This paper focuses on the communication challenges encountered by bilingual Chinese electrical engineers who work in English-speaking high-tech corporations in the United States, and how translanguaging practices enable them to function as competent professionals.

Translanguaging is a common communication practice in linguistically diverse milieus. Bilinguals translanguage to construct meaning, but also to position themselves and others in their social, political, and historical context (Garcia and Li 2014). Indeed, examination of the languaging practices of bilinguals and multilinguals reveals they translanguage across language boundaries to engage in productive and effective communication (Li 2018).

Studies targeting communication challenges at the engineering workplace examined how employees struggled to meet the complex communication needs of the linguistically heteroglossic workplace (Rajprasis et al. 2015; Reave 2004). However, there is a paucity of research on how, specifically, English as a second language (L2) engineers practically meet workplace communication demands. With a translanguaging lens, this study elucidates how bilingual/multilingual engineers functionally employed rich communicative resources daily to cope with an increasingly culturally and linguistically diversifying workspace by engaging their full linguistic repertoire.

The purpose of this qualitative study was to examine bilingual Chinese engineers' translanguaging practices in their workplace communication, as this population accounts for a substantial percentage of L2 engineers in high-tech firms across the U.S. (NSF 2019). Research questions for this study included: (1) what were the challenges Chinese engineers encountered when communicating in English at their workplace? and (2) how and when did Chinese engineers use a translanguaging approach to navigate those challenges and meet the professional communication demands at their workplace?

1 Literature review

Statistics from the National Science Foundation showed that the population of foreign-born workers accounts for nearly 30% of the share of S&E employment in the United States. Asians, in particular, made up 60% of this demographic (Burke 2019). Numerous studies (Reave 2004; Winsor 1996) have found that in the engineering world, writing for communication takes up to at least 20–40% of workday

activities, a figure which tends to increase as one moves up the career ladder (Kreth 2000). With diverse engineering populations and the high communicative demands of teamwork, it has become increasingly critical to understand how bilingual engineers communicate with colleagues who share or those who don't share their home language backgrounds, and to address their frustrations in this endeavor.

A number of studies, such as Lehtonen and Sinikka (2008) and Moslehifar and Ibrahim (2012), have explored the practical workplace language and communication needs of engineers in the United States. Some involved surveys or questionnaires given to the employers of recent university graduates, finding that these new engineers were often ill-prepared for the expectations for oral and written communication (Reave 2004; Wisniewski 2018). Wisniewski's (2018) study reported that managers of novice engineers felt that, when engaging in such activities, they needed to develop clear, appropriate written and visual messages, provide timely content to audiences, as well as increase interactions with technicians and operators.

Additionally, Winsor (1996) found that undergraduate engineering interns often lacked the ability to persuade colleagues of the utility of their designs, products, and services, an experience also currently shared by many Chinese engineers abroad. Similarly, Reave's (2004) study showed that in practice, engineers were unable to present ideas clearly, describe the reasoning behind their communication, nor link sentences into logical paragraphs. Other studies (Gray et al. 2005) found that engineering employees also lacked audience awareness when writing, with difficulties adapting their composition for different audiences and adjusting styles for different purposes.

English proficiency has become an expectation for engineers across the globe. As such, several studies have also focused on engineers' English communication practices in non-English speaking countries. In Rajprasit et al.'s (2015) study, Thai engineering students reported experiencing difficulty speaking and writing in English for professional communication with people outside of their country. Yu's (2010) interviews with six industrial engineers in China revealed that although English was not necessarily a formal requirement at their work, engineers still believed improving their expressive English skills would enhance their professional communications and support professional growth (e.g., writing for publication, composing professional presentations). These activities also abet transnational professional communication so they could more "effectively absorb technical information and present information in a clear and persuasive manner" (111).

Situating writing as a key resource within one's semiotic repertoire, Fraiberg's (2018) case study described the multilingual and multimodal nature of workplace writing activities in an Israeli high-tech start-up corporation. Findings showed that

engineers experienced “complex knotting of Hebrew and English across text and talk with the interactions mediated by written texts (in Hebrew and English), workplace practices and wider national tropes” (60). The study focused on workplace practices related to writing genres and cultural ecologies, and prioritized activity-based writing tasks, in which engineers designed multimodal objects for varied audiences and purposes.

Given the status of English as the lingua franca for professional communication with diverse colleagues within and beyond individual workplaces in the globalized engineering community, research into the communication practices of engineers is crucial in identifying and supporting effective practices. However, the majority of US-based studies on the discursive behaviors of engineers in the workplace focused on English- L1 engineers. There is thus a dearth of research targeting bilingual engineers’ communication practices and needs in English-speaking contexts, particularly through the insider perspectives of these engineers themselves.

Our study targets the self-reported communication experiences of bilingual Chinese engineers at their workplace and the nature of their translanguaging communicative practices. These insider perspectives provide implications for professional English communication training in the engineering field. Such perspectives offer support in preparing bilingual engineering students for their profession, as effective communication has consistently ranked among the most desired qualities by potential employers in the English dominant world (Laydens 2008).

2 Theoretical framework

Translanguaging theory proposes that bilinguals/multilinguals have one unified linguistic repertoire, integrating their lexical, morphological and grammatical features in addition to social practices, from which they select and deploy features to make meaning in context (Garcia 2009). Bilinguals intermingle linguistic features from all their language pools in ways that best serve their communication needs. Bilinguals use “multiple and dynamic varieties of these different languages and literacies-vernacular, formal, academic, as well as those based on race, ethnicity, affinity or affiliation, etc. for varying purposes in different contexts” (Hornberger and Link 2012: 263). Translanguaging is transformative, with the potential to go beyond named languages and remove the hierarchy of languaging practices in bilinguals’ fluid and flexible use of languages (Garcia and Li 2014; Li 2018).

A translanguaging lens proposes that bilinguals' languaging practices contain "entwined linguistic features" (García and Li 2014: 18) for selecting resources to obtain knowledge and express themselves (Garcia et al. 2017). Such a lens is particularly revealing when examining the languaging practices of bilingual Chinese engineers, as it can make visible the languaging patterns these engineers deploy as they wade between different linguistic structures and systems and other sign systems in the linguistically plural workplace. Clear languaging patterns of workplace communication increase bilingual engineers' awareness of their language practices and coax them to bring their "whole selves" to their work.

3 Methodology

3.1 Participants

The participants for this study were 15 Chinese electrical engineers specializing in software and hardware engineering who, at the time of the study, were employed in several high-tech corporations in California. Snowballing techniques were employed to recruit participants (Noy 2008), beginning with finding engineers in the local Chinese community. The participants were selected from large, medium and small size corporations, and all received their undergraduate degrees in China, after which they matriculated in U.S. graduate schools. Of the 15 participants, nine have doctoral degrees, and six have master's degrees. Their ages ranged between 30 and 43 years old. They had been working at high-tech corporations in the United States anywhere between 1.5 years to more than 10 years. Only two of the participants were female. All participant names are pseudonyms.

3.2 Data collection

The primary source of data were 34 formal and 21 informal semi-structured individual interviews, lasting about 25 hours in total. Two to three rounds of formal interviews were conducted for the primary 10 participants. Other formal and informal interviews occurred during the coding or analysis process or data saturation process whenever in-depth data were needed. The interviewing continued over a period of 10 months. All interviews followed an interview protocol but could address tangential topics. Interview questions were centered on engineers' usage of Chinese/English at work, their perceptions of their own writings, and the challenges they encountered in workplace writing. All interviews were recorded via Audacity software and later transcribed using Express Scribe in Chinese and

English. All the remarks and conversation excerpts in the text were translated into English.

3.3 Data analysis

Data was analyzed using grounded theory (Strauss and Corbin 1997). We first identified data excerpts related to engineers' translanguaging practices from the interview transcripts. Then, we conducted line-by-line coding of the data (Holton 2007) by labeling and sorting any actions, processes, or instances of translanguaging in the data. Codes described, for instance, participants bringing Chinese into English, setting English as a standard for writing, and consciously negating Chinese language influences in their communication. Next, we reread those initial codes and used the most significant or frequently occurring initial codes to sort, synthesize and organize data to achieve analytical codes, which included writing to propose ideas, synthesizing meaning via composition, losing confidence due to non-native English, socially isolating from others, etc. During the coding process, frequent peer-debriefing was held. Conversing with the participants about the interview content or clarifying their thoughts regularly helped to avoid any potential bias.

Those analytical codes were further specified, named and sorted to form selective codes in terms of writing difficulties, translanguaging functions, usages, context and perceptions. We then reread all the selective and analytical codes, trying to discern the relationships between the codes, after which tentative categories started to emerge. Those tentative codes included, but were not limited to, writing difficulties in English-only contexts, boosting productivity when translanguaging, and using translanguaging in public. When tentative categories formed, the strategy of theoretical sampling was adopted to gain rich data and fill in gaps between identified categories (Draucker et al. 2007). We constantly compared codes and practiced memo-writing during the coding process. Finally, by sorting through and analyzing the memos and selective codes, definitive categories materialized. During this process, we organized data consisting of transcript excerpts into these categories and these patterns informed final thematic constructs.

4 Findings

Our findings partitioned into two broad conceptual categories. The first category revealed the engineers' frustrations when they had to conduct professional

communications and presentations in English-solely contexts, which limited their communicative dexterity and undercut their professional cachet. The second involved translanguaging practices that enabled bilingual Chinese engineers to fully showcase their professional abilities, competencies and ingenuity.

4.1 Feeling incompetent in the English-dominant context

4.1.1 Feeling inferior as non-native speakers

As part of their professional duties, the study participants reported that they often had to present their work/products in English, which brought about moments of frustration. The majority of the participants claimed that they aspired to get rid of all influences from Chinese in their English communication, fearing that such elements could cause them to be perceived as unprofessional or less intelligent by their non-Chinese co-workers. As Lynn explained, when discussing problems with these coworkers, “you are using a language you are actually not good at. 你不是 native, 你心理上已经输了 [You are not native and you subconsciously felt as if you had already failed].”

Such perceptions of non-native English inferiority caused the engineers to feel insecure in daily interactions and to lack confidence in proposing or presenting their professional ideas in English. In interviews, these engineers conceded that their writing was nowhere close to native English. Young described his writing as “naïve, not native,” defining “naïve” as “elementary students’ writing. ... Chinese expressions still everywhere.” Such statements suggested that our informants held native-like English as an ideal to strive for and felt ashamed of their “not native” English capabilities.

To make their English more native-like, many reported making valiant efforts to socialize with non-Chinese-speaking coworkers. In addition, several participants purposefully read English newspapers or listened to English songs. However, these efforts never lasted long. As Young, noted, “We each have our own comfort zone and social circle,” and went on to explain that trying to leave other Chinese colleagues and the Chinese language was like “separating from their own families,” emphasizing the link between language and identity. These engineers did not want to relinquish their safe and comfortable social network and the familiarity of the language that they grew up speaking. They were already in a foreign setting, and the social aspect of being with other Chinese coworkers using Chinese was particularly important socially and emotionally.

4.1.2 Freezing in solely English contexts

Despite these efforts, these engineers found that when they presented their work in English, their language still seemed stiff and their expression of their engineering knowledge and competence often appeared informal or unprofessional. Young commented,

“I found that when I search for the correct words in my English language bank in my mind, I am fully frozen and can only focus on using the same simple expressions to convey my ideas. After a presentation, I would often feel terrible and think that if I could have only drawn a diagram or used other ways to represent my thinking, I would have sounded more professional. But at that moment, I was just too focused on finding the right English words.”

When encountering challenges in English writing and speaking, all of the participants, just like Young, reported “choosing simpler words or phrases to express themselves.” However, when they used more basic expressions, they felt that their thoughts were diluted or only partially conveyed. For instance, Yoyo added, “I felt powerless to express myself in English, but I have so much I want to say. 我会用简单词去代复杂词, 想法可能就不能 express 了 [I would only use some simple words to present complex ideas], 我能说多少说多少, 要不然我就 give up [Sometimes, I just try to write as much as I can, or I simply just give up].” The expectation for English-only and the concomitant suppression of their bilingual capabilities hindered engineers’ efficacy as professionals in the workplace.

4.1.3 Relying on images and avoiding English writing

To compensate for their insecurity in oral and written English, these engineers reported that they tended to rely heavily on other modalities in their presentations, such as programming codes, raw data, images, etc. As a result, diagrams and graphics became a significant part of their expressive repertoire. All participants believed data and codes to be factual, which represented some universality in meaning and could thus stand alone, and thought these multimodal implementations could more faithfully attest to their engineering acumen and competence. For instance, Lynn demonstrated her design with, in her words, “simulation results instead of numbers only, drawing an electromagnetic field with multiple colors.” At team meetings, she even “made or found a small video to show how things worked.” However, Lynn still struggled with her English expression and felt frustrated with her “unprofessional English” when her colleagues asked her to elaborate on her design revisions. As Lynn stated, had she been able to articulate her thoughts/design logic clearly using English alone, she would not have had to

spend excessive time making videos or creating colored diagrams to convince her colleagues that her proposal was both practical and effective.

Lynn was not alone. Most participants also reported seeking ways to compensate for their perceived deficiencies in expression by simply presenting graphical data. However, by relying on graphical data without giving any descriptive explanations, they failed to fully present their intended meaning and struggled to have their designs adopted or to receive credit for their ideas. Both Feng and Yoyo lamented their awkwardness when proposing ideas at team meetings. “During team meetings, sometimes we had a better idea than other colleagues. But, while we were still searching for the right English words, others had already proposed that very idea we wanted to present or the session was already over,” Yoyo lamented. Several participants echoed this sentiment: “if we only could have used Chinese, there would have been no problem at all.” These engineers expressed their frustrations with their inability to fully express the nuances in their thinking when communicating monolingually in English.

Owing to these challenges, these engineers reported that they chose to fade into the background during group conversations to avoid drawing attention to themselves. As time went on, they began to feel that they didn’t have anything worthwhile to add to the discussions. Their communicative behavior at their workplace had branded these engineers as “silent Chinese” or “incompetent foreigners,” a characterization stereotypical of Chinese bilingual engineers in the engineering field, which further isolated them at their English dominant workplaces.

4.2 Working as abled bilingual engineers

Despite these self-reported efforts described above of communication practices in their workplace where they had to use solely English, in their interviews the engineers also revealed that they regularly intermingled Chinese with English in their writings and oral interactions both in interpersonal interactions with other bilingual engineers and intrapersonal use of language while recording notes or composing for communication. They used Chinese (L1) or mixed English and Chinese to ponder, plan, and draft, before finally composing formal texts in English. Using Chinese to plan and draft their composition was a key feature of the translanguaging practices these engineers employed.

Translanguaging enabled the study participants to articulate their ideas intelligibly and professionally with less frustration than using solely English. For instance, Zhao preferred to outline his ideas in Chinese on paper and then “塞东西进去[fill content into the writings]” as this helped him save a lot of time on

organizing thoughts and thinking of appropriate words at the drafting stage. Other engineers, like Gu, described his translanguaging in thinking: “大多数时间自我感觉挺好的, 感觉自己写的很流畅的, 很 fast。估计就是写的很 Chinese [Most times I felt very smooth in pouring my thought on paper, and it did not take much time and effort. It was a delightful experience, though it might sound very Chinglish].”

When interacting with other Chinese engineers, the study participants reported using Chinese or mixed English to make themselves understood, and present information in a comprehensible way. Translanguaging enabled them to display/engage their creative minds and develop their own ideas and hone language for workplace communication. It also supported them as they engaged with complex (often esoteric) content at work, ‘because it was faster and smoother,’ (Xudong), when interacting with other Chinese coworkers.

For instance, Xudong explained that he chose Chinese or mixed Chinese and English for discussion with other Chinese engineers so he could “准确无误快速的告诉别人我是怎么想的 [express myself to others quickly and accurately], no matter in which language.” The engineers’ usage of Chinese or English or mixed languages in interactions with other bilinguals can be considered a naturally occurring practice for bilinguals (Hornberger and Link 2012). Their translanguaging practices allowed them to communicate efficiently and effectively to meet workplace needs without concern for conforming to named languages or to their “correct usage.” The result of such correspondence was articulated by Feng as: “没有东西是水下的 iceberg [No content was submerged under an iceberg].”

These engineers also credited translanguaging with supporting their ways of generating ideas/solutions and confirmed that productive discussions with coworkers often coaxed innovative solutions/ideas. Lixi shared that interactions in Chinese or mixed Chinese and English with other Chinese co-workers helped him to “想着内容, 还会有新的 idea 和灵感 [focus on the content and incite new ideas and inspirations]” because he could fully display his “reasoning ability in speaking and writing.”

Despite these benefits, the participants all feared that utilizing Chinese to think would compromise their ability to produce English effectively. However, in practice, they frequently employed the “entwined linguistic features” of their single heteroglossic linguistic repertoire to make meaning (Garcia 2017: 18). Lixi’s example illustrated that by utilizing a more natural communicative modality, talking-it-through meant coming-to-know-while-speaking, as interlocutors meta-talked and synchronized their intended personalized meaning (Swain and Lapkin 2002).

When it came to communicating in Chinese or mixed languages, these engineers were able to more faithfully express themselves, supporting their professional creativity while bolstering their confidence as professionals. Translanguaging practices

enabled these engineers to make contributions to teamwork (e.g., design) through activating their diverse funds of knowledge, and their eclectic tools for thinking and expressing.

5 Discussion

This study explored the specific challenges experienced by Chinese L2 engineers and their translanguaging practices to meet these communication difficulties at their English-speaking, high-tech workplaces. Our findings illustrated that when these engineers were confined to solely English in formal and informal professional settings, their wish to sound like native English speakers disabled them, their inability to perform as a professional stymied their contributions, and their social standing in their professional context suffered. However, our findings also indicated that when participants engaged in translanguaging practices, the practice fostered their professional creativity and collaborative engagement with other bilinguals, which better prepared them for formal English written and oral communications. Translanguaging was an effective tool for their communication and engineering design work that allowed them to display their full personalized knowledge and abilities, showcase their technical acumen, and function as competent members of the workplace.

By translanguaging, these bilingual engineers could more effectively convey ideas about product designs. This leads us to speculate that had their professional meetings been translanguaging discursive spaces instead of English solely, where multilingualism was the norm and where non-native language patterns were not marked as problematic, these Chinese engineers would have had better opportunities to make substantive professional contributions. Rather than searching for the right words and letting the moment pass, they could have used their own brand of English to infuse the moment with their ideas without feeling the impetus to fully express them in native-like English on the spot.

That way, their ideas could have retained their vigor without being compromised by using simpler words that diluted their meaning or sounded “naïve,” and could have been translated as needed for other colleagues by the speaker or other bilinguals. When bilingual engineers can use their full linguistic repertoire, they create a multilingual space, a space where they maximize “the capacity of multilingual individuals as active agents” (Li 2011: 1234) to participate in their daily engineering work. Li referred to such multilingual spaces as translanguaging spaces that “allowed language users to integrate social spaces (linguistic code) that have been formerly separated through different practices in different places” (2018: 23).

Our participants also reported that, when deploying the entirety of their linguistic repertoires through translanguaging in collaborative groups with other Chinese engineers, they were able to express their ideas more coherently and effectively. Whether working in a bilingual context with shared languages at the workplace or working in a mixed group with both monolingual and bilingual members, translanguaging spaces have the capacity to enable bilingual professionals to fully demonstrate their knowledge and competence. Instead of ideas remaining beneath an “iceberg,” as Feng described, they can rise to the surface. Such empowering experiences can support a rehabilitation of bilingual engineers’ identities as abled engineers at work by demonstrating their creativity and ingenuity and positioning them as effective communicators.

The findings of this examination of the workplace communication experiences of Chinese bilingual engineers lead us to come to the following recommendations for engineering professional communities, including college engineering programs and industries to work toward creating more inclusive workplace environments that

- understand and value the translanguaging practices of their L2 employees;
- create a culture where every individual can contribute their full language potential instead of solely emphasizing on “fitting” into the organization;
- provide space for bilingual engineers to work with co-workers with shared language backgrounds to maximize their capacity and fully display their professional talents;
- hold focus group meeting on a weekly/monthly basis and have bilingual engineers feel like they have a place to share their ideas and values, where they have a say in decisions;
- guide bilingual engineers through translanguaging processes that support them as they present their work professionally in English-solely contexts;
- include strategies that encouraging employees can send agendas and materials in advance, so everyone feels prepared or pausing to ask what bilingual engineers think in a meeting;
- be open-minded toward World Englishes (such as China English) that feature distinct cultural expressions and accents.

The findings also suggest that engineering programs and English for specific purposes instruction need to raise awareness of the importance and practicality of translanguaging practices in communication for bilingual engineers. When designing curricula, more attention should be paid to broaden engineers’ exposure to, or practice in, a variety of formal and informal meeting communications and writing genres aligned with workplace demands.

Beyond implications for workplace cultures and educational settings, our study findings point to the significance of bilingual engineers' understanding of the value of translanguaging practices, which can help them build positive attitudes toward both their English abilities and their efficacy as communicators. These participants' veneration of native-like English was connected to their denial of the validity of their own bilingual competence (Li 2017).

Embracing translanguaging practices could also help expand the social network of these bilingual engineers. Perhaps by crossing languages and linguistic comfort zones, they can also cross social comfort zones. So, instead of seeking out English-speaking colleagues to merely practice their English, they could also form social bonds with these diverse colleagues, ultimately also facilitating their willingness for active participation in workplace collaborative conversations.

Finally, the practice may also encourage these engineers to see themselves as worthy professionals, who are willing and empowered to richly share their expertise, thereby bolstering their professional self-image. Translanguaging may be an effective practice for giving a professional voice to these bilingual engineers and enabling them to leverage their full competence and skills as engineers in their workplace.

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