Identifying Support Opportunities for Foreign Students: Disentangling Language and Non-language Problems Among a Unique Population

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Abstract. This study investigates how foreign students address language-related and other problems as a means of identifying opportunities to support them with language and social technologies. We identify support opportunities by distinguishing between different types of problems – e.g. whether they are language-related and whether they involve essential activities in their lives or at school – and the extent to which support already exists. Our unique sample of 15 foreign graduate students who live in Japan but study in English helped us disentangle problems relating to language skills versus those relating to other challenges. We examine these issues using a multi-method approach where students used a mobile app to record experiences and interactions over five weeks, and then discussed this data during an in-depth interview. We use our results to identify specific support opportunities that can be addressed through the development of social and language technologies.

Keywords: Foreign students · cultural differences · intercultural communication · non-native speakers.

1 Introduction

The experience of studying in a foreign country involves many challenges, and international students often experience difficulties such as acculturative stress [1], loneliness [2], and language difficulty [3, 4]. These problems can have a detrimental effect on students' motivation and performance at school, as well as their overall well-being [5, 6]. Success at overcoming these difficulties is related to a variety of factors including students' backgrounds and coping styles [1], their relationships with people who can provide support [7–10], and access to supportive technologies [11]. We study different types of problems experienced by foreign students as a means of identifying opportunities to support them with language and social technologies.

We investigate sources of stress and support experienced by 15 foreign graduate students in Japan. We identified problems discussed by each participant, and found they could be categorized along two dimensions. First, we distinguish between functional problems—those that have a direct consequence related to essential tasks such as academic work or accessing basic needs—and non-functional problems, which are related to non-essential activities but nonetheless contribute to acculturative stress. Second, we distinguish between problems caused primarily by language difficulty and those for which language difficulty is not a major factor. Most problems that were not caused by language-difficulty were related to cultural differences, but this was not by definition. The level of provided support varied substantially between categories. Based on our analysis, we discuss reasons for shortfalls in support for some types of problems, which sources of support were most effective for addressing those problems, and how to improve access those support opportunities.

This article focuses on an understudied population with a different arrangement of language difficulties than represented in most previous studies. Much research in this area describes non-English students studying in countries where English is the dominant language inside and outside of school [e.g. 10,12,19]. Students in those studies tend to use two languages: the host-country language (usually English) for most activities and their native language for communicating with co-nationals and with people back home. By contrast, participants in our study use three languages in their everyday lives: the host-country language (Japanese) and a common language (English) for various communication with host-country people and other foreigners, and their native language for communicating with co-nationals and people back home. Most academic activities are conducted using English, though conversations with Japanese lab mates and administrative staff often involve speaking Japanese. Although all but one of the participants are non-native speakers of English, they all reported high English proficiency and almost never attributed difficulties to their own English limitations. Their Japanese proficiency was far lower, so Japanese communications were more difficult. This allowed us to identify non-language problems that may have been masked by language difficulties in other contexts. Had language been a larger obstacle in many situations, it would have been more difficult to identify the non-linguistic components of those problems. When language difficulty was significant, it helped us identify types of communication that are especially difficult to support, such as informal communications.

In addition, many studies emphasize the value of integration for long-term adjustment to the host country. However, as Maundeni [12] pointed out, long-term acculturation is not a universal goal for international students. Most participants in this study indicated they plan to return to their home country after completing school or to look for work outside of Japan. Studying students who plan to return to their home country allowed us to focus on support from relationships that did not necessarily assist long-term integration to Japan, but helped with more immediate coping. For example, 6 of this study's 15 participants were Muslim, and for these students other Muslims were extremely important for supporting challenges related to their religious practices.

Another contribution of this study is its multi-method approach that draws on a combination of data sources. Participants used a mobile phone application, *Study Abroad*

Scrapbook, to record their experiences over the course of five weeks. Then, the data collected using this app was discussed and expanded upon during an in-depth interview. Daily reporting to the mobile app provided a longitudinal account including persistent or evolving problems, and helped identify problems that may not have surfaced through interviews alone. Interview designs were informed by results from the mobile app, providing a means to follow up, clarify, and gather details in great depth. Combining interviews and daily questionnaires helped draw on the strengths of both approaches while mitigating their respective limitations.

The results of this study contribute to a better understanding of (1) the kinds of problems experienced by international students and which of those problems are most lacking in support; (2) how international students draw on various relationships and technologies to overcome these problems; and (3) opportunities for designers of social and language technologies to facilitate access to support that can improve the wellbeing and performance of international students.

2 Background

Previous research has studied many challenges faced by international students as well as ways these challenges can be supported by various relationships and technological aids. Adapting to life in a new country involves many challenges, which can contribute to acculturative stress, "the psychological and physical discomfort experienced when the adaptation to a new cultural environment seems to be overly demanding" [1]. Foreign students may experience difficulties with necessary tasks such as schoolwork and meeting basic needs, and these problems may be compounded by social and emotional challenges. Loneliness is a particularly evident difficulty, including personal loneliness (loss of contact with families and close friends), social loneliness (loss of networks of like-minded people), and cultural loneliness, "triggered by the absence of the preferred cultural and/or linguistic environment" [2].

2.1 Social support

Social support is important for overcoming these kinds of stresses. Cohen and Willis [14] described a *buffering model* of social support, finding evidence that integration into a social network could reduce the effects of stressful experiences. Foreign students' social networks tend to consist of distinct groups with different functions: Friendships with co-nationals from the same home country; friendships with other sojourners; and friendships with host-nationals [7].

Relationships with co-nationals are often close friendships, providing emotional support and opportunities to express one's cultural values with like-minded peers [9]. In contrast, friendships with sojourners from different countries provide companionship for "recreational, 'non-cultural' and non-task oriented activities" [9]. Strong relationships with host-nationals are associated with reduced loneliness [15] and better adaptation and longer-term integration [2, 8, 16–18]. This finding is relatively consistent for students in Western countries (America, Britain, Germany, Australia) and in China [8],

Taiwan [19] and Japan [10, 20, 21]. Strong relationships, regardless of source, have been found to have a positive effect early in sojourners' adaptation, but too much contact with co-nationals can hinder long-term adjustment to the host country [22].

Many studies of international students' social networks have focused on friendship networks and excluded other relationships [12]. Likely related to this narrow scope, some studies have overlooked ways in which social networks can cause stress as well as provide support [10]. To build upon this work, we asked participants to report on communications with all types of people, and interviews yielded many comments about relationships that caused stress as well as those that provided support.

Much of the work about international students' support networks has been inattentive to how communication technologies can facilitate relationships. Past research not involving international students, but college students more generally has investigated the role of social media for facilitating social support [23, 24]. Ellison et al. [25] found that Facebook use was positively related to the maintenance and creation of social capital, and that Facebook was typically used to maintain or strengthen relationships that also involved offline connections. Additionally, contemporary communication technologies have increased opportunities for college students living away from home to maintain relationships with friends and family [26]. However, too much communication with parents has been associated with lower autonomy [27].

Studies of international students [28] and immigrant communities [29] have found these groups use social media both to build connections to their host country and to reinforce their identities related to their home country culture. Both Facebook and home country social media sites are important for international students [30, 31], but a desire to connect with other cultural groups has been found to be negatively associated with the number of friends on home country sites [31].

2.2 Language support

Language difficulties are a key challenge for foreign students [32]. They can complicate formal activities such as understanding academic work [33] and contribute to barriers for informal communication [34]. In environments that use a common language for intercultural communication, non-native speakers may perceive themselves to lack language proficiency and experience anxiety that lowers their willingness to communicate [35]. Furthermore, barriers between intercultural speakers can encourage language-based cliques where intercultural communication is avoided [34, 36]. Finally, language difficulties can cause misunderstandings that deteriorate trust [37] and interpersonal relationships in multilingual workplaces [38]. Because previous research demonstrates that language difficulties have diverse impacts, we designed this study to be attentive to language-related problems and sources of support in a variety of situations.

The literature cited here focuses on English language environments. In our study the situation is slightly different because foreign students are more skilled at English than host-nationals. And, while English is the main language of study for our participants, informal conversations occur using both English and Japanese. Previous work has explored methods for improving intercultural communication between native and non-

native speakers. This includes efforts to reduce cognitive burden [39] and improve comprehension [40, 41] for non-native speakers, and to establish conversational grounding in multilingual conversations [42–44]. For the most part, evaluations of these kinds of tools are based on how participants perform communication tasks in lab settings. Yuan et al. [34] is a notable exception, investigating real-world organizational communication and using that as a basis for design recommendations.

3   Research questions

Studies about social support have described how relationships with different groups of people facilitate different kinds of support for foreign students [7, 9, 10] and how social media technologies are used to build and maintain relationships [23–25]. These studies have tended to examine problems and support independently from one another. We build upon this work by studying how specific types of problems are supported and why others are not. By doing so, we identify opportunities for improving access to support where it is lacking. We investigate these issues through the following questions, ***RQ1:*** *What types of problems do foreign students identify?* and ***RQ2:*** *To what extent are these problems adequately supported, and what reasons can be identified for varying levels of support?*

Previous research regarding language support has been proactive about designing technologies to improve intercultural communication, but these efforts have mostly focused on instrumental, task-oriented communication [43, 45, 46]. We contribute to research about language support by considering how current technologies are used in a real-world setting and ways they fall short in supporting foreign students. Based on this study, we identify ways in which social and language technologies could be improved to better support international students' lives—***RQ3:*** *How can inadequately supported problems be addressed using language and social technologies?*

4   Method

4.1   Recruitment

We recruited 15 foreign graduate students from Kyoto University (8 males, 3 females) and Nara Institute for Science and Technology (3 males). Participants were screened through a brief survey, and only respondents who reported a high level of English proficiency were considered. Because more than 15 people applied, we selected the 15 most suitable respondents by preferring students with little previous experience in Japan and who planned to stay in Japan for more than one year. These participants were most suitable because we were interested in students who were in the process of acculturating to a country where they intend to live for an extended period. At the time of recruitment, 12 participants had been in Japan for less than six months, and three had been in Japan a longer time. It was the first time in Japan for nine participants, four had visited Japan once before, and two had visited more often. In regards to Japanese language proficiency, 4 participants reported they did not speak Japanese, 9 reported low

ability, and 2 reported medium ability. The median time participants planned to stay in Japan was three years. Participants studied a variety of fields, including electrical engineering, agricultural engineering, robotics, public health, and social informatics. Twelve participants were between 20-29 years of age, and 3 were between 30-39. Participants' countries of origin were: Bangladesh (N=2), China (N=3), France, (N=1), Germany (N=1), Indonesia (N=4), Malaysia (N=1), Paraguay (N=1), Thailand (N=2).

4.2   Data collection

The researchers designed an application called *Study Abroad Scrapbook*, and each participant was provided an Android smartphone with this software installed. For five weeks, participants were asked to complete a brief questionnaire each day. Three types of data were collected through these questionnaires.

Communication logs: Participants were asked to indicate who they had communicated with each day, and whether the communication was weak or strong (see Figure 1). Before participants began using the software, we provided them with a definition of "weak communications" as including brief email exchanges, small-talk, or similar communications, and "strong communications" as a longer conversation or more substantial communication. By collecting this log data, we could identify which relationships were associated with particular problems and support. Previous studies of foreign students' social support networks have used similar self-reports of communication in a cross-sectional design [7–9, 16]. By asking participants to report who they communicate with each day we adapt these approaches to a longitudinal model. Participants' logs do not specify medium (e.g. face-to-face, social media, phone call), so it is not possible to address the effects of different media affordances [47] based on these logs, however we did discuss this issue during the interviews described below.

Emotions and experiences: Each day, participants were asked to rate how they experienced homesickness, language difficulty, and culture shock, as well as how comfortable, excited and content they felt about their lives in Japan. Each item was rated on a scale from 1 (not at all) to 5 (strongly). Questions about homesickness and culture shock were included because they have been identified by Akhtar and Kröner-Herwig as significant dimensions of acculturative stress [1]. We also wanted to assess positive aspects of participants' experiences, which is why we asked about excitement, comfort, and contentment. Lastly, we asked about language difficulty because it is a major obstacle for sojourners across numerous studies [2, 4, 48]. This data was mainly used during follow-up interviews with participants, where we probed about how trends and changes in their emotions and experiences related to problems and support opportunities.

Diary entries: At the end of each questionnaire, participants were invited to write a brief text post about their day, focusing on their communication and adding context to the previous questions. These entries were a source of rich qualitative data in which participants described their problems and strategies, if any, for overcoming them.

Since the *Study Abroad Scrapbook* was installed on a mobile phone, participants could choose where, when, and how to answer the daily questions. This encouraged

participants to write about issues that were personally meaningful to them, and granted them the freedom to make posts at whatever times were convenient for them.

Semi-structured interviews: After five weeks using the app, a semi-structured interview was conducted with each participant. These interviews lasted approximately 1 hour and were audio-recorded and transcribed for analysis. These interviews were used to investigate and add context to themes that emerged in data collected using *Study Abroad Scrapbook*. Additionally, during interviews we collected information about the people participants had logged communication with, including how they know each other, what language(s) they use together, whether each person lived in Japan, and whether they were Japanese, from the same home country as the participant, or from somewhere else.

While daily entries in *Study Abroad Scrapbook* encouraged participants to note even minor events from each day, during the interviews participants were more likely to talk about significant problems they'd experienced. Accordingly, the app helped identify issues that may have been fleeting and not been raised by participants in an interview, and the interviews provided context about which issues raised in the diaries were significant and which were minor. Interview questions were informed by patterns and specific events described in the data. This allowed the interviewer to hone in on specific instances that may not have been evident in an interview alone. As well as informing the interview questions, data collected using the app allowed researchers to identify where observations expressed in interviews by one or two participants were evident across a broader segment of the participants. For example, when a few participants discussed that a community of fellow sojourners from their home country provided comfort and support, it was possible to use communication logs and comfort ratings from the app to investigate the role of such communities more broadly.
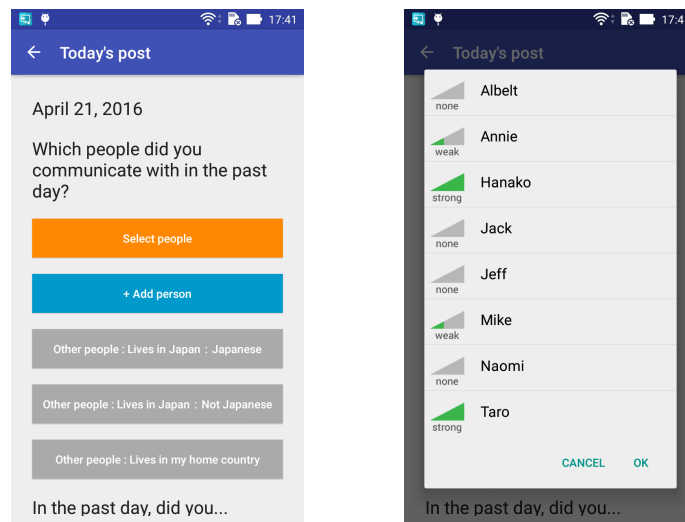

Figure 1. Screenshots of *Study Abroad Scrapbook*.
Left: Daily questionnaire screen. **Right:** Screen used to log strong and weak communications.

4.3   Data analysis

Participants' diary entries and interview transcripts were analyzed using a qualitative open coding approach [49] in which categories were developed through immersion in the data. After meaningful categories were developed, two researchers coded 141 salient excerpts from the data. A first pass coding revealed greater clarity regarding definitions was required for some of the categories. After better defining these codes the data was again coded. The coding included three dimensions whose Kappa scores for an inter-coder reliability test were 0.84, 0.95. and 0.86. Remaining inconsistencies were resolved through discussion among the two coders. Additionally, quantitative analysis was used to identify trends and relationships among the communication logs and ratings of emotions and experiences collected through the app.

5   Results

RQ1 asked *what type of problems do foreign students identify?* Through the course of reading participants' diary entries and interviewing them, two distinct types of problems became apparent. The first were functional problems, which must be overcome to carry out essential tasks for everyday life or school. Failure to address such problems has a direct effect, such as academic penalty or not being able to meet a basic need (like food or shelter). Were such problems not addressed, it could pose a direct threat to participants' abilities to live in Japan and complete their studies. In contrast, non-functional problems are related to things that are not required, but nonetheless contribute to acculturative stress. Non-functional problems might include feeling excluded from social situations, inconveniences when travelling for leisure, or difficulty participating in optional activities that would be easy in one's home country. Although the particular composition of functional and non-functional problems in this study was unique to our participants' situation, anyone undergoing a transition into a new culture experiences both types of challenges to some extent. Distinguishing problems in this way helped to

Table 1. Typology of foreign students' problems by functionality and language-relatedness.

Functionality / Language-Relatedness	Functional *Problems with direct impact on essential tasks.*	Non-functional *Related to non-essential activities, but still cause stress if unaddressed.*
Language-related *Language is the clear and direct cause of the problem.*	e.g. using Japanese language to open a bank account; communicating with professors about work-related matters.	e.g. Feeling excluded from Japanese colleagues' small talk; not being able to communicate during a social occasion.
Not language-related *Language is not the primary cause of the problem.*	e.g. Adapting to Japanese pedagogical styles; accommodating religious needs that are uncommon in Japan.	e.g. Feeling discriminated against; adapting to Japanese socializing styles.

identify how problems with direct, functional consequences may be supported differently from problems whose consequences are less direct, though just as significant.

Problems were further distinguished by whether participants noted that they were caused by a language breakdown. Although language was a persistent challenge in many aspects of participants' lives, we classify "language-related" problems as those where language was the clear and immediate cause of a problem. Using these two axes, we propose a typology of foreign students' problems, presented in Table 1.

Based on this typology, 65% of excerpts coded from participants' diary entries and interview transcripts concerned functional problems (N= 92) and 35% were about non-functional problems (N=49). 59% (N=54) of the functional problems were language-related and 41% (N=38) were not. In contrast, only 35% (N=17) of the non-functional problems were language-related, while 65% (N=32) were not language-related.

5.1 Sources and levels of support

Having formulated a typology of the problems identified by our participants, we address the first part of RQ2—*to what extent are problems adequately supported?*—by coding participants' diaries and interview transcripts for three levels of support: No support, where participants did not identify receiving any support for a problem; inadequate support, where some support was provided but the problem persisted or continued to cause stress; and adequate support that helped the participant overcome the problem without lingering stress. Support was considered adequate if the participant indicated satisfaction with how it helped him or her overcome the problem in the end; this includes cases where a problem was described as challenging but had no evidence of dissatisfaction or lingering stress.
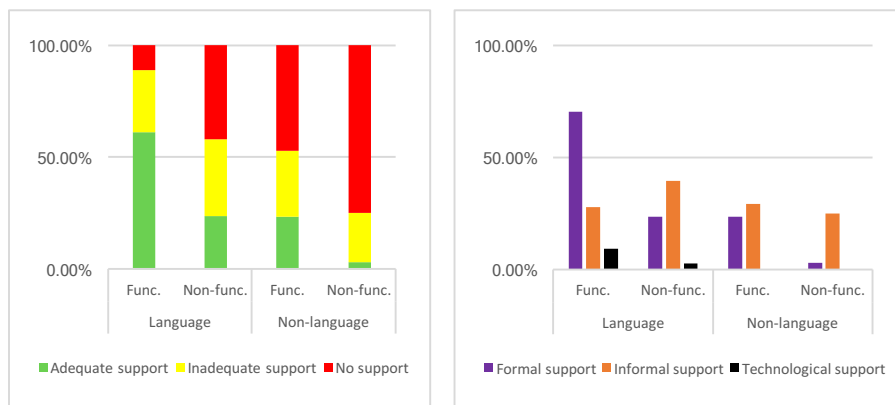

Figure 2. (Left) Percentage of each problem type that received adequate, inadequate, or no support. **Figure 3.** (Right) Percentage of each type of problem associated with formal, informal, and technological support.

Figure 2 shows what percentage of each type of problem was associated with each support level. Functional, language-related problems were by far the most likely to be associated with adequate support (61%), and by far the least likely to be associated with no support (11%). In contrast, non-functional, not language-related problems were often associated with no support (75%) and only one item from this category was associated with adequate support (3%). Functional, not language-related problems and non-functional, language-related problems had similar levels of support to each other.

When some kind of support was identified by participants, we identified sources of support among three categories: *Formal support* provided as part of a formal relationship such as by professors, tutors who were formally assigned to support a particular student, and staff at businesses and train stations; *informal support* provided by friends, strangers, and classmates who have no formal obligation to help; and *technological support* provided by tools such as Google translate or electronic dictionary software. In some cases, participants identified multiple sources of support for the same problem, in which case all of the identified categories were included.

5.2   Types of problems and support

Given the significant variations in the types and levels of support that participants identified for each type of problem, this section presents examples of problems and their support in each category. By doing so, we address the second part of RQ2, *what reasons can be identified for varying levels of support?* Participants' descriptions of problems and explanations for varying levels of support are quoted from their diary entries and interview transcripts; the source of each quotation is indicated in brackets (e.g.: [#7.69, interview] refers to excerpt #69, which was taken from participant 7's interview).

Functional, language-related.
As noted earlier, 65% of the excerpts drawn from the interviews and diary entries concerned functional problems, and 59% of these were language-related. Since participants had strong English proficiency and English was the lingua franca in most of their labs, the high proportion of functional, language-related problems warrants further explanation. First, although participants identified many functional problems related to language difficulty, they often indicated these problems were well supported. The best supported problems were those that are universally experienced by the majority of foreign students. For example, participants indicated that many essential academic activities were supported by professors who could speak sufficient English. Outside of school, participants explained that essential tasks such as opening bank accounts were difficult, but were adequately supported because their laboratories assigned a senior student to act as a tutor and assist them.

Some participants reported problems when working with Japanese lab mates or asking them for help. Although they described their lab mates as generally willing to help, participants often reported that their Japanese peers were lacking in English proficiency. This caused communication breakdowns, and was viewed as causing hesitance

on the part of Japanese students to communicate with foreigners. One participant explained how he improved his ability to overcome these problems by studying Japanese language and using technology:

> Our seniors will guide us directly to use the equipment. But some of the seniors […] are not used to speaking English. So that's kind of a big problem in my first semester. But […] I also study some basic of language. Now I'm able to communicate easily with my senior, you can say, my tutor, to use all the equipment […] [We use] both English and Japanese. But my senpai [senior] sometimes he cannot find the English words, so I use Google Translate to translate his words to English. [#7.69, interview]

Problems that were not universally experienced were unlikely to be adequately supported by professors or other Japanese colleagues and often required foreign students to communicate in Japanese. For example, a minority of participants took some courses that required understanding Japanese, and had significant difficulty. Outside of school, several participants had needs that were challenging to achieve, such as Muslim participants who described difficulty asking restaurant and store staff whether foods were halal:

> Sometimes here the food label does not contain any information about halal, haram […] I want to ask is it halal, but they don't understand English. [#10.90, interview].

Faced with this difficulty, Muslim students were likely to seek support from their Muslim peers, both in-person and using social media:

> We have a Muslim community, they have post on Facebook with foods that are halal, and we follow that. [#8.82, interview]

Sharing information with other Muslims made it possible to overcome difficulties that Japanese hosts were unable to support, but required more work than had those difficulties been supported by participants' universities. It is likely that Japanese peers and university administrators were not aware of the extent of these difficulties because support was sought through Muslim communities of which they are not members.

Non-functional, language-related.
Non-functional, language-related problems were less supported than functional ones, with only 24% being associated with adequate support. Inside of school, these typically related to non-essential laboratory activities conducted in Japanese or informal communication with Japanese lab mates. Outside of school most of these problems were related to activities such as shopping for non-essentials, travelling for leisure, and socializing with Japanese people, all of which often required communicating in Japanese. When participants indicated adequate support for these problems it was because they relied on someone who translated between Japanese and English or they encountered Japanese people who spoke English well enough to communicate.

Language barriers were difficult to overcome when socializing with Japanese peers, and many participants described a mutual reluctance to mingle between Japanese and

foreigners. When participants did socialize with Japanese peers, it was common for language difficulties to persist despite efforts to surmount them:

> [T]hey try to speak English to me sometimes. [B]ut most of the conversation is in Japanese. I sometimes feel like alone with them because I have nothing to say. [#5.45, diary]

One participant identified a strategy to address this problem, explaining that text chatting was a useful approach for informal conversations with Japanese people in English:

> [S]ocial media or email is better option for communicating with Japanese, since they're good at writing English rather than talking in English. [E]ven sometimes I talk to them with emoji/stickers because they're cute and simple. [#4.40, diary]

Finally, even though participants preferred using English when possible, several commented that English was still difficult compared to their mother tongue. One participant remarked that speaking in foreign languages consumed some of his brain's "processing abilities" [#3.27, interview] and others expressed feeling comfort when socializing with co-nationals in their native language, which is consistent with previous research [34]. Finding opportunities to communicate with co-nationals was one way to address this problem, but participants did not identify any other methods of support.

Functional, not language-related.
Most functional problems that were not caused by language difficulty were related to cultural differences. Several participants identified differences between Japanese academic styles and those of their home countries. In one case, this made it difficult for a student to understand her professors' expectations for her work. Informal conversations with fellow foreign students helped her cope with this difficulty:

> In the beginning, I thought it's only me. But when we have a conversation we talk, useless things, we have the same experiences. I thought it was only me! [#6.65, interview]

Other problems were more related to specific needs of individual participants, and were thus less universal. As described earlier, Muslim students had language difficulties when trying to ask whether various foods were halal. Additionally, problems related to Muslim religious practices extended past language. For example, there were few halal options available on campus regardless of one's ability to ask about them. Their university addressed some needs, such as providing a prayer room for Muslim students. When support from their university was lacking, Muslim participants tended to turn to other Muslims.

Outside of campus, problems based on cultural differences were generally either supported by co-nationals and other foreigners, or not identified with any support. One participant expressed frustration with the lack of support from his Japanese colleagues:

> I came here with my family [...] so I think any person who is aware that I am here with my family will know that I need to buy so many things [...] I found all of them by myself. Nobody told me. After that I realized, after

> getting the things, and talking to people, I realized they knew about it. But they never told me […] Sometimes [Japanese people] are supportive, but they are not really that open. [#15.131, interview]

His statement reinforces a common theme in participants' remarks, that Japanese peers were described as providing help when asked, but as not volunteering support on their own. As a result, participants identified many cases where their expectations of support were not met and this gap in expectations itself was described as a cultural difference.

Non-functional, not language-related.
These problems were the least likely to be supported (only 3% were associated with adequate support). Although language difficulty was a common barrier for developing social relationships, cultural differences played a further role. Participants' expectations of relationship norms in their laboratories differed from those of their Japanese peers. One participant felt Japanese members of his lab distinguished between friends and work-colleagues, which he believed constrained his ability to socialize with them:

> A person told me a phrase, if I translate in English it's "laboratory friend." For me it is friends or not friends, or something like acquaintance […] Laboratory is some business and friends are private. So, they have a very clear boundary. [#3.26, interview]

Similarly, another participant expressed unhappiness that his Japanese lab mates were not socially open with him:

> Latin American people […] we are so open … For example, in the morning you ride to the office. If it were Latin America, you will go and say hello to everyone. To everyone! […] but in Japan it's kind of difficult because they always ignore you. […] I come here and sit at my place and the guy next to me won't even look at me. So really for me that's still difficult. [#15.134, interview]

Some support for these social difficulties was provided by a small minority of Japanese people with whom participants had developed friendships, but more commonly participants socialized with other foreigners, especially co-nationals, instead

An additional problem experienced by some participants was perceived racial discrimination. During this study, we did not identify support opportunities to prevent discrimination from taking place, but we did note that participants who felt discriminated against tended to seek emotional support from family and romantic partners, who were overwhelmingly co-nationals:

> I talk with my wife, but I don't talk with Japanese people about that. [#1.6, interview]

5.3   Highlighting co-national support for strong cultural differences

The previous findings have shown that relationships with co-nationals are crucial for supporting problems related to cultural practices that are not well recognized in the host

country. In this section, we discuss how Muslim participants had especially strong relationships with their co-national communities. Our results echo previous research highlighting that Muslim students' religious concerns tend to be poorly addressed by host-nationals [50], and we found evidence that co-national communities were instrumental for addressing those concerns.

Among our 15 participants, 6 were from Muslim countries and observed Muslim customs. Using participants' communication logs, we compared how many people Muslim and non-Muslim participants had logged communication with per day. We distinguished between three groups of people living in Japan: *Japanese people, co-nationals,* and *people from other countries*. Although participants logged both strong (in-depth or lengthy) and weak (brief or trivial) communications, we focused on strong communications as a clearer indication of close relationships. Muslim participants had strong communications with more people per day than non-Muslims in all categories. The largest difference was in the number of co-nationals; Muslims logged strong communications with an average of 1.40 co-national sojourners per day, compared to 0.61 for non-Muslims.

A Spearman's correlation was run to evaluate the relationship between the number of co-nationals Muslim and non-Muslim participants logged strong communications with per day, and how comfortable they reported feeling about their lives in Japan that day. For Muslims, there was a moderate but significant positive correlation between these two variables (r_s=.4060, p<.001) and for non-Muslims there was a weak but significant negative correlation (r_s=-.2190, p<.001). Neither Muslim or non-Muslim participants had a significant correlation between comfort and strong communications with other groups. This suggests that communication with many co-nationals had a comforting effect for Muslims.

A potential explanation for why Muslims seemed to have close relationships with their co-national communities is that they seemed to have strong cultural differences not only with Japanese people, but with other foreigners. A participant from China noted experiencing culture shock more with Muslims than with Japanese people:

> Such as Indonesia, mainly about the language and also their behavior, because they need to pray every day and their food has much requirements. [#2.21, interview]

A Muslim student presents a similar observation from the opposite view, identifying his religious customs as a barrier for socializing with non-Muslims:

> Halal food. That's why I avoid going out with them. One of the reasons. But when I stay with my country people, what they cook I can eat everything […] during the sunset I have prayer time. So, some people are going at that time but I can't go. [#8.83, interview]

These remarks are consistent with previous research arguing that religious differences act as barriers for relationships between Muslim and non-Muslim students [51, 52], and suggest a reason that Muslim participants in this study were motivated to communicate often with other Muslims who were often co-national.

6   Discussion

Our study revealed how different types of problems experienced by foreign students were provided with differing levels of support. Many of the best supported problems were those that are commonly experienced by almost all foreign students. One explanation is that because these challenges are common to most foreign students, they are more visible to university staff who can then prepare support in advance.

The least supported language-related problems tended to involve informal communications. Informal communication is generally ad-hoc, in contrast to the scheduled, agenda-driven nature of formal communication, and is valuable for helping members of an organization learn about each other, improve social relations, and perform collaborative work [53]. There was evidence that Japanese students in particular, but also some foreign students, socialized in language cliques [34] where they grouped themselves by native language. This decreased opportunities for informal communication between Japanese and foreign students, and when they did socialize both sides had difficulty understanding each other. Foreign students who have difficulty making Japanese friends are less likely to be able to turn to those people for either practical or emotional support, so this may contribute to significant problems in the future.

Most problems that were not language-related were based around cultural differences. Participants often claimed that their Japanese professors and colleagues did not recognize or volunteer support for these kinds of problems. As a result, participants often sought support from co-nationals or sojourners from other countries who more likely to have experienced the same difficulties, and therefore were better able to provide practical and emotional support. Muslims stood out as having different problems and support strategies than other participants, and co-national relationships seemed to be particularly important for them. We considered why this could be the case. Although Muslims are well represented among international students in Japan (in 2015 there were 3,600 Indonesians studying at Japanese universities), students from other countries such as China are far more populous [54]. Therefore, the presence of co-national Muslim communities is insufficient to explain this finding. Another explanation is that Muslim participants had significant cultural differences not just with Japanese, but also with other foreigners. This is consistent with previous studies of Muslim international students in other countries [51, 52]. Despite this, Muslims logged strong communications with a greater number of people in all categories (co-national, other sojourner, and Japanese) than non-Muslims did. One explanation for Muslim participants' stronger indications of support is that, by communicating with a larger number of people they may have gained access to more diverse information and resources for solving their problems. That they could build expansive social networks in spite of cultural barriers may be key to understanding how these participants found more support for their problems.

Given the uniqueness of our study population, to what extent could we expect to see similar results in other contexts? It is likely that the general pattern of functional problems being better supported than non-functional problems could also be found among foreign students in other countries and members of other intercultural organizations. Functional problems tend to be visible because they often (1) require urgent resolution and (2) relate to commonly experienced needs. Regarding the relatively high level of

support for language problems, particularly with academic tasks, one explanation is that a significant amount of communication with professors and peers was conducted in a mutual second language, distributing the burden of intercultural communication. In contexts without a common second-language, host-country people are less likely to possess awareness and ability to support sojourners in communicating.

6.1 Design implications

The bulk of our analysis served to categorize foreign students' problems, identify which types of problems are most lacking in support, and consider why this occurs. Based on this analysis, RQ3 asks *how can inadequately supported problems be addressed using language and social technologies?* We suggest three approaches for designers to facilitate increased support where it is most needed. These approaches would support efforts for foreign students to communicate their needs and develop relationships that could provide information, resources, and emotional support.

Supporting face to face intercultural communication

For those who lacked the language ability to converse face-to-face, text-based communication could be conducted using tools like social media sites. Japanese colleagues were described as more capable at writing than speaking English, and foreign lab members could use Google Translate to understand Japanese text. However, text-based communications bear little resemblance to face-to-face conversations that are characterized by spontaneity and improvisation. Given that many technological efforts to support intercultural communication are related to online rather than in-person conversations [55], tools designed to be integrated alongside face-to-face communication may improve efforts to socialize among intercultural peers. Also, previous studies have focused almost exclusively on supporting non-native speakers' comprehension, but our study highlights the need for supporting non-native speakers' in *generating* speech.

One method could be adapting support features of written communication media to face-to-face communication. Linguistic search engines such as NetSpeak [56, 57] and Linggle [58] aim to support writers (especially non-native speakers) by suggesting how to complete phrases based on a corpus of common expressions. And, software such as SwiftKey [59] use machine learning to provide next-word suggestions based on text input. A future step may be to combine such tools with speech recognition, so non-native speakers could view suggestions when struggling to find a word or expression.

Machine translation [46] is another promising approach, but is still in an early stage of development. Future advancements may help machine translation become a viable way for people to have complex inter-linguistic conversations using their native languages, which could be a substantial boon for supporting informal communications. This may be particularly relevant for the context of this study where English was used as a lingua franca among multiple groups of non-native English speakers. Especially since, in spite of their strong English proficiency, our participants noted that their native languages were still more comfortable.

Evaluating technologies for informal communication

Many evaluations of existing technologies to support intercultural communication use metrics such as the speed and accuracy at which participants can complete a task [43, 45, 46]. These metrics are effective for understanding instrumental communication that is most useful toward solving functional problems. This is consistent with our finding that technological support was identified for 9% of functional problems and only 3% of non-functional problems. However, these metrics do not seem well-suited for evaluating informal communication, which is often less instrumental. Therefore, future studies may improve our understanding of how technologies can facilitate informal communication by investigating the use of these tools in natural settings. As well as task completion, researchers could evaluate qualities such as shared knowledge, community cohesion, feelings of belonging, and spontaneity among intercultural peers.

Communicating problems

In many cases, participants indicated that their professors, colleagues, and other Japanese people seemed unaware of the severity of certain problems. A common observation was that Japanese people provided support when asked directly, but rarely volunteered. Instead of constantly asking Japanese colleagues for help, participants often turned to other foreigners. Foreign students would benefit from tools that help them communicate their difficulties to host-nationals. With regard to language-difficulties, previous work has demonstrated that making native-speakers aware of non-native speakers' difficulties encouraged more effective communication strategies [42]. Additionally, language barriers tend to be asymmetric because, although native speakers are aware of non-native speakers' difficulties, they do not understand how this affect non-native speakers' behavior [60]. Awareness of cultural differences seems to be similarly asymmetric, and therefore difficult for institutions to effectively support.

Yuan et al. [34] pointed to the potential of systems that increase "awareness of others' linguistic and cultural backgrounds" for helping members of multicultural organizations identify peers who understand their cultural needs. When our participants turned to co-nationals for support it was often organized through Facebook groups or other communication channels outside their university. Accordingly, the problems and support discussed in those channels were not visible to administrators or faculty who could create formal support mechanisms within their institution. Universities and other organizations with multicultural populations could improve their awareness of cultural differences by providing their own platforms for foreign members to discuss their difficulties. This could be pursued through software that prompts people to make notes of their challenges, or through social networking services with matchmaking systems based on mutual problems, cultural practices, and goals. Information shared through such systems could then be communicated to other members of the organization, taking appropriate measures to preserve individuals' privacy. Applied to a university context, such approaches could improve institutional awareness of problems related to cultural difference, and encourage policies and practices to better support foreign students.

7   Conclusion and Future Work

This study focused on a five-week period in participants' first year of graduate programs in Japan. We investigated how different types of problems experienced by foreign students are met with different levels of support. We shed light on factors that influence the availability of support, and used these findings to identify opportunities for addressing poorly supported problems. The unique population of our study helped disentangle language and non-language problems. Both language and culture barriers are asymmetrical and generally higher when seen from international students' side. For our population, language barriers related to English are higher from the Japanese side, but culture barriers (adaptation to Japanese culture) are higher from the international students' side. Often, culture barriers (like Japanese habits) are invisible from the Japanese side so it causes stress to the international students. As a result, they may attribute some Japanese behaviors to negative motivations such as discrimination, but the root cause could be a lack of awareness.

Our technical recommendations about face-to-face communication address language asymmetry by focusing on non-natives generating speech. And our discussion of tools for improving institutional knowledge of foreign students' difficulties addresses barriers caused by asymmetric awareness of both language and cultural difficulties. Mutual deficits of awareness may lead foreign students to perceive certain Japanese behaviors negatively and discourage communication with Japanese people. Providing them ways to explain their own behavior may help illuminate these difficulties. Other methods for highlighting these barriers could include sensing behaviors using pervasive technologies, clustering them into groups using machine learning techniques, and visualizing/highlighting differences between Japanese and international students.

Although our study provides insight into the problems and support opportunities experienced early in their sojourns, it does not identify changes that might occur later in their studies. Future work may benefit from a longitudinal approach that could better address longer-term adjustment. Additionally, similar approaches may be valuable for studying sojourners in other contexts, such as other types of multicultural organizations.

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9 References

1. Akhtar, M., Kröner-Herwig, B.: Acculturative Stress Among International Students in Context of Socio-Demographic Variables and Coping Styles. Current Psychology. 34, 803–815 (2015).
2. Sawir, E., Marginson, S., Deumert, A., Nyland, C., Ramia, G.: Loneliness and International Students: An Australian Study. Journal of Studies in International Education. 12, 148–180 (2008).
3. Martirosyan, N.M., Hwang, E., Wanjohi, R.: Impact of English Proficiency on Academic Performance of International Students. Journal of International Students. 5, 60–71 (2015).
4. Sawir, E., Marginson, S., Forbes-Mewett, H., Nyland, C., Ramia, G.: International Student Security and English Language Proficiency. Journal of Studies in International Education. 16, 434–454 (2012).
5. Abouserie, R.: Sources and Levels of Stress in Relation to Locus of Control and Self Esteem in University Students. Educational Psychology. 14, 323–330 (1994).
6. Zajacova, A., Lynch, S.M., Espenshade, T.J.: Self-Efficacy, Stress, and Academic Success in College. Research in Higher Education. 46, 677–706 (2005).
7. Bochner, S., McLeod, A., Lin, B.: Friendship Patterns of Overseas Students: A Functional Model. International journal of psychology. 12, 277–294 (1977).
8. Chaoping, L., Ning, Z., Qiong, Z., Zhenglin, C.: Cross-Cultural Adaptation of Foreign Students in Chinese University: Based on Network of Social Support. Cross-Cultural Communication. 10, 16–20 (2014).
9. Furnham, A., Alibhai, N.: The Friendship Networks of Foreign Students: A Replication and Extension of the Functional Model. International Journal of Psychology. 20, 709–722 (1985).
10. Tanaka, T., Takai, J., Kohyama, T., Fujihara, T., Minami, H.: Social Networks of International Students in Japan: Perceived Social Support and Relationship Satisfaction. The Japanese Journal of Experimental Social Psychology. 33, 213–223 (1994).
11. Habib, L., Johannesen, M., Øgrim, L.: Experiences and Challenges of International Students in Technology-Rich Learning Environments. Educational Technology & Society. 17, 196–206 (2014).
12. Maundeni, T.: The Role of Social Networks in the Adjustment of African Students to British Society: Students' Perceptions. Race Ethnicity and Education. 4, 253–276 (2001).
13. Yang, R.P.-J., Noels, K.A., Saumure, K.D.: Multiple Routes to Cross-Cultural Adaptation for International Students: Mapping the Paths Between Self-Construals, English Language Confidence, and Adjustment. International Journal of Intercultural Relations. 30, 487–506 (2006).
14. Cohen, S., Ashby Wills, T.: Stress, Social Support, and the Buffering Hypothesis. Psychological Bulletin. 98, 310–357 (1985).
15. Church, A.T.: Sojourner adjustment. Psychological Bulletin. 91, 540–572 (1982).
16. Hendrickson, B., Rosen, D., Aune, R.K.: An Analysis of Friendship Networks, Social Connectedness, Homesickness, and Satisfaction Levels of International Students. International Journal of Intercultural Relations. 35, 281–295 (2011).
17. Rienties, B., Héliot, Y., Jindal-Snape, D.: Understanding Social Learning Relations of International Students in a Large Classroom Using Social Network Analysis. Higher Education. 66, 489–504 (2013).
18. Ward, C., Kennedy, A.: Where's the "Culture" in Cross-Cultural Transition? Comparitive Studies of Sojourner Adjustement. Journal of Cross-Cultural Psychology. 24, 221–249 (1993).

19. Ma, A.S.: Social Networks, Cultural Capital and Attachment to the Host City: Comparing Overseas Chinese Students and Foreign Students in Taipei. Asia Pacific Viewpoint. 55, 226–241 (2014).
20. Tanaka, T., Takai, J., Kohyama, T., Fujihara, T., Minami, H.: Effects of Social Networks on Cross-Cultural Adjustment. Japanese Psychological Research. 39, 12–24 (1997).
21. Tanaka, T., Takai, J., Takaya, K., Fujihara, T.: Adjustment Patterns of International Students in Japan. International Journal of Intercultural Relations. 18, 55–75 (1994).
22. Geeraert, N., Demoulin, S., Demes, K.A.: Choose Your (International) Contacts Wisely: A Multilevel Analysis on the Impact of Intergroup Contact While Living Abroad. International Journal of Intercultural Relations. 38, 86–96 (2014).
23. Steinfield, C., Ellison, N.B., Lampe, C.: Social Capital, Self-Esteem, and Use of Online Social Network Sites: A Longitudinal Analysis. Journal of Applied Developmental Psychology. 29, 434–445 (2008).
24. Valenzuela, S., Park, N., Kee, K.F.: Is There Social Capital in a Social Network Site?: Facebook Use and College Students' Life Satisfaction, Trust, and Participation. Journal of Computer-Mediated Communication. 14, 875–901 (2009).
25. Ellison, N.B., Steinfield, C., Lampe, C.: The Benefits of Facebook "Friends:" Social Capital and College Students' Use of Online Social Network Sites. Journal of Computer-Mediated Communication. 12, 1143–1168 (2007).
26. Smith, M.E., Nguyen, D.T., Lai, C., Leshed, G., Baumer, E.P.: Going to College and Staying Connected: Communication Between College Freshmen and Their Parents. In: Proceedings of the ACM 2012 conference on computer supported cooperative work. pp. 789–798. ACM, New York, NY, USA (2012).
27. Hofer, B.: The Electronic Tether: Parental Regulation, Self-Regulation, and the Role of Technology in College Transitions. Journal of The First-Year Experience & Students in Transition. 20, 9–24 (2008).
28. Zhang, S., Jiang, H., Carroll, J.M.: Babel or Great Wall: Social Media Use Among Chinese Students in the United States. In: Proceedings of the 30th ACM International Conference on Design of Communication. pp. 37–46. ACM, New York, NY, USA (2012).
29. Rao, X., Hemphill, L.: Asian American Chicago Network: A Case Study of Facebook Group Use By Immigrant Groups. In: Proceedings of the 19th ACM Conference on Computer Supported Cooperative Work and Social Computing Companion. pp. 381–384. ACM, New York, NY, USA (2016).
30. Saw, G., Abbott, W., Donaghey, J., McDonald, C.: Social Media for International Students – It's Not all About Facebook. Library Management. 34, 156–174 (2013).
31. Yuan, C.W., Setlock, L.D., Fussell, S.R.: International Students' Use of Facebook vs. A Home Country Site. In: CHI '14 Extended Abstracts on Human Factors in Computing Systems. pp. 2101–2106. ACM, New York, NY, USA (2014).
32. Morita, N.: Negotiating Participation and Identity in Second Language Academic Communities. TESOL Quarterly. 38, 573–603 (2004).
33. Hansen, M., Scholz, L., Jucks, R.: Intercultural Communication in University Teaching. In: Proceedings of the 3rd International Conference on Intercultural Collaboration. pp. 187–190. ACM, New York, NY, USA (2010).
34. Yuan, C.W., Setlock, L.D., Cosley, D., Fussell, S.R.: Understanding Informal Communication in Multilingual Contexts. In: Proceedings of the 2013 conference on Computer supported cooperative work. pp. 909–922. ACM, New York, NY, USA (2013).
35. Yashima, T.: Willingness to Communicate in a Second Language: The Japanese EFL Context. The Modern Language Journal. 86, 54–66 (2002).

36. Tange, H., Lauring, J.: Language Management and Social Interaction Within the Multilingual Workplace. Journal of Communication Management. 13, 218–232 (2009).
37. Henderson, J.K.: Language Diversity in International Management Teams. International Studies of Management & Organization. 35, 66–82 (2005).
38. Chevrier, S.: Cross-Cultural Management in Multinational Project Groups. Journal of World Business. 38, 141–149 (2003).
39. Yamashita, N., Echenique, A., Ishida, T., Hautasaari, A.: Lost in Transmittance: How Transmission Lag Enhances and Deteriorates Multilingual Collaboration. In: Proceedings of the 2013 Conference on Computer Supported Cooperative Work. pp. 923–934. ACM, New York, NY, USA (2013).
40. Gao, G., Yamashita, N., Hautasaari, A.M., Echenique, A., Fussell, S.R.: Effects of Public vs. Private Automated Transcripts on Multiparty Communication Between Native and Non-native English Speakers. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. pp. 843–852. ACM, New York, NY, USA (2014).
41. Pan, Y., Jiang, D., Picheny, M., Qin, Y.: Effects of Real-time Transcription on Non-native Speaker's Comprehension in Computer-mediated Communications. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. pp. 2353–2356. ACM, New York, NY, USA (2009).
42. Gao, G., Yamashita, N., Hautasaari, A.M.J., Fussell, S.R.: Improving Multilingual Collaboration by Displaying How Non-native Speakers Use Automated Transcripts and Bilingual Dictionaries. In: Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems. pp. 3463–3472. ACM, New York, NY, USA (2015).
43. Yamashita, N., Inaba, R., Kuzuoka, H., Ishida, T.: Difficulties in Establishing Common Ground in Multiparty Groups Using Machine Translation. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. pp. 679–688. ACM, New York, NY, USA (2009).
44. Yamashita, N., Ishida, T.: Effects of Machine Translation on Collaborative Work. In: Proceedings of the 2006 20th Anniversary Conference on Computer Supported Cooperative Work. pp. 515–524. ACM, New York, NY, USA (2006).
45. Gao, G., Xu, B., Hau, D.C., Yao, Z., Cosley, D., Fussell, S.R.: Two is Better Than One: Improving Multilingual Collaboration by Giving Two Machine Translation Outputs. In: Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing. pp. 852–863. ACM, New York, NY, USA (2015).
46. Hara, K., Iqbal, S.: Effect of Machine Translation in Interlingual Conversation: Lessons from a Formative Study. In: CHI '15 Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems. pp. 3473–3482. ACM, New York, NY, USA (2015).
47. Setlock, L.D., Fussell, S.R.: What's it Worth to You?: The Costs and Affordances of CMC Tools to Asian and American Users. In: Proceedings of the 2010 ACM conference on Computer supported cooperative work. pp. 341–350. ACM, New York, NY, USA (2010).
48. Yeh, C.J., Inose, M.: International Students' Reported English Fluency, Social Support Satisfaction, and Social Connectedness as Predictors of Acculturative Stress. Counselling Psychology Quarterly. 16, 15–28 (2003).
49. Neuman, W.L.: Social research methods: Qualitative and quantitative approaches. Allyn & Bacon, Boston (2003).
50. Sherry, M., Thomas, P., Chui, W.H.: International Students: A Vulnerable Student Population. Higher Education. 60, 33–46 (2010).
51. Religious Practices in Cross-Cultural Contexts: Indonesian Male Science Students' Adjustment in Taiwan. Journal of Counseling Psychology. 62, 464–475 (2015).

52. Tummala-Narra, P., Claudius, M.: A Qualitative Examination of Muslim Graduate International Students' Experiences in the United States. International Perspectives in Psychology: Research, Practice, Consultation. 2, 132–147 (2013).

53. Kraut, R.E., Fish, R.S., Root, R.W., Chalfonte, B.L.: Informal Communication in Organizations: Form, Function, and Technology. In: Oskamp, S. and Spacapan, S. (eds.) Human reactions to technology: Claremont symposium on applied social psychology. pp. 145–199. SAGE Publications, Beverly Hills, CA (1990).

54. Report on 2015 Foreign Students Enrollment Survey (in Japanese), http://www.mext.go.jp/a_menu/koutou/ryugaku/__icsFiles/afield-file/2016/04/08/1345878_2.pdf, (2016).

55. He, H.A., Huang, E.M.: A Qualitative Study of Workplace Intercultural Communication Tensions in Dyadic Face-to-face and Computer-mediated Interactions. In: Proceedings of the 2014 Conference on Designing Interactive Systems. pp. 415–424. ACM, New York, NY, USA (2014).

56. Stein, B., Potthast, M., Trenkmann, M.: Retrieving Customary Web Language to Assist Writers. In: Gurrin, C., He, Y., Kazai, G., Kruschwitz, U., Little, S., Roelleke, T., Rüger, S., and van Rijsbergen, K. (eds.) 32nd European Conference on IR Research, ECIR 2010. pp. 631–635. Springer, Milon Keynes, UK (2010).

57. Beyer, M.P.M.H.A., Stein, B.: Improving Cloze Test Performance of Language Learners Using Web N-Grams. In: Proceedings of COLING 2014, the 25th International Conference on Computational Linguistics: Technical Papers. pp. 962–973. Dublin, Ireland (2014).

58. Boisson, J., Kao, T.-H., Wu, J.-C., Yen, T.-H., Chang, J.S.: Linggle: A Web-Scale Linguistic Search Engine for Words in Context. In: Proceedings of the 51st Annual Meeting of the Association for Computational Linguistics. pp. 139–144. Association for Computational Linguistics, New York, NY, USA (2013).

59. SwiftKey: Smart Prediction Technology for Easier Mobile Typing, https://swiftkey.com.

60. He, H., Yamashita, N., Hautasaari, A., Cao, X., Huang, E.: Why Did They Do That? Exploring Attribution Mismatches Between Native and Non-Native Speakers Using Videoconferencing. In: Proceedings of the 20th ACM Conference on Computer Supported Cooperative Work & Social Computing (CSCW '17). ACM, New York, NY, USA (2017).