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Heritage Language Maintenance: The Case of Bangladeshi Immigrants in Canada

Hazem Ibrahim[1], Dina Sabie[1], Prianka Roy[1], Ananya Bhattacharjee[1], S M Raihanul Alam[2], Nusrat Jahan Mim[1], Syed Ishtiaque Ahmed[1]

[1]University of Toronto, Toronto, Canada
[2]Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh

Abstract. Immigrant parents not only face assimilation challenges in a new country, but many also find it difficult to connect their children with their heritage culture. As language plays an important in conveying and practicing culture, the challenges associated with preserving heritage language in immigrant families have not received much attention in the literature. In this paper, we focus on the Bangladeshi community in Canada and interview 20 Bangladeshi immigrant parents to explore the various concerns they have regarding preserving their heritage language and discuss two different approaches to learning through the presentation of language acquisition applications. Based on our study, we report the cultural tensions, economic constraints, and infrastructural challenges the immigrant families face while teaching heritage languages to their children. We also provide a set of design implications to better facilitate heritage language maintenance and associate our findings with some broader concerns in the HCI literature around migration, memory, identity, and learning.

Keywords: Language, Culture, Heritage, Immigration

1 Introduction

Language plays a critical role in the social activities of individuals and communities alike as it establishes a sense of belonging to a group, social identity, and cultural beliefs [1]. Unfortunately, as extensively documented by literature, many children of immigrants lose their ability to communicate via their heritage language and, at the same time, their parents usually cannot adequately utilize the language of the country they migrate to even after decades of settling there [2, 3]. This creates a gap between the children and their parents as they do not find a common communication ground which, subsequently, positions them at different stands on cultural practices in terms of social relations and customs [2, 3]. This problem is present in most migrant-accepting countries, such as Canada, which has seen a steady influx of immigrants over the last several decades with an average of a quarter-million new immigrants coming per year, where approximately 62 percent are from non-English speaking countries [4].

There is a fair amount of HCI literature that aims at assisting immigrants with their integration process in their new environments through employment [5], housing [6],

access to essential services [7], prejudice and racism [8], and isolation [9], among others. Less documented in this literature, however, are the processes by which migrant populations attempt to gather or receive heritage cultural information and education through technology. While there exist some studies that link between technology and cultural preservation within the migration context [10–12], heritage language, in particular, is rarely discussed in this domain with most studies making noticeable advances in the linguistic adaptation of newcomers within their new communities (e.g., [13, 14]). With many immigrants often having children born and/or raised in dissimilar settings to their own, they are often tasked with teaching their children about their heritage culture and language. This internal process within a household is often at odds with external forces experienced by children within their new social contexts such as the schooling system or other peer groups. However, there remains a gap in HCI literature that addresses specifically the lingual practices migrants utilize with their children and the means by which technology can be employed to support heritage language learning and maintenance within immigrant communities.

The objective of this paper is to identify sentiments and problems immigrants face regarding their children's heritage language skills and provide design-level suggestions of opportunities to address these insights. To do this, we have conducted interviews with 20 Bangladeshi immigrant parents in Canada to investigate the processes by which they attempt to maintain their children's heritage language, Bangla, while living in Canada as well obtain their views on two prototypes we developed as probes to address Bangla language learning using different approaches. The first app is the "Bornomala language application" where visual illustrations for each character are used and associated with various words. This application represents the process of independent learning through an application, where the user progresses through the application and learns the concepts on their own. The second app is an online knowledge exchange platform where students are connected to potential language tutors for personal lessons. We discuss our findings to highlight themes and implications for designing technologies to support heritage language maintenance, including community-centered gamification systems, crowd-sourced pedagogy platforms, and shared economy privacy and safety processes. Although our primary focus was heritage-language maintenance, participants' narratives revealed that language learning was sometimes inseparable from broader cultural maintenance practices. We therefore report cultural themes where they provide essential context for understanding how families attempt to preserve their heritage language.

This paper makes three contributions: (a) takes a step towards mending a gap in HCI discourses on immigrants which emphasizes functionality over their cultural needs by discussing the relationship between heritage language and family connections among children born/raised into immigrant families and their parents through the lens of Bangladeshi immigrant families in Canada, (b) advances research in HCI for language learning by generating design implications through initiating a discussion and analyzing the feedback on the design and impact of language learning technologies, and (c) offers insights into the lingual and cultural practices Bangladeshi immigrant in Canada use to preserve their children's connection with their heritage.

2 Related Work

In this section, we first describe the role language plays in cultural practices. We then move into the factors that impact the means by which immigrant children maintain their heritage language after migrating to English-dominant countries. Finally, we give a description of the status of immigration literature in HCI with a focus on the preservation of heritage and language.

2.1 Language and the Practice of Culture

Linguistic anthropology connects culture and language by studying the role language plays in the social activities of individuals and communities [1]. As Duranti [1] notes, ”language is the most sophisticated cultural system available to human societies” as it plays a fundamental role in the process of belonging to a group, social identity, and establishing cultural ideologies. A lack of a common linguistic mean among two groups has many bearings. For example, parents can lose the ability to communicate with their children [2]. Moreover, someone can have a sense of disconnection from one’s roots as they are not able to comprehend what they hear and observe [3].

Language is inevitably bound up with culture. The hypothesis of linguistic relativity (Sapir–Whorf) proposes that a person’s thoughts and actions are determined by the language (or languages) that person speaks [15]. An individual is limited by the language they use to express themselves and different languages have different limitations [15]. Consequently, as Emmitt and Pollock argue [16], the world view of people who are brought up under similar behavioral and cultural backgrounds may vary drastically due to the different languages they speak. Kramsch [17] points out that “language is not a culture-free code, distinct from the way people think and behave, but, rather, it plays a major role in the perpetuation of culture.” Thus, language is rooted in culture and culture is conveyed and transmitted by language.

When someone immigrates, acculturation must happen to them. Acculturation is the process of changes in cultural patterns (e.g., practices, values) that occur to an individual due to being placed in a new cultural group which subsequently affect the individual’s mental well-being and social functioning [18]. Acculturation theories are often studied with much interest to understand the wellbeing of the immigrants in such countries [19]. Such acculturation theories focus more on the languages (and cultures) of the host countries and the processes in which the immigrants learn and adopt them. However, what is less studied and discussed is the language and culture of the immigrants’ home countries that often constitute a big part of their identities, memories, and political selves [20]. As a social group creates experience through language, the practice of culture could be limited if the language associated with such culture is not practiced properly [21]. Hence, the children of immigrants who are raised in the new country cannot practice their heritage culture properly if they are not capable of communicating properly using their heritage language.

2.2 Heritage Language Preservation

It is sometimes assumed that children of immigrants become bilingual because they acquire a second language when they start attending schools which can be added to their heritage language spoken at home. However, in the case of most present-day immigrant children, many research studies have documented how English, in English- speaking countries, quickly replaces the primary language spoken at home for the young immigrants and becomes the dominant if not the sole communication mean [2, 3]. For example, Guardado [22] explores the loss of the Spanish language in Hispanic children in Vancouver from the perspective of their parents. Guardado claims that the method by which parents engage their children in speaking in their heritage language may have a positive or detrimental effect, encouraging parents to promote a positive attitude in their communication with their children. Li [23] shares a similar conclusion, where through a case study of a language minority mother and daughter in the United States, she asserts that language skills and identity formation are significantly influenced by the parents' positive attitude towards the first language in the household. The languages that children are exposed to within the household differ according to the family's language policy, which is defined as any explicit planning in relation to the languages used within a household among family members [24, 25]. The policy determined by a family may differ depending on factors such as religion, beliefs, and values of the parent's cultural, religious, or linguistic affiliations. Yazan and Ali [26] explore the interplay of "linguistic and non-linguistic" forces that influence the emergence and enactment of family language policies within a Libyan Immigrant family in the United States, noting the importance of maintaining heritage language to facilitate participating in religious practices and maintaining relationships with extended family.

Several scholars note the various roles that come into play when discussing the maintenance of the first language, including the roles of the home [27, 28], the school [29–31], and the community as a whole [3]. The motivations for parents to maintain their children's heritage language are manifold. For instance, parents may encourage their children to maintain their heritage language for the purposes of maintaining relationships with extended family members in their native communities [32], or for them to play a role as language brokers for family members who have not yet acquired sufficient language skills after immigration [33]. The loss of heritage language amongst children has also been shown to have negative impacts on familial relationships, due to the language barrier formed across generations and the loss of the parents' and grandparents' abilities to communicate with and discipline their children [34]. Such forfeiture may be influenced by a number of environmental and personal factors such as parental language usage, type of early childhood care, the presence of grandparents in the home [35], and the age of the child at the time of migration [36]. Moreover, the role of the child and their language choices also play an important role with regards to heritage language loss and maintenance, despite their parents' or families' efforts to encourage multilingualism. Authors have shown that factors that influence a child's language choices include the presence of older siblings [37], social pressures, and avoiding appearing different in a non-native language context [2]. We join what these scholars have started and discuss the role technology can play in encouraging (or not) children of the immigrants to engage with their heritage language.

2.3 Immigrants, Culture, and Language in HCI

HCI research about immigrants focuses on comprehending the challenges newcomers face in their new environments and designing technologies that respond to their needs. Various topics are studied in this domain such as access to daily services [38–40], employment [5, 41], health [42, 43], security and privacy [44, 45], and social capital [46, 47]. Due to the importance of culture and heritage for migrants' social inclusion and well-being [48, 49], preserving cultural heritage within the migration context has been increasingly studied in the HCI communities. Most relevant to our work is Arthur et al. [50] efforts in Australia to build "The Migration Experiences platform": a digital heterogeneous collection for the preservation of cultural heritage. Similarly, Giglitto et al. [11] explore the best practices of utilizing ICTs for participatory activities to preserve the intangible cultural heritage of the immigrant and the refugee communities in museums. Hussain et al. [10] investigate how Rohingya Refugees in Bangladesh use ICTs to support their hope through diverse practices of social and religious solidarity and leadership. Wong-Villacres et al. [51] study how schools' liaisons leverage technology and the human infrastructure to bridge - culturally and linguistically - between immigrant parents and the educational systems their children are in. In terms of localized heritage preservation, Sabie et al. [6] show that forced migrants in camps express their cultural identities through motifs made visible by the design of houses the displaced built themselves and discuss the potential technology has in expanding current construction practices. Consequently, Sabie et al. [52] have developed an augmented paper-based home design tool to allow immigrants to reflect on their oral history and aspiration within domestic settings. Our work extends this line of work and focuses on the parent-child relationship as well as investigates a rarely explored perspective on how heritage language could play a role in the everyday lives of immigrants and how technology can contribute positively to it.

Recently, research on Mobile-Assisted Language Learning (MALL) technologies developed to support immigrant populations have become prevalent. MALL technologies include any technology that migrants use to assist their language learning or communication process available through a mobile device, which may include services such as Youtube or language learning applications such as Duolingo. As noted by Epp [53], our current understanding of how migrant populations utilize MALLs to support their communication and language learning practices is inadequate, highlighting the need for tools that enable and encourage self-regulation activities, and tools that help learners rehearse their communication while providing adequate feedback. However, while Epp aims to address researchers' gap in understanding MALLs in the context of English Language Learning, fewer studies aimed to develop technologies to address heritage language learning within immigrant populations. For example, Hashemi et al. [54] analyze language training apps for migrants in Sweden and point to how the majority of apps focus on vocabulary teaching with a lack of societal information and intercultural communication. Jones et. al. [55] developed the 'MApp' to help immigrants' language learning through providing contextual language learning lessons and a social forum to provide a space for social support and cultural information exchange. 'MApp' included a range of tools and services to support informal and incidental learning as well as a social forum providing social support and peer commentary. Gaved and Peasgood [56] explore informal language learning by utilizing location-based triggers to facilitate relevant

language learning activities and by providing knowledge about the town in which the platform was deployed. There have been several language learning technologies targeted toward migrant children. For example, Tewari et al. [57] use speech technologies along with active games to deliver pronunciation feedback for Latino children within the USA. Similarly, Breitbarth et al. [58] augment Hopscotch game with technology to support refugee children and youth in German language acquisition.

However, most of these studies target immigrants' learning of the language of their new communities, while very few studies have explored supporting practices of heritage language maintenance within the migration context. For example, in the context of Korean immigrants in the United States, Lee [59] highlights the impact of computer-mediated nonstandard language use on heritage learners' linguistic development, indicating that electronic literacy practices result in greater socio-psychological attachment to the Korean language and culture. Villa [60] explores the use of technology to support the creation of authentic learning materials to preserve minority languages in the United States and highlights that traditional "interactive" language learning techniques in which a learner sits in front of a computer to learn and listen to language samples do not provide an authentic and adequate communication environment. We extend the existing literature by exploring the educational, social, and cultural practices and family language policies employed by parents for the purpose of heritage language maintenance in the context of Bangladeshi immigrants in Canada. We also implement two prototypes and provide design suggestions for future technological development in this underrepresented area of research.

3 Methodology

We were interested to learn how immigrants prioritized their children's learning of their heritage language, and what obstacles they face toward getting their children to learn it. As most of the immigrants in Canada use mobile phones and the Internet, we were also interested to learn if any online, web, or mobile services help them teach the children their heritage language. Therefore, we decided to incorporate two components in our study methods. First, we engaged our participants in semi-structured interviews, in which we would learn from them about their attitude towards heritage language acquisition and maintenance and the overall challenges that they face in this realm. Second, we presented before them two different technological probes in the form of language learning application prototypes to elicit feedback regarding the usage of technology in language learning. One of the prototypes was customized to address the heritage language learning of the participants specifically, while the other was in the form of a generic online knowledge exchange platform where students would match with teachers that fit their set preferences. The decision to present language learning probes rather than verbally describing the technology design was to root the discussion in a tangible source the participants could interact with. All the study procedures were examined and approved by the ethical review board of the researchers' institution prior to conducting the study. All the authors of this paper are of immigrant background. Three authors are of Bangladeshi heritage and are fluent in the Bengali language. Two of the authors of

this paper have been actively engaging with the immigrant community, personally and academically, in the Greater Toronto Area (GTA) in Canada over the past several years. The Bangladeshi immigrant community was chosen as the target group for this study because three members of our research team are of Bangladeshi background and are familiar with the culture of our participants. As we asked questions about language and culture during our interviews, the participants would mention certain terminologies in Bangla and events that would not have been understood by anyone outside of the Bangladeshi community. Thus, having several authors of the same background as the participants helped us greatly when we did the data analysis to offer the internal eye and explain some nuances when the other authors were confused. Moreover, because one of the prototypes we built was custom-made to a particular language, we had to pick one migrant group. Had we chosen a more diverse group of participants, we would have had more inclusive results. However, we may have had difficulty in comprehending some of the data collected if we did not have authors of the same background as the participants.

3.1 Bangladeshi communities and Cultural Practices in Canada

It is important to explain the context of Bangladeshi immigrants in Canada to better situate the contribution of our work. According to a 2016 survey, the number of Bangladeshi immigrants in Canada is over 50,000 [61]. This number is steadily increasing in recent years. Due to this large number, it is hard to categorize the whole Bangladeshi immigrant communities with a single rubric of socio-economic groups. Toronto, Vancouver, Montreal, and other large cities of Toronto have a large presence of Bangladeshi immigrants. While many of these Bangladeshi immigrants hold prestigious positions in government and private sectors jobs, many others earn their livelihood through small businesses and daily labor. There are also many differences noticeable between the first and second- generation immigrants in terms of their lifestyle, food habits, professions, and practice of culture.

Bangladeshi culture is practiced in limited scope in Canada. In big cities, major Bangladeshi festivals (Eids, Pohela Boishakh, Independence Day, International Language Day, etc.) are celebrated by the local communities where they try to bring the vibes of the cultural practices of their home country. In smaller cities, such celebration is further limited and often absent. In the big cities, there are a few restaurants, grocery shops, and clothing stores that sell products relevant to Bangladeshi culture, which is, once again, hard to find in other cities. In terms, of language learning, it is very hard to find places where children can go and learn Bangla. There are a couple of small-scale Bangla-learning individual initiatives that can be seen in large cities and are only accessible to the people living around them. Hence, most of the community find it difficult to get Bangla language and cultural education for their children. It should also be mentioned here that, Bangladeshi language and culture is often overlapped with the Bangla culture practiced in the West Bengal region of India. However, there are significant differences between these two practices, and most Bangladeshis do not find it comfortable to practice or teach their children the Bangla language and culture from India. Hence, the few Bangla language and cultural hubs that the Bangladeshi from West Bengal have are not very useful for the Bangladeshi immigrants in Canada. As a result, it is often difficult for the Bangladeshi

communities to hold their Bangladeshi cultural heritage through the next generation that is growing up in Canada.

3.2 Prototypes

For this study, two prototypes were developed by the research team to act as probes and elicit feedback regarding educational concerns participants may have had with regards to their children's knowledge of the Bengali language. There exist several free interactive digital platforms which allow users to learn new languages such as Duolingo [62], Rosetta Stone [63], Memrise [64], and HelloTalk [65]. However, we opted for developing our own prototypes because the majority of the applications available do not support teaching Bangla and they are targeted towards adult users rather than children. The two prototypes we developed follow two different but ubiquitous approaches to learning via technology. The first focuses on independent learning, giving the user the ability to learn a language on their own through their interactions with the app, similar to the approach taken by applications such as Duolingo [62]. The second prototype focuses on online interactive learning where students are matched with teachers to engage in online lessons through an online video conferencing service, an approach that has been increasingly adopted since the start of the COVID pandemic. Presenting probes that represented both types of learning was critical to retrieve insights and commentary on the issues participants had with each approach. Furthermore, by building a prototype that targets Bangla learning specifically, we believe that we would have a better understanding of the interests and concerns of the Bengali community regarding utilizing technology to teach their children their heritage language.

Bornomala Language App. This application was developed to elicit feedback from our participants regarding an independent learning approach for language learning via technology. It aimed to assist children in the process of learning to read and write the Bengali vowels through a process of listening to and tracing different letters in the language (Figure 1). This approach uses pictograms which are symbols that illustrate information [66]. Pictograms have been used for teaching purposes mainly among children [67] and people with low literacy skills [68]. They have the advantage of using graphic material along with traditional text contents, the former of which is often perceived as a universal language and captures attention from users easily [69].

The success of pictograms in children's education is probably best illustrated by *Chineasy*, [70], an application that associates each letter in the Chinese alphabet with the image of a corresponding word. Unlike *Chineasy*, in the prototype we developed, pronunciation clips of Bengali vowels and associated words were included, and a game to evaluate the knowledge of the users was incorporated into the application. Similar work has been done by Motahar et. al. [71] at North South University in Bangladesh, who aimed to teach children in Bangladesh between the ages of 3 to 5 the Bengali alphabet using a learning approach that incorporated Augmented Reality. With their developed solution, the user uses a mobile phone to project a three-dimensional AR image of an animal that begins with the same letter as the letter in question. However, with the application developed by Motahar [71], the user is not required to trace the letter, and

Fig. 1. Bornomala Language Application Prototype. In the bottom left, the individual Bengali letter is shown, while in the center, the letter is shown in the form of an animal. At the top, the complete word for the animal is shown.

learns primarily through a visual/auditory approach, rather than tracing the letter as done in the application developed in this study. While their application shares the same name as the application developed in this study, Bornomala, primarily due to the familiarity of the word with the participant group, the chosen implementations are significantly different.

In the Bornomala Language app developed for this study, each letter is designed to look like an animal or object which begins with the letter in question. Moreover, the shape of the letter is displayed to the user in the bottom-left-hand corner. For instance, the first letter in the Bengali alphabet is demonstrated in the leftmost image in Figure 1. The letter sounds similar to the letter 'O' and is the first letter in the word for python, 'Ojogor'. In the 'Learning' mode, the user hears the pronunciation of the letter and the word 'Ojogor' and is shown an animation of the letter being traced. Then the user can practice drawing the letter themselves by touching the mobile screen. In the 'Game' mode, users can test their knowledge through quizzes. Users will first hear the pronunciation of the letter and then they have to correctly identify the letter from four options. They will also have to identify the picture form of the letters similarly after they are shown their real form. Finally, users will be congratulated for their effort and can restart from the beginning.

Online Knowledge Exchange Platform. The platform aims to facilitate users in the process of engaging with tutors from a similar ethnic background (Figure 2). On the platform, a user is prompted to register and create a profile, where they can choose to specify their age, gender, first and second languages, and tutor preferences. Tutor preference allows the user to indicate whether they would like to match with a tutor from a similar nationality, gender, and spoken language as them. From there, an algorithm searches for a tutor with the best possible matching score and suggests a list of tutors

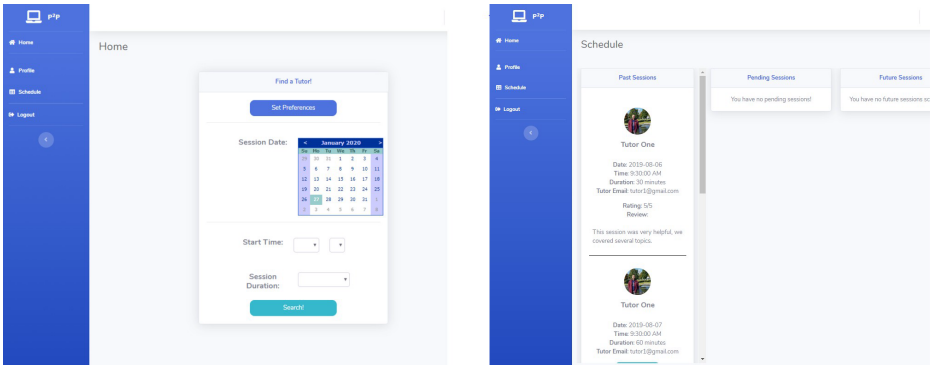

Fig. 2. Online Knowledge Exchange Platform Prototype. On the left, the screen for searching for a tutor is shown. On the right, a dashboard of the past, pending, and future sessions are shown.

from which the user can choose. The matching algorithm for this platform was inspired by research in the field of Adaptive Learning Systems (ALSs), particularly, the 'RiPPLE' algorithm developed by Khosravi et. al. [72] which recommends learning activities to students based on their knowledge state. Once a tutor is selected, an invitation is sent to the tutor, which they can choose to accept, reject, or modify the time/date indicated by the user. Once a session time and date are confirmed, a Google Hangouts link is generated by the tutor and linked to the session and is made available to the user to click on at the time of the session. This platform is a prototype to demonstrate the concept of online tutoring to the participants in this study.

At the time we designed the study and conducted half of our interviews (2019–2020), online learning through video-conferencing applications was far less prevalent than it would become during the COVID-19 pandemic. In the years following our initial data collection, research has documented how prolonged remote learning affected children's engagement and well-being, with many young learners struggling with attention, self-regulation, and reduced social interaction in virtual classrooms [73–75]. These insights contextualize our participants' reflections, as they expressed concerns about their children's motivation and emphasized the need for engaging, culturally relevant digital tools. Within our study, parents discussed both the perceived benefits of online tutoring platforms, such as flexible access to Bangla-speaking tutors and the ability to set preferences for tutor characteristics, and their apprehensions about privacy, security, and the relative value of online versus in-person learning.

3.3 Participants Recruitment

For our study, participants were recruited using two methods. The first one was through posting a call for participation on social media groups. A description of the study and its criteria for participation and compensation were posted on two social media groups on Facebook: the ''Amra Canadian Bangladeshi" (ACB) Facebook group and

Table 1. Description of the Study Participants

No.	Pre/During COVID	Age	Gender	Years in Canada	No. of Children	Children's Gender/Age	Occupation
1	Pre	52	F	25	2	M(10), F(17)	Stay-at-Home Mom
2	Pre	38	M	3	1	F(11)	Graduate Student
3	Pre	40s	F	7	2	M(2), F(12)	Project Manager
4	Pre	32	M	6	1	F(5)	Business Advisor
5	Pre	43	M	6	1	F(8)	Accountant
6	Pre	48	F	8	2	M(11), F(21)	Stay-at-Home Mom
7	Pre	43	F	9	2	M(7), F(16)	Quality Line Leader
8	Pre	42	F	6	2	F(11), M(16)	Graduate Student
9	Pre	37	F	8	1	M(7)	Charity Worker
10	During	35	M	8	1	F(7)	Research Associate
11	During	35	F	8	1	F(7)	Engineer
12	During	42	M	15	2	F(2), F(9)	Professor
13	During	42	F	15	2	F(2), F(9)	Community Organizer
14	During	33	M	4	1	M(5)	Software Developer
15	During	38	M	7	1	M(4)	Software Developer
16	During	35	F	7	1	M(4)	Software Developer
17	During	38	M	4	2	F(2), F(6)	Social Worker
18	During	36	M	4	2	F(2), F(4)	Freelancer
19	During	32	M	2	1	M(3)	Engineer
20	During	41	M	10	2	M(9), F(13)	Banker

the ''Bangladeshi Canadian Canadian Bangladeshi (BCCB)" Facebook group. These two groups are the most active Facebook groups for Bangladeshi Immigrants who have moved to Canada. Eligibility for participation was predicated on the participant having a child under the age of 15, and that they were immigrants to Canada. We used 'snowball sampling' [76] as the second recruitment method, where we asked the existing participants to recommend more participants who meet the criteria of our study. Using their testaments, we recruited more immigrants. We stopped at a theoretical saturation, i.e., when not much new information was found with additional interviews [77]. We recruited 14 participants from the first method while the rests were from the second one.

All of our participants - except one - resided in the GTA (Greater Toronto Area). The GTA has an incredibly diverse immigrant demographic. As of 2016, the area is home to over two and a half million immigrants, or 46% of the population [78]. This rate is much larger than the national rate of Canada, where there are approximately seven and a half million immigrants, or 21.9% of the population [79]. Immigrants in Toronto hail from a plethora of different countries, with a majority of immigrants moving from the Global South, particularly India, Sri Lanka, and Bangladesh [78].

3.4 Study Procedures

We conducted semi-structured interviews with the 20 participants, 9 were between September 2019 and January 2020 (pre-COVID-19), and 11 were between October-November 2020 (during COVID-19). Eight interviews were conducted in-person at

public locations (Coffee Shop, Library) that were convenient to the participant while the rest were over Zoom/Skype due to the COVID pandemic and its associated restrictions. Table 1 gives a description of the participants. All participants had higher education and all except (P6, P14, P18, P19) have no relatives in Canada except for their spouses and children. All interviews were audio-recorded and taken with the presence of two members of our team - one is a native Bengali speaker and the other one is fluent in English. The participants could interview either in English or Bengali. All but one participant were interviewed in English, this one interview was in Bengali. Each interview lasted between 30 minutes and 50 minutes with an average of 41 minutes. A singular participant was compensated with CAD 20 (~ USD 15) while a family was compensated CAD 30 (~ USD 23). Three members of our team transcribed all the interviews and any Bengali words or phrases mentioned in the interviews were translated into English. The Bengali-speaking members of our team transcribed and translated the single interview that was conducted in Bengali.

We asked participants questions with regards to their motivation to relocate to Canada, their thoughts on their and their children's adaptation after immigration, and the educational practices they perform to teach their children about aspects of their native culture such as the Bengali language, history, festivals, and literature. For interviews conducted during the COVID pandemic, we asked the parents questions about their experience with their children's remote learning and their thoughts on its pedagogical impact on their offspring. In all the interviews, we presented the two prototypes developed by the authors to address linguistical concerns parents may have had with regards to their children and gained feedback from the participants with regards to the prototypes. We asked questions in regard to their opinion and concerns of the prototype to teach their kids the Bengali language.

3.5 Data Collection and Analysis

After transcriptions were completed, the first two authors read through the transcripts and allowed codes to develop. They performed thematic analysis on the transcriptions in accordance with Boyatzis's rules for code development [80] separately. Whenever there was a reference to specific events or actions that we did not understand, we asked our co-authors of Bangladeshi backgrounds for clarifications. After several iterations, themes emerged, including practices used to preserve heritage, language role in the family, educational practices of the children, and technological requirements for apps. When conflicts were present, we discussed them to find a middle ground. Our findings section reflects our major takeaways from the data analysis.

4 Findings

In this section, we will first discuss the reasons that motivated our participants to preserve their children's heritage language. Then, we will disclose the various practices the parents used to teach and maintain Bangla with their children and the obstacles that hinder every

practice. Finally, we will discuss the participants' feedback on the prototypes discussed in the previous section.

4.1 The importance of Heritage Language

Even though all our participants labeled their children as 'Canadians' and did not expect them to become 'full' Bangladeshi individuals, the majority still wanted them to engage with their heritage culture in order to not forget their roots. Most of our participants expressed their fear that their children would forget - or not associate with - their Bangladeshi cultural heritage. This disassociation could manifest in several different forms such as loss of their religion and limited knowledge about the history of their nation. Language, according to our participants, plays an important role in preserving their Bengali roots and identity.

Communication with family members was the ultimate reason our participants indicated to preserve the children's identity. Such communication would not be possible without both parties speaking fluently the same language. This observation was in-line with previous studies on the topic of heritage language learning [81]. Since the mother tongue of all parents is Bangla and, as the parents explained, Bangla has expressions that are not easily translated to other languages, some participants indicated that their children feel disconnected from their parents because they cannot understand the conversations their parents would have together or with family friends:

> "In my home, because she [his daughter] doesn't know hundred percent Bengali, so when some days my wife and I sometimes talk and laugh in Bengali, but she doesn't understand and she becomes very curious ... she is like, "why you're laughing? Please tell me". So, there is a barrier because then she feel like that time she feel discomfort. Also, when her friends know the Bengali song but she doesn't know then I just tried to tell her, you got to do that." (P17, M, 38, Social Worker)

Our participants lamented this loss of language as it caused a barrier in communication when the children communicate with their extended family as well, either online or when they visit Bangladesh, as these two participants said:

> "This is kind of complex for us. She understands Bangla, because me and my wife speak Bangla with her, so she can understand. But it's very hard for her to speak, few words maybe. My mom is always complaining about the fact that she doesn't speak her own language, my mom can't speak English so it's hard for her as well." (P4, M, 32, Business Advisor)

> "A big part of my family lives in Bangladesh. His [their son's] grandparents from both sides are not that much educated in English and cannot communicate with him in English. So, the whole culture and heritage thing will only happen when he will visit Bangladesh again, or we have to communicate with them in Bengali. It's really important for them to know their heritage. Otherwise, they won't be able to communicate properly." (P15, M, 38, Software Developer)

Some of our participants also noted that awareness of Bangla conversational skills is not enough. They note that it is important for the children to read their heritage language to be able to examine original texts and hence become more aware of their heritage culture and history and therefore their origins without the need for intermediaries:

> "Because of that, origin, because they're originally from Bangladesh, right, and this is one of the International languages…it is our emotion that we are from Bangladesh and kids doesn't know how to read Bangla and write Bangla that is every parents' responsibility. That's basically, you can call it an emotion from your origin. So that's why I wanted our kids to take that culture and keep forward, right, at least for one generation." (P20, M, 41, Banker)

These insights emphasize the importance of learning Bangla for our participants' children to be able to communicate with the larger family and community. While all parents want their children to be able to maintain their ability to speak in Bangla, some also would like for them to read in order to interact and comprehend original texts.

4.2 Practices to Preserve Heritage Language

We present now the various methods our participants used to teach their children the Bengali language, the outcome of such attempts, and the issues that hinder their endeavors.

Family Interactions. The main method all the participants used to preserve their children's heritage language was to speak to their offspring in Bangla at home and attempt to read stories in Bangla for them to make them more comfortable with the language. However, there would be a high chance for the child to reply in English or to use Bangla mixed with English because the child's proficiency in their heritage language converse is low. Moreover, even if they attempted to converse in Bangla, they could not express themselves properly. This is the case not only for children who were born or brought in Canada at a young age. Even for children who were able to speak, read, and/or write in Bangla before moving to Canada, they were unable to maintain these abilities as they grew more integrated into the school system and were required to learn not only English but in many cases French as well (because Canada is a bilingual country).

A dilemma was also present with some of our participants' children who did not speak any English prior to migrating or had speech disorders. As the children struggled to integrate into the schooling system initially and to help with the process, the parents attempted to improve the children's ability in English and would communicate in English with their offspring to assist in the process of learning at home. One participant explained:

> "They were really good [in Bangla], but now I'm very worried, oh my god, my daughter's condition is very bad, even though I tried a lot. Now she is very comfortable with English but she's not comfortable with Bangla, so she doesn't like to speak. I know, I tried to, but at the same time I am required to learn how to speak English right? Good English... In the future, if they only speak English, maybe I won't be able to understand them and their

> emotions, what they are feeling, what they mean. If I don't understand that, it will be a hard time, it will be very difficult." (P8, F, 42, Graduate Student)

Several participants interviewed mentioned their children's Bangla accents as a possible barrier to communication with extended family in Bangladesh. One participant noted that due to their child's "Westernized" Bangla accents, family members in Bangladesh often ridiculed their accent, discouraging the children from continuing to speak in their heritage language:

> "Yeah, but when people back home talk to my kids, they feel weird, because when my son pronounces something, they laugh all the time because he has an accent. I understand that its not the way most people speak back home, so they think its funny, so my kids feel discouraged." (P6, F, 38, Stay-at-Home Mom)

On an interesting, yet contradicting note, few participants pointed out that their extended family viewed speaking English as an indicator of having a higher social class, thus encouraging their children to speak in English rather than in Bangla. One participant mentioned,:

> "She was studying in an English medium school in Bangladesh, and the school encourages students to not speak in Bangla but rather in English due to social status. Although I don't like the fact that she can't speak in Bangla, my extended family look at the fact that she can only speak English as a pride thing. Her grandparents are of higher socio-economic status and they view the fact that she speaks English as a good thing." (P2, M, 38, Graduate Student)

Social Gatherings. An important approach many of our participants utilized to improve the practice of Bangla of their children is through supporting their cultural identity by engaging with the local Bengali community, either through friendly gatherings or large festivals. This approach was noted by other scholars and would include performing certain domestic tasks that could reflect their cultural heritage such as cooking authentic foods, home decorations, narrating stories, and teaching children heritage customs [82, 83]. One of the most important aspects of Bangladeshi culture, as mentioned by our participants, was the celebration of religious and cultural festivals by going to Bangladeshi community events. All of our participants mentioned the importance of celebrating and acknowledging several festivals, including the major Islamic, Hindu, and Buddhist religious festivals (regardless of the participants' religion), and cultural festivals such as the Bangladeshi New Year's festival and International Mother Language Day. Our participants noted the importance of wearing the proper attire to celebrate International Mother Language day and cherished explaining to their children the importance and relevance of the festival. Some of our participants explained how their kids enjoyed some of these events, despite them not entirely grasping the significance of those events:

> "A couple of events that we participated, he [their son] started enjoying them with the kids, playing with them, right. But when we are having that

> culture of singing or dancing or things like that, they enjoyed that, but it's not like that they understand all of them. But that's not our intention all the time either and maybe there are other kids who like Bengali songs or Bengali dancing or things like that. If we can engage with those, I think that could engage our son more on learning the culture." (P15, M, 38, Software Developer)

However, despite the participants' efforts to encourage their children to participate in these festivals, most parents expressed their children's lack of interest in attending or celebrating them, because they could not associate themselves with these events, especially if they did not have many relatives in Canada to celebrate the cultural festivals with. Thus, their children often opted to celebrate more traditionally Western festivals such as Halloween. One of our participants said:

> "We don't have any relatives in Canada, while other families usually had other members available to celebrate with, but since we don't have relatives, we don't celebrate Bangladeshi events socially, whereas she has adapted more to enjoying Western holidays such as Halloween. When Eid would come, we would spend time at home, and she might not even be aware that it was Eid to begin with. We wanted to go to the Bangladeshi festival, but we felt that it isn't the same [as in home country], and the weather is cold. So, we did not go to the parties. Our cultural identity is dying off here ... its changing, missing out on a lot of components which are Bengali, the Bangla festivals here don't feel authentic." (P2, M, 38, Graduate Student)

Attending social events was also not an option for many of our participants. The cost of engaging in cultural events prevented some of our participants from being part of them. For example, despite the availability of cultural programs and events organized in the region where our participants resided, several participants indicated that they did not take part in such programs as they lived far away from areas with a high concentration of South Asian immigrants. Some participants indicated that they and their children had lost connection to many of the people they knew there and were unable to attend cultural events as often due to the cost of transportation. In addition, they also noted the hidden costs of participating in cultural events and programs, particularly with regards to the cost of buying new clothes and cooking for potluck events. One participant said:

> "It is actually not easy to maintain communication with people. It is hard to keep talking to people over phone. After going to a get-together, you have to invite them over, then spend a lot of money on food and everything. It is hard. You have to buy so many things and cook for days for the potluck and buy new 'saree' [cultural dress] all the time. I can't do all that. It's too expensive." (P1, F, 52, Stay-at-Home Mom)

Several participants also noted the 'shame' they felt in regard to their social status since migrating and thus refuse to take part in cultural gatherings. For example, one of our participants noted that due to the structure of the immigration system in Canada, many Bangladeshi immigrants may often feel a sense of shame in interacting with other

immigrants, if they were unable to occupy a position that they had anticipated to take up before immigrating. The immigration process in Canada is facilitated through a points system, where potential immigrants receive points based on a number of categories, including, Language skills (English and French), their education, work experience, age, whether they have an arranged job in Canada, and their spouse's adaptability for immigrating to Canada [84]. As such, participants who immigrate with a high point total, but do not achieve their expected employment level may shy away from interacting with other Bangladeshi immigrants who are employed in higher-paying positions. For example, P2 talked about what prevented him from meeting with his former colleagues in Bangladesh. He had immigrated in hopes of obtaining positions at a bank, but he had been working as a security guard. He noted that with a lottery immigration system, such as the system employed in the United States, many immigrants may not hold high expectations with regards to their employment, and therefore, aspects of shame are mitigated. Such explanations are in-line with the socio-cultural dimension of the cultural adaptation model proposed by Ward, where occupational aspects of adaptation are addressed. Many authors have explored the adaptation of immigrants in the context of their occupational domain or motive, such as studying migrants in organizational expatriation and self-initiated expatriation settings, and international students [85, 86].

When attending social events in Canada was not possible, our participants attempted to recreate the cultural atmosphere for their children using different methods. Almost all of our participants visited Bangladesh every two years or so for vacation so their children get more exposure to their heritage culture and the parents believed that their kids did enjoy meeting their extended families and the foods. When they attempted to create similar gatherings in Canada, they were unable to instill similar enthusiasm as the difference in weather and environment between Canada and Bangladesh also plays a role in not establishing the authenticity of the festivals. For instance, the Bangladeshi New Year festival, celebrated in the month of April in Bangladesh is often accompanied by warm weather and outdoor activities, street food vendors, snake, and puppet shows, and wearing cultural attire, whereas, in Canada, the weather is often cold and unaccommodating, limiting the experience significantly. Moreover, some of our participants noted that because no vacations would be given to their cultural events, preserving their cultural activities came down to their personal effort to attempt to celebrate certain festivities. One of the participants mentioned:

> "I would say lack of opportunity [to celebrate] ... Say you would have vacations on certain days right, then you would observe that day during your vacation. Here you don't get a vacation on Eid, you don't get a vacation on Bengali new year, you get a vacation on your like the 21st February like the mother language day, right. But you get vacation on Christmas and other festivities that are observed here, right. This makes you a little bit less performing your own culture." (P14, M, 33, Software Developer)

Language Schools. All of our participants had knowledge about Bangla language schools which are part of heritage language after-school or weekend programs funded by the government to teach immigrant children about their heritage language. Several of our participants have sent their children to them. However, their experiences with the

language schools and the improvement of their children's Bangla ability were mixed. Several participants noted the 'old-fashion' education approach the teachers used in these schools which favored students listening to the lessons rather than an interactive model which is widely used in public elementary schools that the children are used to. Some participants explained that they believed that the teachers in these schools are not well trained in teaching methods common in Canadian schools. Moreover, some parents noted that these schools only teach basics (e.g., letters) without focusing on elaborative conversational skills. Thus, participants felt that there was a lack of progress in learning Bangla with their children who went to such schools. Nevertheless, few participants offered an enthusiastic response to Bengali language schools. They cited the teachers as the reason why the language classes were fun and therefore were beneficial for their children. One participant mentions:

> "Actually, every Saturday, he [her son] goes to a Bangla school. He has been attending the school for the past two months. There, they learn Bangla songs and they give him homework. The teacher used to be at a very reputable school in Bangladesh, so she has a study plan for them, so once they go in, they do a 5 minutes presentation in front of the class saying what they did for that week in Bangla. After that they get to write. There are other fun activities, for instance, she shows them the map of Bangladesh, and shows which area is where, and yesterday he learned how to write 1 to 10 in writing in Bengali." (P9, F, 37, Charity Worker)

Participants who did not enroll or did not want to enroll their children in language schools noted several factors for this decision, most notably the immense pressure their children are currently under. Many immigrant children are often tasked with learning up to two new languages after moving (English and French) in school.

> "it's very overwhelming for them because in school they are doing English and as well as French ... So, Bengali, they feel like they are not comfortable at this point so we didn't give any pressure and we are also searching any good technique, like an easy technique to teach them Bangla ... That was very difficult, and we don't want to give them that scenario." (P20, M, 41, Banker)

Moreover, many participants attempted to teach their children to read in Arabic, often prioritizing reading in Arabic over reading in Bangla. They explain this prioritization by accounting that this was part of their mandatory duties as Muslims to teach their children to read Quran and therefore teaching them to read in Arabic, while teaching them Bangla was viewed as optional or dependent on their child's interest in learning to read and write in Bangla. One participant said,

> "He knows some surahs [A passage in the 'Quran'], we would recite it to him, so he is learning, he picked up some... It's a part of our religion to teach our kids the Quran. We are teaching him at home at the moment, but in the summer I plan to enroll him in Quran classes at the mosque." (P9, F, 37, Charity Worker)

Thus, many parents opted to prioritize only speaking Bangla, rather than reading or writing. However, these schools do not prioritize conversational skills. One participant noted:

> "Because she's [the daughter] not going to write Bangla here anywhere, so that is not going to happen. She can speak because we speak at home and the community around her and she understands it. Speaking and understanding is enough. Reading and writing require a different kind of interaction that she won't be as exposed to while living in Canada." (P3, F, 40s, Project Manager)

Depending on the location and student demographics of the school, the availability of cultural or language programs catered towards Bangladeshi students differed significantly. Most of our participants mentioned that the schools their children attended did not have many children of Bengali background and there were no kids from the same culture in their friend circle therefore their kids were not exposed to their heritage culture frequently. On the contrary, few participants noted that there had been a large number of Bangladeshi students at their children's schools and therefore there were many cultural and language programs offered at the school such as celebrating Bengali new year celebrations and language day and wearing traditional clothes. In an effort to combat this loss of Bangladeshi identity, many participants engaged their children in various programs or lessons to familiarize them with Bangladeshi culture. However, participants noted that with this additional load on their children, added pressure is placed on the children as they start comparing themselves with other kids who did not have to engage with such activities. Similarly, several participants mentioned that they would not force their children to learn about Bangladeshi culture or the Bengali language due to the compromises that their offspring already had to make in moving to Canada with their parents and the lack of a supportive system such as extended family and friends:

> "We are a bit confused as parents, my wife and daughter are both making sacrifices by being here with me, they sacrificed their family and their work to accompany me for my Ph.D. In Bangladesh, we would push for her [daughter] to perform or to read, but here, she is already making compromises for me, so I don't want her to feel pressured to do more than she wants. In Bangladesh she has a support system through her aunts and uncles, but she is more alone here, since my wife and I are busy a lot of the time with work, and I don't want to put even more pressure on her." (P2, M, 38, Graduate Student)

While such schools are free or are available for a nominal fee (CAD 10, ~ USD 8 per semester), several parents explained that the cost of transportation to these schools and time needed to make such a trip, even if they have a car, prevented them from enrolling the children. From a different perspective, dialects in the Bengali language also emerged as an obstacle. P5 noted that the public school in which his daughter is enrolled offers Bengali language lessons on the weekends. However, despite the availability and convenience of such a program, he has opted not to enroll his daughter, due to the difference in dialect between traditional Bangla, and the dialect spoken in the household, 'Sylheti'. The status of the language is disputed, with some considering it to be a Bangla dialect, and others considering it a related but separate language.

Technology. The use of technology to learn Bangla had a very weak presence in our data. Several participants noted how their kids sometimes enjoyed watching Bangla TV shows and cartoons and listen to Bengali music as they see their parents do that. Some participants indicated that their children used some apps (e.g., Duolingo, YouTube) to learn languages such as Japanese, French, and Spanish because they wanted to understand things they liked to watch (e.g., Anime, TV shows). However, the children would not use such applications to learn Bangla because, according to the parents, the resources available to teaching Bangla in these applications were not of good quality and because the child would not find benefit from learning Bangla for entertainment purposes.

In this subsection, we have highlighted the various approaches our participants utilized to support the learning of Bangla for their children. However, all the approaches as our participants indicated did not yield desired results mainly due to the lack of interest in Bengali culture and language experienced by the participant's children. This issue is compounded in situations where the child is learning to speak both English and French in the schooling system, along with learning Arabic for religious reasons, which prevented several participants from having their children pursue learning Bangla.

4.3 Response to the Prototypes

In this subsection, we will discuss the positive feedback as well as the concerns our participants had with regards to the two different approaches to learning portrayed using the prototypes and with regards to online education in general. We note that all our participants explained that their children had access to smartphones, tablets, and computers. The children either had their own devices or they used their parents' devices. In addition, many had access to tablets and computers at their public schools as well.

Bornomala Language App and Independent Learning. Responses from our participants were primarily positive for this application that some participants even asked for a copy of this prototype for their children to engage with. The interactive and gamified nature of the app was cited as attractive features for the children. Moreover, several parents noted that a self-paced learning platform would allow their kids to explore things on their own and at times convenient to them. While the approach to learning itself seemed satisfactory, the prototype was rudimentary with regard to the skill levels that are targeted. However, a number of participants brought up the issue of a lack of incentive on the part of their children for using such applications. One participant explained,

> "I think if you want to learn, you can learn anywhere, you have YouTube, you have Google, you just need to have motivation to learn. If you don't have motivation, I think the first thing is to grow their interest, and then they will learn. If they don't have interest, whatever I give them, they won't care. It's disappointing, but no I don't think so. Its difficult. They know English and Western media and culture. They aren't thinking we need to learn Bengali." (P7, F, 43, Quality Line Leader)

The issue of motivation to use technology for the purpose of learning, rather than using their phones for entertainment was a common theme among the participants.

Basic in-app gamified elements such as badges or awards did not seem to be adequate motivation for independent learning through the application, indicating the need for more creative approaches to motivate their children to use their phones for learning Bangla. Incorporating gamified elements which expand beyond the scope of independent learning and integrate the learner's social circle was suggested to be a possible way to motivate their children to use the application.

Learning letters as the application's main theme was a debatable concept among our participants. One group was very excited about the concept stating that once their children learn the alphabet, they can read and write and therefore be more connected to their heritage culture. However, some participants pointed out that this application specifically targeted skills that were elementary, where their children had already advanced in learning the Bengali language beyond learning to write and pronounce the Bengali alphabet. Moreover, a group of participants was skeptical of the app concept because the teaching approach in Canadian elementary schools follows a reverse order. When their children learned English (and often French as a second language), they were taught words and songs first, followed by learning the letters. Such a reversed learning method was popular amongst their children because they enjoyed the process of singing and learning songs rather than the more abstract and standard 'learning-letters approach'. Consequently, the participants pointed out how their children did not like attending Bengali language programs (after school or over the weekend) because the teachers in these programs used traditional 'Eastern' teaching methods that were not engaging and which focused on indoctrination.

This insight suggests that for an independent language learning application to be effective within this community, it should incorporate elements that reflect the language learning approach children experience within their schooling system. Furthermore, this presents an opportunity for further integrating cultural elements into the language learning process. Bangladeshi culture is rich with traditional songs which can be incorporated into a language learning application, both assisting the children in learning the alphabet in a familiar fashion as they experience within the schooling system, while also familiarizing them with cultural songs.

In summary, participants noted that facilitating the language learning process through an engaging application might motivate their children more than traditional methods of learning that they had attempted and passive browsing of online educational content. While the Bornomala Language application attempted to incorporate gamification elements such as positive feedback at the completion of a level, gamification elements that target user motivations beyond acquiring heritage language skills must be addressed more effectively.

Online Knowledge Exchange Platform. Over half of our participants mentioned that they preferred the online video conferencing approach of this application to the independent learning approach due to their belief that their children would not learn if they were left on their own. Moreover, they believed that the presence of a tutor would make the process of learning more effective, as it would offer more exposure to a variety of information and activities. On the other hand, the participants who did not favor this application were wary of the 'inflexibility' that comes with learning with a tutor, as there would be set times for meetings and the kids may feel overwhelmed because

of other commitments they may have, whereas, in an independent learning application, the children can progress at their own pace. Thus, with regards to online learning, the challenge is to balance the flexibility of independent learning with the engagement offered when learning with a tutor.

Furthermore, several participants expressed a number of concerns, particularly with regards to the privacy and security of such platforms. These participants reflected on the incidents of privacy breaches that had occurred while living in Bangladesh. One participant explained this issue by noting:

> "From back home we always faced scams online, and people would always try to take advantage of the kids and take their information online, we have some privacy concerns about this." (P6, F, 48, Stay-at-Home Mom)

Another participant mentioned:

> "I feel uncomfortable with the idea of video conferencing, I am hesitant to even have my audio recorded. If you asked me seven years back, maybe, but now I hate that social media is breaching people's privacy nowadays. In Bangladesh in the past two years, political phone conversations are being leaked, I hate it and I don't feel comfortable anymore. For my daughter, we have read so many articles where if they use social media it's not good. It's not time yet." (P2, M, 38, Graduate Student)

Most of our participants also talked about their apprehension with the tutor who would be teaching their kids. While the gender of the tutor would not be a concern for our participants, they asserted the importance of 'trust' between the parents and the platform where the platform must verify the tutors prior to them being part of it. For example, P15 and P16 said that they trusted the Bengali teacher that was teaching their children because she was part of a government-supported program to teaching heritage language and she had to provide special education certificates and other documents to be able to teach the children. Thus, P15 expressed his concern that this would not be possible when the tutor comes from a different country, especially from "the other side of the world". In this regard, our participants said that it is important for the platform to provide evidence for the parents that the system can be trusted:

> "I would trust tutors from here more than tutors from Bangladesh because if you teach online [here] maybe I'll ask where you're from, and you tell me, I may be able to see you or call you or know your address, but back home, it's hard to know anything." (P7, F, 43, Quality Line Leader)

Our participants voiced their concerns with regard to their children's interest in using the platform. Participants explained that the tutor must be incredibly charismatic and interesting to maintain the attention of the students in the tutoring sessions, as their children would likely not have much intrinsic motivation to learn about such topics. Also, regardless of where the teacher is from, the teaching methods must be similar to what the children are used in their elementary schools in Canada because they are fun and not abstract to them. In addition, participants indicated that while a one-on-one interaction

with a tutor may be beneficial in some contexts, they would prefer for the sessions to include a small group of students interacting with the teacher, rather than a one-on-one conversation, due to the increased competition between the students, the ability to speak and interact with other children their age in Bangla, and the ability to share knowledge and discuss ideas amongst a group. P18 said that "if it's a one-to-one, it will be like a punishment for sitting in front of a device".

The main feature all of our participants required from any language teaching application is 'engagement'. The process of learning must be fun for their children (e.g., game, art) because otherwise, the children would not be interested in learning. Some participants indicated that their kids did not learn from their parents but from fun engagement with their teachers and their colleagues. P17 gave an example of their kid's teacher who taught them the Quran. The teacher did not speak English nor Bangla and there was no fun interaction with the students and thus the child was bored and did not want to attend the class again.

In all our interviews that were conducted after the COVID-19 lockdown (P10-P20), the participants were skeptical about online learning in general because they have witnessed their children's experience with remote education. While they applaud the schoolteachers for their attempts to mimic the physical class activities virtually, all of the participants interviewed after the lockdown, except one observed how the tutors were not able to make their virtual classes engaging and interactive and how the students were not able to interact with other students like they used to do, which was an important part of the learning process.

In summary, engagement and interactivity are the two main features that must encompass the implementation of any language app targeted towards children. Social interaction amongst students participating in the lesson is also critical to maintaining engagement. Moreover, accommodating the privacy concerns of immigrant populations with regard to online education is a critical aspect that must be addressed when developing online educational platforms. The feedback obtained from the participants with regard to the prototypes is valuable for directing future work in developing technologies to support immigrants in their pursuit of maintaining their heritage language.

5 Design Implications

Based on our participants' interviews and feedback, we highlight three main design implications for when implementing technologies that aim at teaching the heritage language for Bangladeshi and other similar communities: (a) increasing child engagement through family and community-oriented gamification, (b) improving community participation practices through the crowd-sourcing of cultural and teaching methods information, and
(c) ensuring privacy through utilizing systems used in sharing economy services.

5.1 Interactivity and Engagement

As our findings illustrate, our participants emphasized the importance for the language app to be interactive and engaging because of their children's low intrinsic motivation to learn Bangla and therefore it would be difficult to induce them to use the application otherwise. These findings are similar to the findings of several studies within children's education that have asserted the positive role interactive media can play in the learning process of a child [87, 88]. We can borrow from the research on Parent-Child collaborative games and family-centered gaming to suggest similar efforts to be made in the context of heritage language learning. For example, research on domestic collaborative games has been done in the contexts of museum education [89] and sexual health dialogues [90], among others. Considering the current trends of increased engagement of children with media by themselves at earlier ages and for longer periods of time [91, 92], and based on our findings that parents have made the effort and spend time with their children to teach them about their mother language, we believe that increasing collaboration between parents and children in the context of heritage language learning through gamification is beneficial. Furthermore, given that immigrant children may often be separated from their extended families and grandparents through immigration, collaborative video games also offer an avenue for communication for children with their relatives in their home country [93].

Scholars in HCI have highlighted several game design mechanisms of educational platforms to increase engagement, drawing from psychological theoretical backgrounds [94], such as badges, leaderboards, and trophies to signal achievement and progression [95, 96]. We borrow from this literature to suggest the importance of incorporating gamification elements into the design of educational games for heritage language maintenance. However, social interaction has rarely been the behavioral goal of educational gamification solutions, as the general trend of gamification implementations has not been designed to support collaborative action and cooperation [97]. We extend our suggestion of incorporating gamification elements to include social and community-centered reward systems to further incorporate users of the system into their heritage community. For instance, top-performing heritage language learning users on the gamified application may be honored or recognized at local community events to further integrate them into the community, offering opportunities for social networking, and cultural engagement and learning. Furthermore, as a majority of participants have noted that their children made use of a personal mobile phone, in addition to their explanations on the importance of having their children celebrate and understand cultural festivals and celebrations, we suggest gamifying the experience of attending cultural festivals and events through incorporating Augmented Reality (AR) elements and exhibits. The incorporation of AR into various settings has been explored in the contexts of science festivals [98], tourism [99], and education [100], and has been shown to increase entertainment and engagement levels [98] and to improve learning achievement [101] and motivation [102]. We suggest that AR elements which demonstrate critical historical and cultural events may further increase the participation and engagement of children with the festival and therefore may act as an inducer to further engage with their heritage language.

In addition to gamified and family-centered strategies, collaborative and crowd-based learning approaches provide another promising avenue for heritage language acquisition.

For example, the SIMOLA project explored a distributed, collaborative platform where learners contribute and access community-generated content, illustrating how peer-driven knowledge sharing can enrich language practice [103]. Integrating similar crowd-sourced exercises or community-curated resources into heritage language learning tools could increase engagement, reduce isolation, and leverage the social dynamics valued by our participants.

With regard to these design suggestions, there are several considerations to be made. Firstly, community-based reward systems are only possible with the collaboration of community organizations and associations that are available to organize and host such reward assemblies. In cities where there may be a negligible or smaller cultural contingent, such reward systems may not be achievable, and thus, reward systems focusing on community engagement and integration would require a different approach. Collaborative games, particularly as an avenue for communication with older relatives, may also pose challenges within households that are not technologically-adapted to utilize such platforms to their fullest extent, or within households that do not have the technologies (smartphones, tablets, or laptops) to support such practices. Thus, it is critical to further understand not only how immigrant populations utilize technologies within their households, but also how their extended families make use of technology as well. While AR exhibits would likely generate enthusiasm from visitors to cultural festivals, developing AR exhibits requires a certain level of expertise to create and deploy effectively, a burden which community members and organizations may not be able to accommodate. As the technology to support developing AR exhibits continues to develop and become more accessible, we anticipate that such challenges could be ameliorated in the future. Developing online content-sharing community platforms also pose challenges with regard to the power dynamics of moderation on online platforms, limiting trolling behavior in anonymous contexts, and facilitating the creation of appropriate categories for content classification and retrieval, factors which may differ depending on the community to which the platform is tailored.

5.2 Coordination of Teaching Methods

Our findings illustrate a clear disconnect between children raised in Canada and their heritage language teachers. While the children are accustomed to certain teaching methods such as those that focus on learning songs and words rather than letters, their teachers utilize more conventional teaching methods that prioritize learning letters and abstract grammar concepts. Furthermore, their teachers often favor a more traditional unidirectional mode of communication, from the teacher to the recipient. This has, as our study shows, created a disconnect between the children and their Bangla language tutors and consequently produced a disinterest from the children's side towards learning the language.

Differences in educators' teaching methods and students' expectations have been well documented in education literature (e.g. [104, 105]). These studies put the burden on the person who delivers the information to narrow the communication gap. Thus, teachers on online platforms, regardless of their location, must be trained to know the pedagogy techniques suitable for the children they engage with. There are multiple resources

tutors use to independently update their teaching methods such as blogs, podcasts, and YouTube. These platforms are used frequently because they offer rapid access and sharing of teaching methods, and research outputs in an open, transparent manner [106, 107]. If we are to implement a platform that can connect tutors with children, we propose that teaching resources such as sample videos, lesson plans, and curriculum must be put on the platform such that all potential tutors have equal access to them. Such ancillary material should not only focus on pedagogy techniques but also on the cultural norms of the country where children reside. As noted in our findings, many parents said that their children did not relate to some of the things they witness in their heritage cultural festival or their language schools such as stories, food practices, and customs because the kids felt more related to the Canadian culture. Therefore, the platform must push the tutors to make themselves familiar with the culture the children relate to such that when references are made in the teaching session, the children can make connections and comprehend the content.

5.3 Privacy and Safety

As our findings have shown, privacy was a critical concern for our participants with regards to where a language tutor in an online platform is based. Because teachers who work with underage students in Canada are required to complete the necessary training and to submit several documents prior to their engagement [108], our parents felt 'safe' that their children would not be exploited. However, when the teacher is not within the country's borders, verifying their credentials would not be straightforward, as our participants have feared. This is certainly true as evident by how several teaching platforms, such as Khan Academy and Coursera, prevent the interaction with any child under the age of 13 with peers as well as with teachers [109, 110]. Thus, it is the responsibility of the teaching platform to provide the verification parents require to protect their children.

This is not a novel issue but an integral part of applications that connect potential service providers to consumers, such as Uber and Airbnb. We can borrow from these sharing economy services on how service providers verify their identity and credentials. They implement multiple methods such as requiring them to submit their personal ID and driving license periodically and allowing for the sharing of photo geocoding and local data collection whenever they are on the job [111, 112]. For the teaching platform, tutors could be asked to provide their national ID and use videos the platform can use to ensure the credentials of the tutors. Further in-depth research is needed to make this design more applicable.

6 Discussion

Besides the above-mentioned design implications, our study has also generated important lessons for the HCI literature around learning and education, migration, future of work, and political identities. First, a significant portion of the HCI scholarship is centered

around the idea of ”collaboration”, and successful collaboration is often dependent on the alignment of culture and language among the collaborators [113]. As digital technologies are becoming more ubiquitous, and transnational collaborations are becoming more possible than ever, the need for immigrants to know the local language and culture has become important for the countries they migrated from. For example, we often find immigrant communities raising money through various charity programs to help people in their home countries in times of natural disasters, disease outbreaks, and wars [114]. A large-scale trans-national charity work requires smooth collaboration between people in the home country and the immigrants - and it is immensely important for the immigrants to know the language and culture of their home countries to present them before their social peers in their current countries. This is also important for many other national and international projects where many countries in the Global South depend on their immigrants who live in the Western world. Although this study centered on heritage-language acquisition, our findings highlight that language and culture are deeply intertwined. Parents' efforts to maintain Bangla frequently occurred in the context of cultural events, rituals, and family practices, reflecting that heritage-language learning cannot be fully separated from cultural maintenance. We argue that the HCI scholarship should focus on studying and designing more efficient technologies to help such transnational initiatives be more successful through designing for learning linguistic and cultural heritages for the immigrants.

Second, the HCI literature has also been historically interested in learning and the politics associated with it. With the advent of modern-day Massive Online Open Courses (MOOCs) such as Coursera, edX, Udacity, and Khan Academy, it has now become possible to transfer knowledge from one place to another quite easily. However, more often than not, the flow of knowledge is mostly one-directional: from the West to the Global South. In most cases, the academia or industry experts of the North American or European countries create learning materials that are consumed by people from all around the world. It is often hard to find materials created by experts in the Global South. As a result, there are more resources for learning Western languages and culture in these platforms, than for learning their Eastern/Southern counterparts. Our study surfaces this politics and depicts how this creates a barrier for the immigrant parents to teach their children heritage languages. We argue that future HCI research should focus on the biases ingrained in such digital learning platforms.

Third, our study also highlights the insecurity in the mind of the immigrant parents that is reflected in the responses regarding privacy and security. The privacy and security community in HCI has expanded to encompass social conceptualizations of security, which vary notably because ”different communities foreground different objects that need to be protected”[115, 116]. Consequently, designing a learning platform that is usable for the children is not sufficient to make the parents feel safe and secure. Rather, the system should be designed in a manner that reflects the children's and parents' values alike. As our findings illustrate, the participants expressed a strong interest in their children learning their heritage culture to communicate efficiently with their parents and extended family and not lose ties to their origins. Our participants enjoyed the concept of their children using digital learning platforms to learn Bangla because it would be more convenient both for them and for their children. However, they also expressed their

concern with these platforms in terms of privacy and engagement. Our findings not only illustrate several challenges but also show some opportunities and make several important contributions to HCI and related literature on the topic of immigrant assimilation into their host societies.

Fourth, our findings advance the areas of Computer-Assisted Language Learning (CALL) and Mobile-Assisted Language Learning (MALL) by showing how Bangladeshi immigrant families in Canada use mobile devices and community-based practices to support Bangla at home. When considered alongside studies of digital heritage language tools, such as diaspora-focused educational applications [117] and longitudinal family language management research [118], these findings suggest that technology mediates a learning ecology connecting home, school, and transnational family networks. Our prototype evaluation builds on prior community-driven mobile learning initiatives, in-including the Bangla Mobile Learning Application and location-triggered lesson designs, by incorporating heritage-specific content, child-centered gamification, and tutor verification protocols. These features align with recent MALL research on robot-supported conversation practice [119] and culture-embedded web tasks [120], as well as large-scale studies of scaffolded online collaboration [121] and collective-responsibility approaches to heritage language maintenance [122]. Together, these insights offer a practical template that future CALL and MALL efforts can adapt for supporting minority-language communities.

Finally, our study contributes to the HCI scholarship in migration and identity politics. Immigration has long been a political agenda in the countries that accept immigrants. A huge body of work has been done to understand how the new immigrants learn and adapt to the new culture of the foreign land. One part of this scholarship resulted in social and technical initiatives to help the immigrants with food, shelter, medicine, jobs, and language support. The other part focuses more on their long-term assimilation with the host country. One fundamental aspect of this body of work is the constant attention to changing immigrants to a new body that accepts and mimics the host country's culture. While this aspect is often essential for the functional needs of the immigrants, we argue that the lack of similar initiatives in allowing the immigrants to practice their heritage culture can eventually strip them of their political identities. There has been a long body of work that shows how immigrants, especially in their second and their generations, start losing the essence of their home cultures [123, 124]. This often threatens the culture of the countries that send thousands of immigrants to other countries due to natural, financial, or political constraints. At the same time, immigrants, after losing their cultural background, often lose their political identities and end up being docile objects of the host country [125]. We argue that the future HCI literature should focus more on this long-term immigration politics and its implications in nation-building, and extending care through socio-technical means can facilitate a platform for developing political identities in that scholarship.

7 Limitations

Our work has several limitations. First, our study only focused on one community in Canada, a country known for its multiculturalism. Second, all participants interviewed lived in or relatively close major metropolitan areas which have generally large migrant communities of similar background. Hence, we were unable to discern the methods by which individuals who live in non-homogeneous communities maintain their children's heritage language skills and their cultural identity without the support of a larger heritage community in their vicinity. Third, our work is not free from participation and selection bias, as we only had the opportunity to talk to 20 participants. Given these limitations, we do not claim that any of our findings are the collective view of the immigrant residents as a whole. Instead, based on the strength of qualitative research, we emphasize the stories that our participants provided to gain some valuable lessons for HCI and believe that the findings of our study will be useful for technology design in the context of heritage language learning in immigrant communities.

All interviews were conducted before or during the COVID-19 pandemic, and participants' reflections on online learning may have been influenced by the circumstances of that period. Results might differ if the study were conducted entirely in a post-pandemic context. Our data came only from parents, who provided household perspectives but not the voices of children or educators. Future work, including these groups, could offer a fuller understanding of how heritage-language tools are experienced. Several members of the research team share Bangladeshi heritage, which helped in interpreting cultural and linguistic nuances. To reduce bias, multiple researchers were involved in coding and peer discussions to reach consensus on the analysis.

We also note that, at the time our study was conducted, existing platforms such as Ling, Qlango, and italki, which now provide some Bengali-language learning resources, were either unavailable to us in their current form or offered limited functionality relevant to our child-focused, heritage-oriented objectives. Since then, these platforms have become more sophisticated and could represent promising avenues for future work—either as alternatives to custom prototypes or as complementary tools integrated into community-based heritage-language interventions.

8 Conclusion

Immigrants are faced with a multitude of challenges after moving to their host society, both with assimilating into their host society and with maintaining their cultural identity and heritage language. In this study, we aimed to address the gap in HCI literature on how technology can help facilitate heritage language learning specifically and cultural identity maintenance broadly within the Bangladeshi immigrant community in Canada. Our work revealed the different approaches taken by Bangladeshi immigrant parents to foster their children's ability in their heritage language, Bangla. We have highlighted the various barriers prohibiting individuals from engaging their offspring with their heritage language whilst living in a non-native context and presented several design implications to guide future research in developing technologies for immigrant and marginalized

populations, highlighting both the roles played by the family, as well as the larger cultural community.

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