Parenting, Studying and Working at Home in a Foreign Country: How International Student Mothers in the US Use Screen Media For and With Their Young Children

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The struggle to thrive as a productive student researcher, an attentive parent, and a caring partner can be difficult, particularly for international student parents who are far from home and also possibly burdened with complex cultural expectations, interpersonal dynamics, and institutional biases. Using uses and gratifications theory as a framing mechanism, we describe interviews with twelve international student mothers in the United States who are primary caregivers of children between six months to five years old, focusing on the context of their use of screen media content and devices, the gratifications they seek from their children's use of screen media devices, and the differences in their perceptions about the use of screen media as an educated, non-US parent. Our findings give an initial account of the role of screen based technology in their domestic life with young children, and the limitations of their technological experience. We present four opportunities for designing for this population including technologies for positive distraction, interactive language aids, playful acquaintance tools, and anonymous peer networks for parent support. We conclude by formulating future promising avenues of research in this design space.

CCS Concepts: • **Human-centered computing** → *Human computer interaction (HCI).*

Additional Key Words and Phrases: international student mothers, screen media, uses and gratifications, parenting technology, graduate mothers

ACM Reference Format:
Neelma Bhatti, Lindah Kotut, Derek Haqq, Timothy L. Stelter, Morva Saaty, Aisling Kelliher, and D. Scott McCrickard. 2021. Parenting, Studying and Working at Home in a Foreign Country: How International Student Mothers in the US Use Screen Media For and With Their Young Children. *Proc. ACM Hum.-Comput. Interact.* 5, CSCW2, Article 440 (October 2021), 25 pages. https://doi.org/10.1145/3479584

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2573-0142/2021/10-ART440 $15.00
https://doi.org/10.1145/3479584

1 INTRODUCTION

Screen media devices have gained a special status in modern parenting [15], where parents reach for the television, smartphones, or tablet devices in order to simply 'get things done', including duties from housework to meal preparation to basic personal hygiene [102]. During the COVID-19 global pandemic, these 'getting things done' activities may now also incorporate working from home under less-than-ideal conditions [70]. With the consumer market surge in screen media devices over the past decade [4], many mothers living without co-located extended family use them to engage their children while they complete their domestic and childcare duties. Their reliance on screen media devices as babysitters [14] is described as being due to the absence of daily caregiving help, limited options available for affordable and/or reliable childcare [21], as well as the cultural and social, and (sometimes) professional pressures and expectations placed on the mothers [21, 29, 30]. The advent of the 2020 international lock-down (due to the pandemic) coincided with the beginning of our investigation into the experiences of a particular subset of parents who work from home while caring for children and also dealing with difficult socio-cultural challenges. We make no claim for prescience however, but rather ground our research intention in understanding an under-studied community and the complexities and challenges of their ongoing lived experience, and the role of screen media in their lives inside the home.

The struggle to adapt and subscribe to a multiplicity of roles including productive student, efficient mother, and dutiful partner sets international student mothers in the United States (US) apart as distinctive users of technology. Firsthand experience of moving to the US, experiencing childbirth and motherhood, while also pursuing higher education with no support structure (family or close friends) inspired the first author to investigate the daily practices and perceptions surrounding the use of technology by international student mothers like herself. Such mothers often experience pregnancy and childbirth away from their family and friends during their graduate studies. Hence, they may face several life disruptions [10] simultaneously, such as moving to a new country which is culturally different than theirs, undertaking graduate studies, and becoming a new mother with little to no support structure. Their unique circumstances, responsibilities and values [34], make it important to study their motivations from various perspectives in order to understand their technological choices. Although several studies investigate the role of technology as a parenting tool, little is known about the role of screen media technology in busy student mothers' lives with young children in the domestic environment. We emphasize the domestic environment as this user group's maximum time is often spend in the multipurpose home (site for domestic work, graduate studies, and childcare) in the presence of their young children.

We ground our research in uses and gratifications theory, which perceives users as active seekers of gratifications from their media use [91]. Gratifications are the diverse dimensions of user satisfaction [41] provided by, and obtained from different kind of media, motivating consumers to utilize certain media [64]. While the approach assumes that users are active consumers making deliberate media choices [49], young children are often not capable of making conscious media choices, which makes them more dependent on parental preferences. Hence, in the context of screen media use by young children at home, the users (children) and seekers of gratifications from media (mothers) are two distinct but interdependent entities. The uses and gratifications of media are also influenced by several factors such as socioeconomic context of the family and ages of children [4]. Therefore, to get a well-rounded view of the role of screen media in international student mothers' lives, we investigated three aspects of their use: a) complexities and challenges of adapting to the multiple roles of parent, student, and spouse in the home, which could explain their context of use of screen media, b) the gratifications they seek from their children's use, and the extent to which state of the art screen media devices and content are able to provide those

gratifications to explore opportunities for design and, c) their perceptions around their children's screen media use with their unique positioning as high-literate, culturally diverse foreign mothers. In our study therefore, we sought to answer the following three questions:

(1) *What is the role of screen media in international student mothers' lives inside the home?*
(2) *What gratifications are sought by international student mothers through their children's use of screen media?*
(3) *How does their positioning as high-literate, non-US/foreign mothers affect screen media use by their children?*

By answering these questions, we draw attention to the context of use of screen media, which is affected by participants' socio-cultural backgrounds and the multitude of responsibilities. We discuss the various gratifications sought by mothers including the use of screen media for distraction/engagement, as a language facilitator, for incidental learning, maintenance of distant ties, and as a childcare proxy in the absence of co-located caregiving assistance with their young children. Considering the extent to which mothers were able to obtain their sought gratifications, we then present four opportunities for designing for this user population including technologies for positive distraction, interactive language aids, playful acquaintance tools, and anonymous peer networks for parent support. We conclude by presenting avenues of future research in this design space including different methods of investigations and the inclusion of a more diverse representation of parents and children.

1.1 Study Population And Scope

From this point onward, the general term *mothers* used in this paper will refer to the user population of international student mothers. We draw on findings from interviews with twelve mothers, who are the primary caregivers of their young children in the US. These mothers are on one end of the spectrum of mothers who are separated from their family, residing in a country which is culturally different than their homeland, and without familiar support systems. Our choice of studying the experiences of international student mothers in the US is motivated by the fact that the US is the global host country leader of international students [2, 92, 95], with 44% (678,841) share of non-immigrant students in the 2018 calendar year being female [46]. Their education is supported by scholarships, assistantships, grants, loans, and personal funds [66], due to which they often live in financially tight circumstances. Prior literature show that many mothers in academia pay the *baby penalty* [1] [60, 61], as the cost of availing of childcare in the US is not affordable for many student parents [13, 22, 76, 87, 97]. Hence it is important to empathize and design parenting technologies for the well-being of this population to ensure lower drop-out rates and give them broad opportunities and choices with regards to expanding their families. We further narrow our research focus on international student mothers of children between the ages of 6 months to 5 years, as this pre-kindergarten/grade school age is most likely to require some form of parental supervision in the absence of professional care [37]. The main focus of our paper therefore is on the student mother-child dyad, within the context of the domestic environment, the local milieu, and connections to the homeland.

1.2 Contributions

With an initial investigation of technological experiences of the under-studied user group of international student mothers, we intend to make two main contributions to the CSCW and HCI

[1] gender based disadvantages such as lower perceived competence and commitment, higher professional expectations, limited career choices, etc.

communities focusing on technologies for mothers and children. First, **we synthesize their context of use, gratifications sought through use of screen media devices by and with their children, and their perceptions around screen media use by children from the viewpoint of an educated mother raising children in a foreign country to identify opportunities of design of technology for their specific parenting needs**. By providing a rounded view of their lived experience with screen media technology, we aim to build empathy with this user group and open up the design space for mothers with similar circumstances. Second, **we describe four design opportunities including (1) technologies for positive distraction, (2) interactive language aids, (3) playful acquaintance tools, and (4) anonymous peer networks for parent support**. Despite our bounded research focus on international student mothers, our recommendations can be useful to design technology for parents living in circumstances similar to our intended user group. We conclude by describing future research directions with respect to studying this user group, including methods of investigations and a more diverse representation of parents and children.

2 RELATED WORK

In this section, we first position our work in the domain of women's work-life balance studies to describe the significance of our chosen study population. Next, we situate our work within research on technology for mothers and children in HCI. Finally, we describe the theoretical underpinning of this study by reviewing literature on the uses and gratifications of media.

2.1 Mother's Struggles to Achieve Work-Life Balance

Research shows that women who go through the transition of becoming a mother, moving to a different country, and pursing graduate studies experience a crisis of self-identity [10], often making them question their life choices and leading to feelings of disorientation. Academic milestones of women pursuing graduate studies often occur during their potential childbearing years [59, 103], but being able to afford comprehensive healthcare and adequate childcare, as well as spend quality time with their young children are some of the considerations which make graduate students postpone parenthood until significant graduate milestones are achieved or the program is completed. While in some countries childcare responsibilities are shared by grandparents and other non-working family members [75], burden of childcare in the US rests on the international student parent(s) as they usually do not have the luxury of having family living close by. For this reason, female graduate students are reported to be twice as likely to quit academia compared to their male counterparts, due in part to the lack of 'clock-pausing' [2] permissions in their academic careers [60, 61].

Due to the vast array of research on women's strategies to achieve work-life balance, we limited our focus to work addressing the challenges faced by working mothers of young children who strive to achieve work-life balance inside the home with the help of technology. In that regard, we found studies which explored tele-working women's perception of work-life balance, their division of time to accommodate childcare [42, 81], and the role of smartphones in helping women manage their dual roles of being a working woman and a mother [67, 94]. While research also quoted women being privileged to be able to choose between work and motherhood [75], there is increasing evidence of how technology is increasingly blurring the boundaries between women's work and domestic life [67, 94], where their schedules are more closely tied around that of their children in comparison with their male partners. Research which paid particular attention to student mothers tended to focus more on their identities as students, and propose solutions which catered to that individual identity [99, 107]. We take this as an opportunity to study the role of screen media technology in the lives of this underrepresented group of women who pursue higher education

[2]postponing an academic or career milestone for a certain period of time

while caring for young children in a foreign country. They do so also while facing the added struggles of isolation [96], adjustment to unfamiliar environments [57, 73] and limited extended family assistance [6]. By understanding their intrinsic and extrinsic motivations for using screen media based on their lived experience, challenges, and cultural backgrounds, we aim to contribute to the research which investigates the context of use of technology by women with inter-sectional identities to provide a richer view of their experiences.

2.2 Technology For Mothers And Children

Women (cisgender or trans) may experience life transitions such as pregnancy and childbirth due to their distinct biological factors, which can affect their physical and mental wellness [77]. These unique experiences come with a range of emotional and social pressures, which are distinct from fathers [85]. Current research in HCI focuses on many aspects of motherhood [3] including the use of technology by mothers to increase their confidence, reassurance on their choices and concerns regarding their child, as a means of self-therapy and as a community builder [35]. Technology has also been used by mothers for information seeking [74], sharing information about their children [65], creating and participating in ICTs due to lack of formal support systems [10], support without judgement [90], or to simply stay connected with the world [58]. There is also a special focus in HCI on the experiences of first time mothers and women in early stages of motherhood, specifically their use of digital media for information seeking during [68, 79] and after [56, 79] the transition to motherhood. Often, the technologies for mothers imply moral platitude, ignoring the subtleties in attitudes and feelings of mothers [24]. We use these studies as a benchmark to understand this under-studied community of mothers, and to provide recommendations for technology while being considerate of mother's attitudinal nuances.

Domestic HCI studies thoughtfully examine co-use of screen media technology by mothers and young children by studying the use of mobile media by children and their families [23, 25], young children's use of tablets [45] and television [86], the role of technology in supporting communication practices among parents and young children [58], regulation on technology use instituted by parents [43], and parental mediation strategies and perceptions about early childhood media exposure [54, 88]. These studies tend to focus on the use of a particular kind of screen media device, or include a broader age range of children, which is different from the family dynamic we are exploring. Lauricella and colleagues examine the factors influencing children's screen-time and parental attitudes around a broader range of screen media devices frequently encountered and used by children in the home, reporting that children's screen-time usage is strongly associated with parental attitudes and their own screen time [53]. We build on their work by further investigating the gratifications sought by mothers in our study population through their children's use of screen media on a conscious and unconscious level, which may influence their attitudes around the use of those devices.

2.3 Uses And Gratification Of Screen Media

Uses and gratifications theory has been used by researchers to understand the motive behind the preference for a certain type of media over the other, providing cues for understanding how people seek, consume and are affected by their choice of content [51]. Gratifications are the diverse dimensions of user satisfaction [41] provided by and obtained from different kind of media, motivating consumers to be attracted to certain media [64]. Communications research has approached the study of children's media use through the uses and gratifications perspective [18, 86], and the use of screens to assist parents in their parenting tasks has also been reported in social sciences and family studies [28]. In our review of research on the crossroads of HCI and uses and gratifications approach, previous work has not examined the uses and gratifications of

screen media by mothers of young children in the domestic sphere to the best of our knowledge. Qiao and Zhu talk about the limitations of current research in HCI due to the lack of focus on new, richer media choices and neglect of consumer's personalized preferences and behaviours which can impact their uses and motivations behind certain media use [80]. Our research seeks to fill this gap by focusing on the motives and selection patterns of screen media by mothers in the context of their lived experience as international student mothers. We further explore whether they are able to successfully attain their sought gratifications, and what, if any, are the gratifications obtained inadvertently by their use of screen media.

3 METHOD

While observational methods in naturalistic environment have been deemed crucial for child-family focused research due to their ability to reflect participants' behaviours and practices in their naturalistic setting, they also require highly trained researchers to avoid measurement problems [4]. As in similar studies [43, 106], the first author's positioning as an international student and a mother was hoped to establish a shared rapport with the participants, allowing them to open up more comfortably during in-depth conversations providing a comprehensive account of their experiences (as opposed to surveys for example). The timing of our study also coincided with the COVID–19 pandemic, which made interviews the most viable (and permissible by our Institutional Review Board) choice of studying the lived experience of our intended user group.

3.1 Researchers' Disclosure

The first author on our research team is an international student and a mother, and as such was able to establish a shared rapport with the participants, which assisted in putting participants at ease—particularly when discussing challenging aspects of their lived experiences. While belonging to the user group helped the first author to empathize and be deeply involved in the experience shared by participants, it was also prone to introduce researcher bias. Hence the remaining researchers who, unlike the first author, had not experienced childbirth and motherhood as international graduate students, evaluated the findings as external auditors [21] to reduce researcher bias and to evaluate the findings from varied perspectives. To provide context, two members on our research team are mothers of young children[3], four are international graduate students representing different genders, and two members were born and raised in the US[3].

3.2 Participants

We recruited participants using convenience sampling, snowball sampling, and by posting on university list services. Due to the timing of the study (the end of the semester), we did not hear back from a large number of students whom we approached personally and through word of mouth. 12 international students in the US who were mothers of children aged between six months to five years agreed to be part of this study. Participants were entered into a drawing for an Amazon Fire tablet for participating in the interview. We had a representation of participants from the top four countries of origin for international students [26], with 11 participants from Asia (including Pakistan, India, China, South Korea, Saudi Arabia), and one from Africa (Ghana). Participants were members of six different higher education institutions in the US, with eight of them pursuing doctoral or post-doctoral studies. Participants were aged between 29 to 40 years (Mean=33, SD=3.6), and the majority of them (9) had one child. While the majority of the participants had spent less than three and a half years in the US, three of the participants had lived there for a more extensive period, ranging from four and a half to seven years.

[3] Graduate student and Associate professor

PID	Children's Ages
M1	5, 3.5, 2
M2	4, 1.5
M3	2
M4	6 months
M5	1.5
M6	2.5
M7	2
M8	1.5
M9	11 months
M10	4
M11	4
M12	2.5, 10 months

Table 1. Coded names of study participants aged between 29 to 40 years, with corresponding age(s) of their child(ren). Eight of the participants were pursuing doctoral or post-doctoral studies. While the majority of the participants had spent less than three and a half years in the US, three of the participants had lived there for a more extensive period, ranging from four and a half to seven years.: *ages in years unless specified otherwise

3.3 Data Collection

We conducted 12 semi-structured interviews with participants between March and June 2020. Due to the COVID–19 pandemic and subsequent instructions from our institution's Institutional Review Board, we used teleconference software to administer the interviews. The interviews were primarily conducted in English, with four exceptions, where the participants chose to speak with the first author in their shared non-English language. The interviews lasted between 23 minutes to 1 hour in duration (total 422 minutes) and were audio recorded with participants' permission. The first author then transcribed each of the interviews and translated four of the interviews into English.

We were interested in learning about how the life of our participants differs from other mothers, hence we asked them to describe their life as an international student mother in their own words. We believed that an open-ended narration of their struggles, if any, would help us understand their lived experience, which could provide context to their choices and decisions with regards to screen media use with or for their children.

We also inquired about the circumstances where they allowed screen media used by their young children to explore the uses of screen media devices, and the gratifications sought by mother's through their children's screen media use with questions such as *"what kind of media does your child use, and for how long? ", "when do they use it/ why are they allowed to use it?", "what kind of programs do they watch and enjoy?"*. For understanding their level of awareness or accountability as educated mothers, we asked questions like *"are you aware of screen time limit recommendations for children of your child's age? If yes, what are your sources of information?"*. We were also interested in learning about how the participants monitored their children's access to and use of various technology devices (*"do you (if ever) monitor what they watch?")*. Additionally, we inquired about their technology and non-technology mediation activities [48] and how they engaged with them during usage times by asking: ' *"do you perform any activity together with the child that requires technology?"*. These questions sought to aid our understanding of the current use of screen media use within this particular user group with the goal of identifying future opportunities of design and evaluation of technology.

3.4 Analysis

We adopted a two phased analysis of data and findings [106]. In the first phase, anonymized transcripts were iteratively read multiple times individually by four other members of our research team who had not participated in the initial interviews, each of them producing a code list for every interview transcript. While we acknowledge that such an approach cannot fully mitigate any bias introduced into the original data set, we did want to achieve a somewhat more removed first level of analysis. The first author collected all codes from the individual transcripts, removed duplicates, and maintained a code book for all identified codes. In a joint session, the first author and coders sorted and identified reoccurring codes, and labeled them according to the emerging thematic categories [9]. 73 emerging categories were then extensively discussed and grouped together in an online affinity diagramming session [34]. We found three broad themes from our discussion corresponding to the research question outlined in the introduction: 1) Parenting as an international student 2) gratifications sought from screen media 3) screen media use by children of educated, foreign mothers. We used these broad themes to group information about the mother's context of use based on their background and lived experience, their use of screen media use by and with their children, and the limitations of their experience to provide design recommendations. Excerpts from the interview transcripts were extracted to elaborate the findings.

In the second phase, we analysed the findings to identify the mothers' technological needs and recommendations, and to also suggest opportunities for design with respect to the relevant literature. We identified three gratifications sought by mothers which were not obtained from the state of the art screen media devices and content to suggest three design recommendations: 1) positive distraction technology, 2) interactive language aid, 3) playful acquaintance, and 4) anonymous peer networks for parent support. We further reviewed the limitations of scope and participants in this study to devise future research and evaluation opportunities.

3.5 Ethical Considerations

Our study was reviewed by our university's Institutional Review Board. Although we were not asked by the participants to remove or conceal any part of the interview, we found that their shared rapport with the first author made them casually communicate some sensitive information (quotes from their academic advisor, spouse etc.) which had the potential to be used against them. Hence we took inspiration from Bruckman's work [11] to apply some level of disguise to their demographics by reporting participant ages and countries of origin as aggregate data, instead of individually identifiable information if combined with the ages of their children. This decision does not alter our findings from the interviews.

4 LIFE AS AN INTERNATIONAL STUDENT MOTHER: PARENTING, STUDYING, AND WORKING IN THE HOME

We first describe the life transitions and their effects as described and experienced by our participants, which provides an overview of their choices and decisions in incorporating screen media technology as a parenting tool in their everyday life.

4.1 Multiplicity Of Roles Inside The Home

Our participants described their diverse experiences as students and caregivers operating as single parents, temporary lone parents, or co-parents with other students. For example, M1 was the sole caretaker of her four children in the US, while her husband visited them occasionally due to the nature of his job back in his country of origin. She described the difficulty of balancing her cultural [82] and academic expectations, while also assuming the role of both parents in a country

dramatically unlike her own. M10, who was raising her son as a single mother, talked about the challenges of dealing with his tantrums and maintaining discipline as a single parent who was also trying to complete her PhD. Participants whose partners were also students (M5, M7, M11), shared that in their experience, the burden of childcare was not distributed equally. M7 talked about how taking care of the child was a difficult task, and she could not depend on her husband as he had his own work to do. M11 initially thought her husband had an equal role in raising their daughter describing a time when she attended a seminar for a few days, while her husband looked after their daughter. As an afterthought, she added that she put more effort into their childcare duties due to the *two body problem*[4], where she deferred her career in favor of her partner. She wanted her husband to complete his degree sooner in order to get hold of a job, as he was on a student loan unlike herself (she was a scholarship recipient), and she did not want "his money to be wasted" while she completed her studies. For example, she stated:

> *"I cannot go to hangouts or any other things if my husband has a class. At times I have to skip my stuff because I have to get back home earlier to my daughter [..] If my friends are going for any extra stuff like food or anything, I never try to be a part of it, or I tell them that I have to be there with my daughter as I can not leave her alone. Sometimes if there is an event at the university, I take her (daughter) with me as my husband has a conflicting schedule and nobody is home." (M11)*

Seven of our participants were the primary full-time carers for their children in the home, meaning that their studying and research, together with housework and meal preparation, predominantly took place with their children co-present. This dilemma of having research demands occurring in conjunction with care-giving expectations also seemed to be compounded by the ways in which our participants compared themselves (often negatively) to other mothers (e.g. US mothers, stay-at-home mothers, mothers in their home country, etc.). M1 put this most directly when she stated: *"I think we suffer a lot, and we don't have support like other mothers here"*, while M10, when comparing her life to other mothers said:

> *"I feel one thing that I am not able to give him is more time like other parents because I am studying [..] But I think I'm still doing my best during day time, especially in lock-down, I just stay and play with him, and at night time I study like, from 8 pm to 4 am." (M10)*

M5, who was also married to another student, described how she felt disadvantaged whereby even though she had support from her partner, she perceived her daily experience as being more challenging than others:

> *"Sometimes I feel like their (other mothers) lives are easier than mine, as we both (partners) are studying, so we have to manage stuff accordingly." (M5)*

These descriptions serve to highlight the additional burdens and accompanying complicated feelings about work/life balance experienced by student mothers, which is further compounded by the extra acculturative, academic, and cognitive stressors experienced by international students in the US in general [1]. The student/carer expectations balance were even more starkly defined by M8 who talked about her choice of having only one child by quoting 'advice' from her academic advisor:

> *"One day my advisor called, he did not have an intention to insult me, but he told me 'please don't have another baby during your PhD', and I totally agree." (M8)*

The apparent conflation of childbearing with childcare responsibilities in this incidence is unfortunately common within academia [89], to the extent that it can also become socially internalized

[4]dual academic career couples, due to the increasing number of female PhD graduates and the tendency of women in academia to be partnered with another academic [101]

by mothers and fathers alike. However, it is somewhat improbable to imagine this advisor proffering similar advice to a male graduate student.

4.2 Lack Of Co-located Familial Support

The lack of a co-located familial or friend-support network was a major issue for our participants. This has been similarly reported in literature as a common phenomenon for new mothers [10]. However, it was different for our participants in the way that the support was not available to them due to geographical distance between their families, and the limited number of (if any) close friends in the US. One of the participants compared her life in the US to that of her home country of Ghana, stating:

> *"If I compare it with my home country, we are used to the extended family, when you give birth you have so many people coming in to help, but here we are all by ourselves doing everything." (M5)*

Moving from childbirth to childcare, another mother recalled how people in her home country of Saudi Arabia had access to cheap and accessible childcare where they could employ full-time babysitters to live-in with the family in order to mind the children. Only five of the participants in our study indicated that their children attended daycare, with other participants specifying that the cost of daycare was prohibitive for their families. M8 and M12 described having their mothers or mothers-in-law visit them occasionally to help with childcare duties as both of the parents were students and did not have enough money to send their children to daycare. However, having an extended family member staying to help with childcare also brought its own set of problems:

> *"It is good to get help from family, my mother-in-law, but it also brings a lot of problems. My husband and I worked a lot for our relationship. Having a baby and raising a baby itself is very complicated, but dealing with another family member is 'one more big problem' and I needed to work on both, it wasn't that easy." (M8)*

The need for external support and the potential for conflict (particularly with regards to unsolicited advice) is noted in the literature which points to "mixed assessments of the net impact of a third generation upon new parent - grandparent relationships" [27], and in particular with parents over 26 years of age [17].

4.3 Screen Media Device(s) As Additional Members Of The Family

Our participants described using screen media devices with their children to communicate with distant family members, to engage in exercise and artistic activities, and to learn about their families' cultural, spiritual, and religious beliefs. While many of the participants detailed how they often sought out and used devices simply as a way to distract their children while attempting to work, several of our participants also highlighted the important usefulness of screen media in assisting their children with speech delays or learning different languages. M7, who bought screen media devices specifically to engage her child, commented on how it ended up becoming an extended 'member' of the family:

> *"Previously we used to turn on the TV to entertain him, but now it's like the TV is a member of our family who keeps him engaged for some time while we do our work." (M7)*

As busy mothers in a nuclear family unit, the use of screen media devices by some of our participants occasionally resulted in conflict with their partners for using extended screen time as a distraction and/or for their assumed convenience. M7 described occasional technology 'score keeping' arguments with her partner, stating:

> *"We do argue about it sometimes saying to the other that 'you let him watch it for more time than I did' and 'why did you not play with him', so we do have quite a bit of conflict about it." (M7)*

M11's husband was concerned when she gave a smartphone to their daughter during mealtimes and attended to other tasks such as cleaning the kitchen. M6 described a different dynamic with her husband when he came home from a long day's work, even though she had previously described her unwillingness to expose her child to screens.

> *"Sometimes I don't want to show him any screen media but (husband name) comes home tired and says 'just let him watch it, let me have some peace as he (his son) is climbing over me, so let him watch it for a little more time'." (M6)*

5 GRATIFICATIONS SOUGHT FROM SCREEN MEDIA

5.1 Distraction/Engagement

Nine of our participants were culturally responsible/expected to cook meals for the family, and to be primary caregivers to the children. Hence, they often found themselves in situations where they had to divert their children's attention away from them to complete their assigned tasks seamlessly and quickly. Screen media devices and content became useful while performing tasks such as cooking, cleaning, and studying, often in the presence of children. Participants also used different screen media devices such as televisions, smartphones, and tablets as temporary distractions to enable them to complete household chores, put children to bed, or to keep children occupied while they finished their food [15, 16].

M6 remarked upon her dependence on screen media by stating how her son would not let her work otherwise. M5 played songs or found something interesting on her mobile phone to show to her child. M2, whose children went to daycare pre-COVID-19, used the television to keep them occupied in order to complete her chores in the morning, including making breakfast and getting ready for school. She used technology as a convenience in the morning and for her children's entertainment in the afternoon (after they were back from daycare). Those distractions were short lived for children under the age of 2, who had a relatively shorter attention span. M6 and M7's sons were very similar in age (2 years), but had varying levels of engagement with screen media. M9's 11-month-old son needed her constant presence in order to be engaged in any activity. Similarly, while M6 found screen media to be efficient in engaging her child without her direct involvement, it only lasted for a short while for M7's son:

> *"Once when I came home late from the lab, and I had not eaten my food, and he (son) wanted me to give him attention. So I told his therapist (who was taking zoom sessions due to COVID) that I have yet to eat my meal, and she was like I am going to engage him for few minutes while you go and eat. It was only for a span of five minutes and he was not engaged during that time so eventually I had to get involved." (M7)*

It is worth noting that while many participants used technology to engage their children for a certain period of time, there was a fine line between the terms distraction and engagement in their descriptions of use. The participants used both terms interchangeably:

> *"Sometimes distract, sometimes engage. Like right now I'm working in the kitchen and he's watching TV, so I would say I would use the word distract right now. I also have to distract him from me when I'm studying. But to engage him when he eats as he does not eat if there's no screen in front of him." (M6)*

Unlike the negative connotation of the word distraction, this positive distraction often leads to engagement, helping participants in performing tasks which required their undivided attention.

5.2 Language Facilitator

Most of our participants (except M1 and M10) were living in the US as a nuclear family, with their children getting minimal outside exposure due to their parents' busy schedules. Participants were also raising children who were multilingual, and several of them reported having minimal spoken communication in the presence of their children, which resulted in some of the children having speech delays. M1 described her experience by comparing it with her sister-in-law who lived in a different country, but in a nuclear family set-up like her:

> *"She (daughter) has started sentences, but they're not too fluent, I have seen kids at her age who speak a lot, but maybe it runs in my husband's family in a way that my sister-in-law's son started speaking when he was four because they were living in a nuclear family in Saudi Arabia. Another reason is that we both don't speak a lot with her because we both are busy with the studies, so I feel she has also lagged behind because of that. Both of us being students was a challenge and we have had to cope with it. But because of that, I feel some of her development milestones were missed: not physically, but in terms of language and communication." (M11)*

M3 and M7, whose sons both had speech delays, utilized the interactivity offered by screen media in two different ways. M3 mentioned a children's show named *Blippi* in which a human character attracted children's attention by asking them questions. She noticed an improvement in her son's speech using rhymes as they encouraged him to learn new words, which motivated her to utilize her child's screen time for a word learning and recall activity that could be performed later. She claimed it was the fastest method to improve his speech compared to talking to parents, language therapists, or play-dates with other children. M7 scheduled meetings with her son's language therapist who had started giving sessions online owing to the COVID-19 pandemic, and used an app recommended by the therapist to help him to learn words. M7 also shared an anecdote about her son's attachment to his language therapist:

> *"The first time she came online, my son was not ready to see her, and was kind of upset, because he did not have an idea that she could come online like this. When I told her about it, she changed her background to 'wheels on the bus' screen, he saw that and quickly ran towards the screen. Normally our virtual session is half an hour, but it went on for an hour that day. He was enjoying it and not letting her go as she was really making him happy by responding to him and encouraging him to speak." (M7)*

Some of the participants turned to screen media to help their children learn both their native language as well as English as a second language. One of the participant attributed her daughter's delayed speech to the fact that both parents were busy students. She then credited screen media for her child's improved speech and shared her experience on using technology to help her daughter with learning her native language:

> *"My husband puts on poems and verbal programs to get her more fluent with our native language. He has also installed an app "Urdu Seekhiye" (learn Urdu) on his phone which has all Urdu alphabet and words, so when she sits with him they can swipe along to learn them. She has learned vegetable names from it, so she goes and brings them from the fridge and kitchen cabinet when we ask her to use our language. It is kind of a play and pretend thing where she goes and comes back with the stuff that she has seen on the phone screen." (M11)*

5.3 Incidental Learning

Being student parents, the mothers noted their investment in educational gains from screen media. They did not want their children's exposure to screens at an early age to go to waste and had an ulterior motive of letting their children learn something during their screen viewing sessions [44], which made them feel positive about their choice of early childhood media exposure. As busy mothers, most of our participants did not have time to engage in social activities or arrange play dates for their children. In such situations, they utilized screen media to perform technology mediated activities which enriched mother-child interaction, and familiarized their children with their cultural and religious background. As such, M1 used YouTube videos to stimulate her daughter's interest in physical activities such as dancing, ballet, and yoga, while M11 used screen media as a supplement to her physical arts and crafts activities with her daughter. M2 co-watched child-friendly shows with her children during their time together as a family, and M5 used technology to familiarize her child with their religious and spiritual beliefs. M8 only allowed smartphone use for educational purposes, motivated by the thought of helping her child to learn about things that were not accessible due to their limited budget or inability to visit learning venues:

> *"We use it (smartphone) to show him 'dandelion' because we cannot go outside these days (due to COVID-19). One day he saw the image of a trumpet, and he really wanted to know more. We don't have an expensive trumpet, so we just showed him the cello from "Yo-Yo Ma" (world-famous cellist) on YouTube, and now he knows what is cello." (M8)*

Some participants were motivated to explore and use mobile learning apps with their children. As M2 explained:

> *"These days we are mostly staying home, so I really wanted my son to learn things that he was having in his daycare. Recently, for the very first time, my husband downloaded an app for him (son) where kids can learn alphabets, and their phonic sounds. Of course it was a learning app, but in normal circumstances we would never do that (install app for kids on phone), it is not usual or common for us." (M2)*

Participants hypothesized that the learning gains from screen media gave their children an edge over their peers who had limited exposure to screens. However, they also acknowledged that learning through screen media was a form of fast learning which left little room for thinking, problem solving, or reflection [19]. Like slow technologies [36], participants desired to have slow media which would encourage children to critically think and interact, both mentally and physically. Key recommendations included having interactive shows and apps which could engage children by asking questions and holding conversation. Having such interactivity might engage children for a longer time, giving mothers enough breathing room to attend to their duties, while preventing their children from completely zoning out while watching static programs.

5.4 Maintaining Distant Ties

As members of geographically dispersed families, seven of the participants used smartphones to engage their children during remote family calls to ensure that their children would become more familiar with family members, especially grandparents [31, 98], who they did not get to see in person for months, or sometimes years.

> *"When my parents or his grandparents want to see him, we video call them and my (son) gets involved when he sees them. He also knows that they often when the phone rings its call from [home country]." (M9)*

Video-calls were the only preferred mode of communication for children [62, 63], and ensured greater engagement as family members interacted with children by showing them things of interest to get their attention [31].

> *"She (daughter) prefers an interaction with her instead of just talking. Like when my father has a cat and a dog at home, so when he talks to her, he's showing them to her and randomly showing other stuff to her, so she gets attentive towards that during the remote conversation." (M11)*

Participants also used screen based devices to connect with friends at distance, which sometimes evolved into acquainting their children with each other through videos and pictures:

> *"My friend who lives in the United Kingdom asked me to send me videos of [child name] when I'm making her hairstyle or when she's doing some art work, because her daughter watches those videos and then she says I want to have my hairstyle made like her and I want to do stuff like her [...]. When I upload some videos of some art work made by [child name] on Instagram, another friend who is regularly following me says she makes her daughter do a lot of things when she watches videos of my daughter, although her daughter is six years old (older than M11's daughter), but she says its really good and inspiring." (M11)*

The majority of our participants hailed from Asian countries. Given the geographical distance, they were typically only able to visit their homes sporadically due to financial and visa concerns. Living away from family and without the friends they grew up compelled our participants to use screen based devices to communicate with their essential familial and friend networks from a long distance. Born in the US without a physically co-located family, the children of these mothers recognized family and acquaintances primarily as a faces on the smartphone screen. While it is not an ideal introduction, the mothers really wanted their children to cultivate close relationships with their grandparents, cousins, uncles, and aunts.

6 SCREEN MEDIA USE BY CHILDREN OF EDUCATED, FOREIGN MOTHERS

The American Academy of Pediatrics (AAP) recommends against the exposure of screens to children below the age of two [47], unless it is for video chatting with a family member living at a distance [71]. For children between the ages of two to five years, they encourage caregivers to co-view educational and high quality programs with a limit of one hour per weekday, or three hours on weekend days [71, 72]. They also discourage the use of screens before bedtime or using screen media as an appeasement strategy, and recommend keeping bedrooms technology free, mealtimes for families only, and parent–child play times screen free. [47].

6.1 Screen Time Knowledge And Implications

We queried participants about their knowledge of recommended screen times and the source of that recommendation. Three of our participants said they did not know what the professionally recommended screen time limit was for their child's age, whereas five others reported it incorrectly. Five participants showed a certain level of confidence about their knowledge, with the sources of recommendation being children's pediatricians, the AAP, and various news articles read by the mothers. Mothers of children under the age of two (M4, M8, M9) were especially strict with their screen time limits, which is perhaps not surprising because of the young age. For the remainder, the average self-reported screen time for children was around four hours or more. Regardless of whether the child was watching it or not, TV stayed on in some households out of habit. M7 expressed her ineffectiveness towards putting recommended screen time limit into practise:

> *"We don't follow them (screen media limit recommendations) really to be honest. Like it's for one hour but I play TV for four hours for him" (M7).*

In response to our questions about parental perception on mother-child and child only use of screen media devices, participants were often pleased about their child's daily screen time compared to their age mates, based on their conversations with other parents. This was surprising since most of them self-reported their children's screen time to be more than three hours, which was already above the recommended screen time for young children. M11 reasoned about her child's screen time based on her knowledge of screen time practices of children back in her home country, highlighting that even though help with childcare is readily available in her home country (in the form of grandparents, extended family members, and house helps), she believed that children there are exposed to screens more than the ones in the US.

> *"I don't really know how much children use it nowadays because it varies from family to family and country to country, but if you keep the scenario in the US in mind I have seen that (children's) screen time here is something between average and above average. But if you compare it back to kids in [home country] I have seen that mothers just let their kids go with the devices and they just forget that their kids are busy with the devices, so I would not say that it's less than average, but it is average for sure." (M11)*

The onset of COVID-19 pandemic resulted in the introduction of new technologies and decision-making about screen time restrictions and limits for several participants whose children had attended daycare before the pandemic. Previously, M1's children spent most of the day in daycare and came back tired, wanting to eat and sleep. Although she tried to do various activities with them, she described the difficulty of stopping her children from watching TV and using smartphones very regularly. M10 stated that she was generally good with the two hour limit, but her son's screen time during the pandemic had worsened due to the fact that she was the only caretaker, and had to attend several meetings online as she worked from home. For M3's child, screen time during the day increased to six hours, which included both active and passive watching.

6.2 Acceptance, Ambivalence, and Rejection

6.2.1 Perceived Opportunities. Two of the participants (M6 and M11) demonstrated a more positive inclination towards the perceived benefits of early childhood media exposure. They described how they believed that their children were more advanced than their peers due to their relatively expanded knowledge about the world about them (i.e. M6 described how her son had learned many animal names and their sounds by the age of 15 months). For M11, the learning gains went beyond their own child, with her child's activities (as shared on Instagram) serving as an inspiration to her distant friends. M1 shared her perspective on her child's technology use:

> *"Honestly technology is not something that is supposed to be in the future, it lives with us every moment, so they (children) cannot avoid it, it is a part of our lives. I know that some parents don't let their children use smartphones at all, I think that it will be hard for them in the future. I prefer that they use TV and smartphones with the control, rather than not using it at all." (M1)*

M3, whose child had a speech delay, was cautiously positive about the benefits of screen time with regards to her child's speech development:

> *"I don't know if I am being selfish or something, but I want him to improve with the words and everything [...] So I'm letting him do that (watch screen media), because according to me he is improving, and it's not even a minute difference, it's a huge difference." (M3)*

6.2.2 Perceived Risks. Many participants showed an implicit (hinted by their disapproval of screen media choices made by other parents) and explicit dislike for early childhood media exposure, with each mother expressing their desire to reduce their child's screen time. M5 expressed that she would not have exposed her child to technology at his age if she was not so occupied with her other responsibilities. M8 thought that non-technology mediated learning was more impactful than screen media, as in her opinion children just passively watched screens without focusing or interacting with it. M6 supplemented this opinion by emphasizing the importance of parental involvement in learning, which she found to have more profound and long-term learning outcomes. M1 revealed a different concern about the possible effect of screen technologies on her daughter's speech development and behavior. While she felt that it was beneficial in that her child was learning new words, she also expressed concerns about her daughter 'zoning' out and becoming very quiet while watching screen media:

> *"It is like she can stay in that world as many hours as you want her to be." (M11)*

A primary fear for several of the participants was to do with the potential impact on children's eyesight. Their acceptance of screen media was often proportional to the screen size of the digital device, with M11 believing that having a bigger screen size was supposedly better for the eyes, and M12 thinking that "Projector is bigger, and I think it can protect his eyes".

6.3 Moderation, Mediation, And Control As An Educated Parent

Some participants (M1, M2, M3, M6) liked having total control over their children's technology use and content consumption. While M1 controlled her children's device access by only allowing them to see TV when she played it, M6 resorted to restricting the internet access in her smartphone by putting it on airplane mode before giving it to her son. M3 had a specific playlist for her son in which she chose all the videos and cartoons that she wanted him to watch. She also screened everything beforehand before showing to her child:

> *"When my friends recommended I watch Blippi, I watched an episode quickly and kind of understood what it was about and then I let him (son) watch it. He sees nothing which I don't want him to watch, because I don't think it's worthwhile to let your child watch cartoons without you knowing what's in them." (M3)*

There were certain trusted platforms (TV channels and apps) which were more favored due to their parent friendly settings. M1 preferred using YouTube kids over the regular YouTube app which allowed her to change settings to restrict content according to her children's ages. M11 trusted children's channels on Amazon fire stick and Netflix as she believed the content was pre-approved to be shown to children, and did not have many advertisements. M10 put parental restrictions on her phone to ensure that whatever her child chooses to watch has to go through her.

> *"Even for the PBS videos, if you go to another section, you have to enter some relevant questions which can only be answered by parents." (M10)*

Despite having control over their child's content consumption, participants liked keeping an eye on their watching habits. Being in close physical proximity to the children seemed to make it easier to monitor their screen media usage.

> *"Are you asking if I stand by him all the time to see what he's watching or doing? Definitely yes. The audio is so loud that I keep hearing what's being played, so if he shouldn't be watching something I would immediately go and change it." (M6)*

Overall, mothers paid close attention to the content consumed by the children per professional guidelines [47], as they believed that having proper monitoring and control strategies for screen access was more important than depriving the children of their use [43, 83].

7 DISCUSSION

7.1 RQ1: Context Of Use

Our findings revealed the struggles of parenting as an international student including the complex and challenging socio-cultural issues, a multitude of responsibilities, and an unequal distribution of child care duties. More often than not, mothers put the needs of their family before their own, often compromising their mental well-being. For some, managing their multiple roles also led them to hold back on expanding their family, to handle one thing at a time, by choice or otherwise [59, 103].

We found our participants to be often critical of the early childhood media exposure choices made by other parents even when the motivations for that exposure were similar to their own. This led to screen time judgement, which was a reflection of their own ideals and expectations of what it means to be a 'good parent' [38]. Participants often placed at least partial responsibility for their children's challenging personality and behaviour traits to their exposure to screen media, whereas good characteristics were often primarily associated with their own efforts.

Knowledge of these changeable ambivalent feelings and inherent biases can help in designing screen media content and technologies, while incorporating these attitudinal nuances. We also report these challenges to describe mother's (often involuntary) choices of early childhood media exposure and their motivations for using screen media as a parenting tool in presenting a broader picture of their context of use. Here we argue that only describing their uses of technology and the gratifications sought from the use of specifically screen media is a story half-told, making their choices prone to judgement from critical others.

Despite our focus on the mother-child dyad, the reporting of experiences with technology by mothers (who lived with their partners) included a window into the father's interactions with the child, and the influence of the mother's own use of technology for, and with their children. Mothers used various mediation and control strategies to regulate their children's screen media usage and their own expectations and fears regarding screen based devices use by their children. Being able to customize the device settings and screen media content from an established and reliable source (such as popular kids channels and content approved by fellow mothers) gave mothers a sense of relief by making them feel in control of their children's screen media consumption. Although children's preferences and needs influenced mother's selection of platform, device, or media for their children, they still held an authoritative position over their young children's media consumption by actively moderating their usage. Therefore, in the context of media use by young children at home, mothers are the passive users and active seekers of gratifications from screen-based technology, and their choices are influenced by several factors which can alter their context of use.

7.2 RQ2: Gratifications Sought Versus Gratifications Obtained

Among the various roles of screen media content and devices in our study participants' lives, a previously less recognized use of screen media as a language aid emerged among international student mothers who were raising children who were bilingual/multilingual. They used screen media to both acquaint their children with their parent's native language and to also help them become proficient in English owing to their US context. Screen media also aided mothers whose children had delayed speech, despite the concerns about screens inducing slow language development and speech delay in children [12, 40]. While the use of voice user interfaces as children's bilingual communication aids appears in the literature [5, 104], we believe that the potential of screen media as children's assistive interlocutors for secondary language learning, while living in a family unit consisting of limited members, has not been completely realized as of yet.

In addition to the gratifications sought from screen media, our findings revealed an understated gratification of using screen media devices as a proxy caregiving assistant. Since mothers' use of

screen media converged with children in more ways than their partners, screen media devices often acted as a reliable childcare assistant [6]. Their motivation for engaging their child using screen media devices included the urgency of their work, the affordability of media devices in the US, the intuitive nature of the devices themselves, and being able to watch over their child alongside them while they completed their own necessary work. Although many instances of mothers use of media devices as a support structure [38] contravene the AAP recommendations for young children [47], for our participants, their challenging circumstances as student mothers often called for desperate measures. We present this quandary to urge researchers to explore the potentially controversial yet unappreciated benefits of using technology as a childcare assistant.

7.3 RQ3: Recommendations Versus Praxis

Our participants represented a high-literate population, where they could be expected to have considered knowledge of expert recommended screen time limit recommendations and demonstrated caution about early childhood media exposure. Children's daily screen time declared by our participants was contradictory to the reported screen time (< two hours) for children below the age of five [52, 53]. While our participants expressed their ultimate desire for reducing children's screen time, their circumstances often led them to allow screen media usage for extended periods of time, and considerably beyond the professionally recommended guidelines [47]. It was primarily because of being subjected to pre-defined gender roles, which unfortunately most often put the responsibility of housework and childcare on mothers [75], and the dilemma of adhering to their prescribed gender role as the primary child caregiver in order to establish their identity as a good parent [50]. Although the use of screen media beyond the recommended screen time is common in low-income, low literacy families [14, 84], the use of screen media as a parenting tool amongst high-literate families like our participants was revealing.

While mothers had effective strategies to moderate and monitor their children's consumption of screen media content, screen time limit recommendations were either not known, or disregarded due to the mother's responsibilities and their budgeted time. In the rare cases where they were followed diligently, we note that this was in instances when the mothers had help from family members who occasionally came to live with them and helped with childcare. However, having an extra family member resulted in family friction, and affected the mental health of the mothers, where they had to cope up with an additional challenge of conforming to the additional family member's concept of ideal living. The predicament was that screen watching practices before and during COVID remained similar for children of most mothers, as they were already not attending daycare, and spending time at home with screens. This called attention to possibly revisiting the guidelines about early childhood screen media exposure based on the lived experience of parents with a lack of childcare support, in order to help mothers feel acknowledged and appreciated for their efforts, and to systematically educate fathers/partners about the effects of unequal distribution of childcare responsibilities on mother's well-being.

8 DESIGN AND EVALUATION OPPORTUNITIES

While mothers were able to find screen media content suited for their children's age ranges, obtaining some of the gratifications they sought from screen based technology were to some extent limited by their technological experiences due to their unique circumstances and needs. We reviewed relevant literature with the viewpoint of identifying opportunities for designing technology to deliver common gratifications sought by the mothers. In the subsequent sections, we first describe our propositions based on insights from the literature and findings from this study. Our design propositions are developed with consideration for the supervisory role of parents who are active receivers of the gratifications provided by screen media through their young children.

They are intended to serve as non-exhaustive, high-level technology blueprints which can serve as parenting tools. In proposing the design opportunities, we strive to make them generalizable to a broad set of parents including student parents raising young children in a different country, working mothers, and single parents living without co-located family. We then present a set of opportunities for evaluating screen based technology and content for young children and investigating family's co-use of technology in consideration of the limited scope of this study.

8.1 Positive Distraction

The mothers primary motivations for allowing the use of screen media devices by their children were distraction and engagement. As they were responsible for tackling multiple tasks in the multipurpose home, mothers used screen media to distract their children so that they could complete their work quickly. Young children (the ones in our studied age range) often seek their mother's direct attention and assistance constantly throughout the day, both for genuine and impulsive reasons. While the mothers wanted to spend time and engage with their children throughout the day, the budgeted availability of time regularly forced them to seek ways to engage the children for a prolonged period and away from their attending mother. Children are naturally liable to give in to their emotional states when faced with disruptions in the regular flow of events, resulting in disruptive behavior [43]. In that regard, we found potential for developing technology which can help mothers avoid possible time-consuming behavior disruptions, while keeping the child seamlessly engaged so that they can continue working without interruptions. Diversionary apps and programs are especially desirable when mothers are studying, as disruptions to the flow of their thoughts can disorient them during their work/study sessions at home [7], jolting them out of focused concentration as they tend to their children's untimely demands of attention.

8.2 Interactive Language Aid

While socially contingent video viewing sessions have proved effective in promoting preschoolers science learning [105], research suggests the insufficiency of communicative social cues to support toddler's word learning via video presentation in the absence of a co-present communication scaffold [100]. Although shows like *Dora the Explorer* introduce the concepts of music, language, and interaction to young children, they fail to account for children's untimely responses. With limited availability of time and a limited number of family members in the household, we propose having an interactive show [8] with characters who can hold believable dialogue with children. Such a show could have the potential to help children with speech delays by encouraging them to participate in a conversation through the use of age appropriate, context specific questions. Together with engaging children, an interactive show in the parent's native language could help children become familiar with the language in the absence of their parent(s). With multiple language options, children could potentially develop some basic proficiency with, for example, English by conversing with English speaking character(s) in the show. As young children also learn new words by overhearing conversations by adults [100], characters in the show could have conversations amongst themselves while also including asides to the watching children to further promote unsupervised language learning. Additional research could also investigate the prospect of involving conversational agents and augmented reality [20] in conjunction with screen media to promote a greater level of engagement of children with the virtual interlocutor.

8.3 Playful Acquaintance

Traditionally, video-calls are popular for connecting children with members of their geographically distributed families such as grandparents, incarcerated parents [93], and migrant parents with children who remain in the homeland[32, 33]. However, the interest of children in conversing

with people who don't share the same space with them physically depends greatly on their mood, objects of interest, and the level of interactivity offered by the person on the screen. A child's short attention span can be upsetting both for the parents and the person with whom they want the child to interact. We believe that there are opportunities for developing screen based games which can help in facilitating conversation and interactivity between children and their distant relatives. Augmented reality/mixed reality games [55] can give children a deeper impression of their conversation partners by sharing the same space as them, thus possibly producing greater levels of engagement. These communications can have a positive impact on the mother's perception of her child's para-social relationship with screen media characters, as in this instance, they would instead be communicating with known people.

8.4 Anonymous Peer Parent Support

Research suggests that peer support programs for parents of children with special conditions can be effective against stress and anxiety [39, 78], and be a means of emotional support to parents [69]. Keeping participant's involuntary practice of comparing their performance as a mother with others in differing roles, and subjecting themselves and others to screen-time judgement, we envision an *anonymous screen-time log* application, where mothers can log their child(ren)'s daily screen time. The logged data can both be displayed individually (and anonymously) for each household, and also aggregated and visualized to give insights about screen media usage in a general household with young children and busy mothers. The anonymity may help in avoiding possible screen-time judgement, while also being able to observe the routine of other families in a similar living situation. We hoped that the (possible) theory vs praxis of screen time recommendations would enable mothers to have a positive feeling about their choices, potentially leading to acceptance of technology in a positive way. Additionally, the application could incorporate features such as an *ambivalence canvas*, which may allow mothers to reveal their hesitations and potential regrets regarding their parenting, especially with regards to their children's screen media usage. Mothers can be as creative as they wish with their input, using their preferred form of expression from text, to audio, or drawing. It may allow mothers to explore their ambivalent or conflicting thoughts while also connecting with others who share their lived experience. We hope that being aware of these ambivalent thoughts and having a platform for sharing them may enable mothers to bond over their communal context of use of screen media and potentially contribute to their overall well-being.

8.5 Areas of Further Investigation

Our study was strengthened by the representation of mothers from various ethnic groups and the diverse perspectives of our own research team (multiple parents and non-parents alike from diverse countries), resulting in a cohort of participants and contributors with widely differing backgrounds and roles. There are a few limitations to our study in terms of scope and findings, which have the potential for further study. Our study is only focused on international student mothers in the US, with primary representation from Asia and Africa due both to our sampling technique and because the time of the study coincided with the end of semester for most students. While the highest number of international students in the US hail from Asia, we did not have representation of students from all continents. It is worth mentioning that after this study, the first author participated in a doctoral consortium[5] with student mothers from several parts of the world including Europe, the United Kingdom, and Asia, who felt deeply about the issues addressed in this paper. Additionally, the experiences of international student mothers in the US are likely

[5]Workshop for PhD students from all over the world who are in the early phases of their dissertation work

somewhat different from mothers engaged in study elsewhere, requiring additional work to verify the generalizability of our findings. Secondly, as with all interviews, these were all self-reports which are prone to bias and limitations as participants may try to give socially acceptable answers. We noticed some mothers adopting a defensive strategy when asked about screen time usage resulting in a Hawthorne effect [43], which might affect the accuracy of the reporting of their daily routines. As our current explorations were restricted due to COVID-19, we aim to observe and interact with participants and their children in their actual domestic settings to reveal valuable information about the use of screen media that may have been overlooked due to the self-reported and remote nature of the current study.

Although mothers in our study population were responsible for the majority of childcare and domestic duties, and held authority on decisions around their children's screen media usage as their primary caregiver, there is a need to investigate the co-use of technology by fathers/partners with their young children to give a holistic view of the family practices around screen media usage, which was out of scope of this study. Another dimension to this research is to include the voices of mothers with children with different abilities to create a more inclusive picture of parenting experiences. Finally, there is a need to investigate mother's reception of our proposed design solutions by prototyping and deploying them in their naturalistic setting.

9 CONCLUSION

Using uses and gratifications theory as a framing mechanism, we studied international student mothers' experiences with screen based technology by investigating the context of use based on their background and lived experience, the gratifications they seek from their children's exposure to screen media, and their perception about the use of screen media by their children as educated, foreign mothers. Our findings highlighted the complex and challenging socio-cultural issues, multitude of responsibilities, and an unequal distribution of child care duties, which prompted mothers to allow extended use of screen time by their children. Mothers were found to use screen media for distraction/engagement, as a language facilitator, for incidental learning, and the maintenance of distant ties. Additionally, they also used it as a childcare proxy in the absence of co-located caregiving assistance with their young children. Based on our findings, we present four opportunities for designing for this user population including technologies for positive distraction, interactive language aids, playful acquaintance tools, and anonymous peer parent support. We reveal future avenues of research in this design space including different methods of investigations and the inclusion of a more diverse representation of mothers and children. While we studied the experiences of a particular user group with respect to their use of screen media, we believe that our findings could also reflect the experiences not only of student mothers, but also many other types and groups of mothers and parents in the US, particularly during this extraordinarily challenging global epoch.

ACKNOWLEDGMENTS

We wish to thank the participating mothers for sharing their valuable experiences with us. We also want to extend our gratitude to the anonymous reviewers from CSCW and CHI where we submitted this work previously, as their invaluable feedback really helped us in strengthening our work.

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Submitted January 2021; revised April 2021 ; revised July 2021 ; accepted July 2021; accepted July 2021