

“It’s a girl thing”: Examining Challenges and Opportunities around Menstrual Health Education in India

ANUPRIYA TULI, IIT-Delhi

SHRUTI DALVI and NEHA KUMAR, Georgia Institute of Technology

PUSHPENDRA SINGH, IIT-Delhi

Cultural taboos and limiting social norms make it challenging to communicate and teach about menstrual health in India. We present findings from an inquiry of current approaches used to educate adolescents about menstruation, examining the perspectives of young adults, parents, teachers, social workers, and health professionals for identifying design opportunities and potential for impact. Our findings from the content analysis of education and training materials in use, an online survey of 391 adults, 52 interviews, and 2 focus groups indicate that although detailed and descriptive information materials are available for use, there exists a disconnect between parents’ and teachers’ expectations regarding who will introduce these topics to adolescents. We also highlight a clear difference in attitudes regarding who must be taught, how, where, and at what stages. Finally, we articulate factors that shape access and receptivity to this knowledge and engage with the lens of feminist HCI to discuss sociotechnical implications for the design of menstrual health education initiatives.

CCS Concepts: • **Human-centered computing** → **Empirical studies in HCI**;

Additional Key Words and Phrases: Menstrual health education, India, feminist HCI, HCI4D

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1 INTRODUCTION

The field of human-computer interaction (HCI) has engaged broadly and deeply with a host of global health concerns. This is an intersection that is fast developing (e.g., [45, 66]) and includes sensitive health topics such as HIV/AIDS education, mental health, and others. Cultural taboos can prevent open communication on these sensitive topics, which may be of critical importance for the wellbeing of individuals and communities. Women’s health, in particular, is an affected area that has received increasing attention in HCI in recent years [6, 7], including at a workshop on *Hacking Women’s Health* at the CHI 2017 conference [10]. Within women’s health, menstrual health-related behaviors comprise a growing area of study (e.g., [25, 28, 37]) and we extend this nascent focus to

Authors’ addresses: A. Tuli and P. Singh, IIT-Delhi, Okhla Industrial Estate, Phase III, Near Govind Puri Metro Station, New Delhi, Delhi 110020, India; emails: {anupriyat, psingh}@iiitd.ac.in; S. Dalvi and N. Kumar, Georgia Institute of Technology, North Ave NW, Atlanta, GA 30332, USA; emails: {shrutidalvi, neha.kumar}@gatech.edu.

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research the challenges that impact communication about menstrual health education (MHE) in India, and identify design implications for addressing them.

In India, approximately 24% of girls skip/drop out of school on account of menstruation [78]. In 2017, a 12-year-old girl in South India committed suicide after she was scolded by her teacher on staining her uniform and bench with menstrual blood [73]. Segregating women during menstruation is an age-old practice across several parts of India [16, 70]. More recently, another 12-year-old lost her life to the Gaja cyclone because she was made to sleep in a hut next to her house while she was menstruating [51]. These instances highlight the marginalized treatment women routinely receive on account of their menstrual activity in their critical, formative years. The ongoing and acutely controversial case of the Sabarimala temple [80]—where women have traditionally not been permitted to enter the temple due to the absence of machinery that can confirm their purity (i.e., that they are not menstruating)—is another manifestation of this marginalization. Identifying ways of addressing this systemic, long-standing marginalization of women is the primary motivation underlying our research agenda.

We collected data using a combination of research methods—a survey of 391 adults, 52 interviews, and 2 focus groups—to understand how adolescents (in urban India) are introduced to topics around MHE, how they must stitch together fragments of knowledge amid strong social stigmas, and what they feel would have made a positive difference in their initial encounters with menstruation. Our findings highlight the heavily gendered nature of this context that determines both provision of and access to relevant information. We emphasize that it is not only the nature—accuracy or accessibility—of the curriculum that matters, although that is the first step. There are critical decisions to be made regarding who must introduce the relevant information, to whom, at what ages, and in what contexts. By identifying potential answers to these questions, we attempt to identify sociotechnical implications for the design of initiatives that might leverage existing behaviors and practices.

In this article, we begin by providing background on various MHE initiatives in India, before summarizing related research on women’s health in HCI, the engagement of culturally responsive design for communicating taboo topics, and working across genders. We then describe the methods we used to understand existing approaches and challenges in addressing MHE. To identify sociotechnical implications for the design of MHE initiatives, we employ Bardzell’s *feminist HCI* framework [13]. Our focus remains on taking an ecological approach to address the challenges of MHE, identifying ways for technology to be leveraged toward creating safe environments for adolescents to learn, across genders, along with peers, utilizing, and/or augment already available content. Our larger goal is for this education to be consumed and shared not only to inform those who menstruate but to sensitize non-menstruating sections of society, and to protect against marginalization and discomfort on account of widely prevalent cultural taboos.

2 RELATED WORK

We next provide background on MHE initiatives in India, before summarizing related HCI research on women’s health, taking a culturally responsive approach to design, and challenges in working across genders. We then describe the feminist HCI framework [13] as we engage it to analyze our findings.

2.1 Background

Discussion and education on sensitive topics such as menstruation are routinely shaped by locally situated cultural taboos. The ongoing case of women’s access to the Sabarimala temple in India is a prime example of the extent of stigmatized treatment on this topic [52, 72, 80]. However, educational and governmental bodies in India are making efforts to be more progressive,

by addressing such practices that are deeply rooted in age-old taboos (e.g., [51, 58]). The Indian government has also introduced national guidelines for effective Menstrual Hygiene Management (MHM) under the *Swachh Bharat Mission* [53]. In Kerala, it is now mandatory to have sanitary pad vending machines in every school to encourage MHM [2]. More recently, the Indian government has also acknowledged the need for MHE across genders. Within the technological realm, the Indian Ministry of Health & Family Welfare, launched the *SAATHIYA* resource kit in February 2017, which includes a mobile app as part of the *Rashtriya Kishor Swasthaya Karyakram* (RKS or the National Youth Health Program) [18]. This app, which uses content prepared in collaboration with the United Nations Population Fund (UNFPA) [29], aims to engage a peer as a mentor to educate all youth about their bodily changes. The Delhi government is also aiming to include materials in school curricula toward sensitizing adolescent males: “*Education Minister said [both] boys and girls needed to be taught about menstruation and puberty*” [36]. There are also various practitioners (such as Sachhisaheli [63], Vikaalp [79], Menstrupedia [50], among others) in the domain, who work toward spreading awareness on the subject through campaigns (e.g., [57]), workshops ([50, 63]), and the creation and distribution of content [50, 71]. Despite these initiatives, the recent deaths of two adolescent girls on the pretext of traditional practices around menstruation brings the systemic marginalization of women to the fore [51, 73]. The primary goal of our research is to uncover challenges and opportunities in the context of addressing MHE to address this marginalization.

2.2 Women’s Health and HCI

HCI researchers have shown interest in women’s health and wellbeing in recent years. At CHI 2017, there was a workshop on hacking women’s health [10], and the area is rapidly growing with researchers working on intimate care [6], sexual wellbeing [22, 39], breast cancer [5], breastfeeding [9, 20], pelvic fitness [7], and other topics. Within the domain of women’s health, HCI research on menstrual health and management is still in nascent stages. Jain et al. designed a tablet-based game—*Help Pinky*—to teach adolescent girls in Assam, India about menstrual health and related myths [37]. Similarly, Tran et al. built an IoT-based working model of the uterus to engage children and parents in early discussions on menstrual health [75]. Epstein et al. explored the use of menstrual tracking applications in the US and highlighted the non-inclusive nature of such applications [25]. More recently, research has explored how to engage menstrual tracking information through ambient light- and color-emitting smart mirrors [28, 34]. Tuli et al. studied *Menstrupedia*, a digital health platform designed specifically for Indian women, and identified missed opportunities for advocacy and engaging the non-menstruating gender toward MHE [77]. The HCI community is also working toward women’s wellbeing with an emancipatory agenda around the topic of safety [3, 4, 21, 40]. Given the stigma associated with menstruation, our work sits at the intersection of emancipatory action research and women’s health.

2.3 Culturally Responsive Design

HCI researchers and designers acknowledge the importance of factoring in cultural and local contexts, such as in the way Gulf Arab Muslims interpret and practice the concept of privacy, which is “*beyond concerns for safety*” and more about “*the careful navigation of social media activity so as to preserve respect and modesty*” [1]. Another study exemplifies the role of culture on the adoption of *Protibadi*, a digital platform for women to share their sexual harassment experiences in public places [3]. In this study, Ahmed et al. observed that despite the professed need for such an intervention, the culture of shame surrounding sexual harassment in Bangladesh led to comparatively low adoption. The HCI community is working to address communication on similarly sensitive issues, taking into consideration local cultures to combat and work around long-standing stigmas present within communities. For example, instead of aiming to dismantle taboos, Sorcar et al.

leveraged local cultural customs to provide comprehensive HIV education to youth in India [67]. They customized materials to accommodate local languages, accents, and appearances, creating a familiar and comfortable environment for the user. They designed TeachAIDS, a software application consisting of a culturally acceptable educational curriculum, which they tested extensively with their target audience to ensure that there was no discomfort in engaging with the materials. Another study from India explored how collaboration and seeking support can generate avenues for conversing about sensitive topics in the hope of decreasing stigma around these conversations by designing a tablet-based game, an adaptation of the game of *Snakes and Ladders* where girls are required to seek support from their community and peers around MHE to succeed [37].

Almeida et al. suggest that, in designing for intimate care and other sensitive topics related to women's health, designers must focus on channeling the experiences and emotions of women [6]. In one such study, the researchers designed an augmented system, *Labella* [7], that supports body literacy by encouraging women to explore their bodies just as they would have done using a mirror. Tran et al. developed a game for engaging parents and children (4-9 years old) on the taboos around menstruation [75]. This game takes the learner through each phase of menstruation by using a prototype of the uterus supported with audio and visual cues. In other recent studies from the Global North, researchers are trying to counter societal taboos related to women's reproductive health by embedding menstrual tracking information into their daily lives using ambient lights [34] and smart mirrors [28]. Given that menstrual health practices (e.g., tracking) may vary across cultures [25], we aim to extend the culturally responsive approaches above to addressing MHE in the Indian context.

2.4 HCI Across Genders

Despite supporting evidence that there is interest across genders for using interventions designed for and around women's health (e.g., [25, 77]), most research on women's health in HCI views women as the sole stakeholders. Bardzell references Foucault's theory of identity to talk about subjectification [12], explaining that in any situation, individuals are subjected to the practices of the institutions we are part of, as well as our response to that subjectification. There are multiple HCI studies highlighting the use of "*stereotypically feminine attributes*" in applications designed for managing women's health (e.g., [25, 61]). Epstein et al. point out how the use of gendered icons, colors, and text in menstrual tracking applications generates a notion of being excluded among sexual and gender minorities [25]. Another example is *Menstrupedia's* comic on MHE designed specifically for an Indian audience [50]. The comic uses the backdrop of a middle-class Indian family to showcase the journey of three friends (young adolescent girls) as they discover menstruation and MHM practices. With missing male characters, possibly an attempt to be culturally responsive, the comic falls back to treating menstruation as a gender-specific subject [77]. A UNICEF team took note of the negative social experience that adolescent girls faced around menstruation in schools in Indonesia and created an educational comic targeting both girls and boys [49]. Held one way, it gives girls information about their periods and how to deal with them; turned upside down, it is a guide for boys on positive ways to interact with their peers who may be experiencing menarche.

Research argues that historically "*women's bodies have been conceptualized in relation to a male standard*," adding that the discomfort male adults experience due to the topic stems from the fact that they themselves do not experience the phenomenon [27]. Peranovic and Bentley report that although everyone knows that a woman's reproductive capacity necessarily involves menstruation, it may still be perceived as an alien phenomenon by men [60]. Designers have designed a prototype of a *Menstruating Machine* (MM), which simulates the experience of menstruation [68]. Though MM creates empathy toward people who menstruate, it does not discuss other related aspects like

reproduction [11]. There appears to be a dearth of resources that tackle how women’s health is addressed across genders. Men express a desire to contribute but may be held back due to lack of comfort, often because they have received little education on such topics in their younger years. This seems to be a general consensus among men in many parts of the world, not only in countries of the Global South [60]. Our research also finds that gender impacts MHE practices in India, in addition to proposing opportunities for engaging the non-menstruating gender perspective.

2.5 Feminist HCI

Bardzell’s introduction of the feminist HCI framework—with its principles of pluralism, participation, ecology, embodiment, advocacy, and self-disclosure—allows HCI research to examine power imbalances, and how these might impact the realms of technology design, adoption, and use [13]. For example, HCI scholarship has employed this framework to shed light on technology interventions such as panic buttons for women’s safety [40], mobile media use for maternal health [44], online forums that discuss street harassment [3], among others. We view MHE as an area that has been susceptible to power imbalances, given the differential dissemination of information to male and female adolescents across schools and homes. Thus, we engage the feminist HCI framework in our inquiry of MHE in urban India—first to highlight how existing practices uncovered by our study engender missed opportunities for addressing MHE, and then to understand how feminist HCI principles might assist in shaping future interventions. Among these principles, pluralism and participation work together to appropriately inform interventions that recognize and address different needs across a target user base [13]. The principle of ecology encourages us to think about how technology might be designed to align with the environment in which it is being used [13]. Embodiment allows us to bring bodies into the mix, recognizing both commonalities and differences across such bodies, with gender being one mode of differentiation, while the principle of advocacy focuses on ensuring that technology is progressive and attempts to bring about political emancipation [13]. Finally, the quality of self-disclosure suggests that technology make visible the ways in which it constructs its users, and with what assumptions. We engage with this framework in our article as a guiding lens for deriving sociotechnical implications from our research findings.

3 METHODOLOGY

Our study, approved by the Institutional Review Boards (IRB) at our institutions, took place in New Delhi (India) from May 2017 to August 2017. Our goal was to understand how adolescent health topics with a focus on menstruation and menstrual health practices were introduced at homes and in schools. To do this, we used a combination of methods to collect data from materials currently used, parents (mothers and fathers), teachers, community health workers, social workers, and young adults (male and female). We conducted an in-depth survey with male and female respondents; their responses are labeled SM# and SF# respectively. We also conducted semi-structured interviews with a set of participants in each stakeholder group; these are labeled IM# and IF# for young male and female adults, IPF# and IPM# for fathers and mothers, IT# for teachers, IH# for health workers, and IS# for social workers. Currently, Indian society by and large assumes and behaves according to gender binaries. Thus, to engage in discourse with our participants, we admittedly fell back on their language, which excludes people. We acknowledge that not all the people who menstruate identify as woman/girl, and not all the people who identify as woman/girl experience menstruation.

All of the data was analyzed in conjunction and duly corroborated (particularly across surveys and interviews). The data from multiple stakeholders allowed for appropriate triangulation.

Table 1. Our Online Survey Received 342 Complete Responses from 109 Participants Who Identified as Males and 233 Participants Who Identified as Females

	Adults (250)	Parents (92)
Gender	Female (156), Male (94)	Mother (77), Father (15)
Age	Min 18, Max 45, Median 24	Min 26, Max 69, Median 39
Religion	Hindu (164), Muslim (9), Sikh (8), Christian (3), Other (11), Atheist (24), No particular religion (31)	Hindu (66), Muslim (3), Sikh (5), Christian (1), Other (3), Atheist (6), No particular religion (8)
Income (per annum)	Low: < \$5K (46), Middle: \$5K–\$26K (134), High: > \$26K (48), No response (22)	Low: < \$5K (11), Middle: \$5K–\$26K (39), High: > \$26K (40), No response (2)

Both, male and female were given different sets of questions, with additional questions posed to parents.

3.1 Content Analysis

We analyzed the materials used in schools as part of the standard curricula for eighth grade—where the topic of menstruation is introduced—and tenth grade, where it is revisited. We also analyzed materials provided to health workers under different state-supported schemes. We looked at the content prepared by the UNFPA [29] in Hindi for consumption by different state agencies within India. While we also analyzed the curricula devised by recent non-profit initiatives (e.g., Menstrupedia [50], Sachhisaheli [63], Vikalp Design [79], and TARSHI [71]), in this article, we focused on the content used by schools and government organizations that have a mandate to reach across India and teach adolescents about menstrual health and hygiene. We examined the extent to which these materials imparted MHE—the facets they touched upon (or not), whether they discussed the challenges that parents and teachers had perceived, products to manage hygiene, and more. We conducted semantical content analysis [42] with a focus on word frequency [30, 31] to analyze the materials. The text was open coded before being organized into five broad codes: “*evasion*,” “*physiology*,” “*myths and taboos*,” “*management and hygiene*,” and “*visible body changes*.”

3.2 Survey

We designed an in-depth survey to understand how adults (also including parents and teachers) across genders receive and disseminate MHE. We included 49 questions, with 19 targeting female participants in particular, 14 targeting male participants, 4 targeting parents, and 12 focused on demographics. Some questions were multiple choice, such as questions about the participants’ sources of knowledge about menstruation, the suitable age for imparting MHE, and so on. Others were more open-ended, such as questions about any restrictions imposed on activities during this period.

We recruited survey participants through email, WhatsApp, LinkedIn, and Facebook. The survey was developed and administered in English. A note at the beginning of the survey explained the objective of our study. All survey participants provided us with written consent. The survey received 506 visits, with complete participation from 391 visitors. During our analysis, we eliminated 49 (12.5%) incomplete responses using listwise deletion [65] as they followed NMAR (not missing at random) pattern. This left us with 342 complete responses (see Table 1).

For open-ended questions, we coded responses from different stakeholders and conducted thematic analysis of the same [17]. Examples of codes included “*misinformation*,” “*no prior information*,” and “*religious practices and beliefs*.” The remaining questions were analyzed by calculating percentages and cross-tabulation [42] to view gender-specific percentages for certain questions

Table 2. We Conducted 52 Semi-Structured (20–30 minutes) Interviews with Various Stakeholders

	Adults (23)	Parents (11)
Gender	Female (12), Male (11)	Mother (5), Father (6)
Age	Min 19, Max 30, Median 26	Min 33, Max 69, Median 45
Religion	Hindu (3), Muslim (1), Sikh (2), Other (3), No particular religion (2)	Hindu (9), Sikh (2)
Income (per annum)	Low: < \$5K (2), Middle: \$5K-\$26K (17), High: > \$26K (3), No response (1)	Low: < \$5K (3), Middle: \$5K- \$26K (4), High: > \$26K (3), No response (1)
	Teachers (9)	ASHAs (9)
Gender	Female (8), Male (1)	Female (9)
Experience	< 10 years (1), 10–20 years (2), >20 years (6)	< 5 years (1), 5–10 years (6), >10 years (2)
	Focus group 1	Focus group 2
Participants	Science teachers (8)	Social workers (10)
Gender	Female (8)	Female (5), Male (5)
Site	Government Girls’ School	Non-Governmental Organization (NGO) [19]

In addition, we conducted two focus groups of 30 & 50 minutes with teachers and social workers, respectively.

and how one’s experience affects the response. Examples included cross-tabulation of “When did you first learn about menstruation?” and “What was your reaction when you had your first period?”

3.3 Interviews and Focus Groups

We conducted 52 semi-structured interviews and two focus groups (with teachers and social workers); a summary is presented in Table 2. Participants were recruited using a combination of snowball and purposive sampling [46], particularly useful when researchers have limited access into the community of participants. We aimed for a balanced sample, ensuring diversity of gender, ages, and cultural backgrounds. We made sure to obtain informed consent from all participants.

The goal of our interviews was to understand the diverse perspectives of different stakeholders including fathers, mothers, teachers, health workers, and (male and female) adults. To understand how participants related to the topic of MHE, we started our interviews by asking participants what came to mind first when they heard the word “menstruation” or “periods.” Questions we asked focused on unpacking the factors that contributed to the complexity of this topic—for example, “How is the conversation around menstruation affected by the gender of the people involved in the discussion?” and “Is it the relationship or the gender that affects the comfort level in bringing this topic to discussion?”

All interviews were conducted on phone or in person, and in Hindi or English—depending on the participants’ comfort levels. Interviews were transcribed and translated to English, when necessary, for further analysis. All authors were in regular touch throughout the study design, data collection, and data analysis stages. We subjected the data to iterative, inductive analysis. We started by reading through our interview transcripts and coded the data line by line. Based on the patterns that emerged through this coding, we formulated clusters such as “talking about ‘periods’ in class” or “stigma in family.” These helped in organizing our findings section.

3.4 Self-Disclosure

All authors are of Indian origin and have conducted fieldwork across different regions and marginalized communities in India. In particular, we have all conducted HCI research with a

focus on mobile technology design and adoption across domains, including health and education, in variously underserved communities. Three of the authors identify as female, and one as male. We were all born and raised in different parts of India, but have had similarly limited experiences with MHE in our formative years, shaping our motivation to conduct the research we present. Having seen women being marginalized repeatedly and on various counts due to lack of informed-ness or social stigma around menstruation, we all feel strongly about facilitating open and respectful communication around this topic.

All authors received their schooling in India, and each of us has our own set of experiences (positive and negative) around the subject. Our initial brainstorming sessions for conceptualizing the study were driven by our experiences and revealed that the state of MHE in professional and non-professional settings has not changed over the last decade. Though the advancement of technology has made information more accessible, still a natural body phenomenon continues to receive taboo treatment. This current treatment led us to explore the factors affecting face-to-face dissemination of MHE and identify opportunities where technology might be used to encourage and foster communication on the subject. This study represents the beginning of a longer research engagement in addressing taboo topics around women's health using technology-based learning.

3.5 Study Context

India is a large, culturally diverse country, with a population of above 1.3 billion people belonging to different linguistic, socio-economic, and religious backgrounds. Although our survey targeted a diverse set of respondents, we acknowledge that the language, technology mediums, and outreach protocols used afford a limited perspective. Email and social media are not as inclusive as we would like. However, the choice of using an online survey provided us with an opportunity to reach out to a larger audience with the opportunity to participate (share their stories and experiences) within their safe space. The taboo associated with menstruation, as also observed by us during interviews, could have limited our reach especially to the non-menstruating sex. English formed a suitable language choice as for more than 86 million people English is their second language, followed by 39 million people who use English as their third language [35]. Further, our intimate experience with the context shaped our anticipation of people being more comfortable and familiar with English vocabulary for sensitive bodily functions given the associated taboo (as validated later in our findings). Also, a recent study suggests that avid smartphone users in India “*frequently engage in English communication proactively and enthusiastically, despite their lack of English fluency*” [41]. Our primary target audience was India's middle class population, which is expected to form 41% of the national population by 2025 [15]. We are thus unlikely to learn about perspectives from participants who are less conversant in English, and/or less likely to go online.

Minors were not part of our study either. This was primarily because getting schools' permissions for including them was impossible due to the sensitive nature of the topic of menstruation; schools and parents are resistant to talking about menstruation and menstrual health in general, and were strongly opposed to our engagement with their students/children on these topics. Our best approximation for adolescents, thus, were young adults who had only recently experienced adolescence. We do believe that even in their mid-twenties, they would have a fairly accurate recollection of their introduction to MHE. Furthermore, we verified that school textbooks have not changed their treatment of MHE since 2007 [32].

We received a large number of varied responses immediately after we rolled out our survey. While on the one hand, participants reached out to support our efforts and ask us to share our analysis with them, others were surprised as to why we chose this topic, and some were baffled as to how technology could help. In many instances, people initially showed their willingness to participate but shied away once they were informed about the nature of the survey. This trend was

apparent also in the survey responses: we received 49 incomplete responses, of which 27% respondents left the demographic sections empty, and 41% of participants left the survey in the section where they were asked to share the experience of their first period (the demographic sections came at the end of the survey to minimally impact the participants’ performance [43, 69]).

Even in interviews and focus groups, when the first author, who is a woman, approached a couple for an interview, men always stood up and left the room to grant privacy to the women. When these men were explicitly asked to stay back, they would ask why their responses would be relevant. A few of them also expressed their discomfort in talking about the topic. Our attempts to connect with various reputed private schools were also in vain because most of them did not respond to our emails. Despite the above challenges we encountered in conducting our research at every step, we did end up with a rich—albeit slightly biased—collection of data. We next present our analysis of this data.

4 FINDINGS

We organize our findings into three sections below. First, we discuss existing means of introduction or how MHE currently reaches adolescents, focusing on the *delivery*. We then unpack the challenges that impact *receptivity* to MHE, such as causes for social stigma. Our last section lays out the suggestions that emerged in our data, as participants keenly expressed approaches that could be used in *response*.

4.1 Current Means of Introduction and Challenges

The findings from our mixed-methods inquiry demonstrate that adolescents encounter information as well as myths about menstruation and menstrual health in various contexts and through various initiatives. Below, we describe how this information is delivered by schools, at home, through peers, and on account of government initiatives.

4.1.1 Classrooms. The Central Board of Secondary Education (CBSE) decides the curriculum to be used by a majority of schools in Delhi, including all the schools represented in our study. Our analysis of CBSE textbooks revealed that the topic of menstruation is introduced in the eighth grade (to 13 year olds) in a chapter titled “*Reaching the Age of Adolescence*” that attempts to explain bodily changes that occur during adolescence. In this chapter, the menstruation process is described—from menarche to menopause—in one paragraph of 241 words. Topics such as personal hygiene, myths, taboos, and adolescent pregnancy are covered in 2–3 lines without any detail. The book uses increase in height during adolescence as the main example to highlight the bodily changes that occur during puberty. In fact, the word “*menstruation*” occurs 8 times through the chapter, while the word “*height*” occurs 24 times. In 10th grade, when students are typically 15 years old, the topic is revisited in a chapter titled “*How do Organisms Reproduce?*” This chapter explains the physiology of menstruation in 97 words, excluding any information on its management and hygiene aspects. Both chapters present diagrams of the male and female reproductive system. No visual representations of menstruation are offered.

Despite the above coverage of menstruation in the curriculum, approximately 46% of our survey participants mentioned that they were not taught about it. This finding aligned with our interviews, in which multiple participants mentioned that these chapters were skipped altogether. According to one male interview respondent (IM9):

Usually in our education system this chapter (reproduction) is actually usually dodged out. Teachers used to say you have to read it yourself and prepare it by yourself. They tell you in abstract manner. This chapter was not discussed, not fluently, not even clearly.

This appeared to be the case with teachers across genders; female teachers were not necessarily more comfortable, we were told: *“she kind of skipped it, she was not comfortable. She taught it for only 10-15 mins and then skipped it”* (IM6). In addition, even though this syllabus was meant to be imparted across genders, only 19% of our survey participants from co-educational institutions mentioned that it was covered in a common classroom session. Interview and survey findings both indicated that the behavior of boys was “giggly” or “weird,” while the girls “felt shy” in asking questions. As a female interview participant (IW8) mentioned, *“Girls were listening, and as usual boys, I don’t know, there was kind of making fun of or they were enjoying...I was feeling little shy even after having a query I did not ask them to my teacher”* (sic). This “non-serious” behavior from the non-menstruating sex is frequently the reason why separate sessions are organized for boys and girls, or why the lesson is skipped entirely. As a male interview participant (IM2) shared, *“I got to know that in the class adjacent to us the chapter was skipped completely because the boys were just making too much fun.”* We note, however, that the feeling of shyness persists among girls even in girls-only sessions. While sharing her experience of conducting girls-only sessions, a health worker (IH2) said, *“They do not ask questions openly, girls feel shy because of the topic being discussed. We are not able to discuss in depth as girls feel shy.”*

Beyond the sensitivity of the topic, the language and the vocabulary used can also pose a problem. Sharing their experience, teachers mentioned that Hindi words used for the given subject sounded “embarrassing,” leaving them no choice but to use English words in Hindi sentences:

And especially one problem which I have seen is the language issue. In Hindi, even NCERT books have used such terminology which people are not comfortable with. . . half of the time the moment we utter those words the class goes somewhere else (IT3).

In sum, not only are the educational materials not adequate for imparting MHE to adolescent students, it is challenging for teachers to overcome the stigma around such conversations in the classroom. Female students continue to feel shy, while the male students’ display of “non-serious” behavior makes others uneasy. Navigating between Hindi and English is also a challenge; communication is hard in both.

4.1.2 Workshops. Various Non-Governmental Organizations (NGOs) (e.g., Naz Foundation [76] and Sacchi Saheli [63]) and companies producing menstrual products (e.g., Whisper) regularly conduct workshops at schools. However, these are organized in *ad hoc* fashion and their format varies from one context to another, depending on the location of the school, among other factors. Even when these workshops are conducted, they are typically only for girls, as our interviews and survey conveyed. More than 50% participants of those who mentioned that they were taught about menstrual health said that it was through a workshop organized for girls only, 13% mentioned that separate sessions were organized for girls and boys, and only 5% stated that the session was open to everyone. Interviews with teachers also reflected this pattern. For example, IT1 shared: *“When Whisper visits the campus, we call girls and their parents also. So the session is conducted together for both parents and students in a common hall. No we don’t call fathers, we only call the mothers.”* Most such workshop initiatives are limited to urban areas, while the government initiatives—through health workers—focus on reaching rural areas. The gender divide is even more prominent in rural areas; almost all health workers we interviewed indicated that they address only girls during their monthly meetings and school visits, *“We visit anganwari for meetings, we only teach girls, and we do not give any information to boys”* (IH7).

4.1.3 Government Initiatives. Outside of the formal education system, the state has launched two outreach schemes for adolescents: Kishori Shakti Yojana (KSY) [58] and SAATHIYA [18],

which we described in our Related Work section above. As we learned, however, there are challenges in delivering such content. The KSY scheme primarily targets girls only government schools, which are typically attended by those from less-privileged backgrounds. A good number of these are in rural/semi-urban areas, where frontline health workers are the main vehicles of delivery. Currently, India employs more than 950,000 frontline health workers, who are involved in a variety of public health schemes across India [54]. These workers are already considered over-burdened and under-trained [8, 24, 47]. Irregular training results in poor counseling/communication skills as well as limited mastery over the content they are expected to deliver. This inadequate training is a well-recognized problem and several solutions have been suggested by the research community to address this (e.g., [81]). In our interactions with health workers, they mentioned that while they are told about the task in detail—to discuss adolescent changes—they are not given any additional support or training on how to deliver this information. Moreover, no other teaching aids are made available to them apart from the content:

We had this scheme for adolescents where one girl and one boy was selected and they received training from the doctors. Then they were asked to sit with their peer maybe at home or any place comfortable and spread awareness among them. But they did not do it after coming back to home as they felt shy. Girls did conduct sessions but boys did not pursue it. (IH8)

The SAATHIYA app proposed by Indian government [18] has its own challenges. It is currently only available for the Android platform and the content is only in Hindi, which excludes non-Hindi speaking populations, approximately 60% of all Indians [55]. We observed that people prefer to use English words for sensitive body parts and menstruation to avoid embarrassment, which might affect the adoption of the application.

At a higher level, we found that three different ministries—Human Resource Development, Health and Family Welfare, Woman and Child—are involved in creating content for MHE. However, there is little evidence of collaboration among them.

4.1.4 Family. We reached out to parents to understand their approaches to explaining menstrual health and hygiene to their male and female offspring. A majority of fathers (4/6 survey responses) on being asked whether they would explain (or have explained) menstruation to their daughters, answered that it was their wife’s responsibility. Our survey results showed that for 131 (55.98%) female respondents, their mothers/sisters were the primary sources of MHE, out of which 71 (54.19%) were informed before menarche, whereas 60 (45.80%) received information only upon experiencing their first period. Fathers/brothers were the source of information for only 2% of male and female respondents, making them the least popular choice. The following quote by a father reflects the unspoken rule practiced by a large number of Indian families: *“It is a mother’s job to educate her daughter about this topic.”* (SM43)

Our survey results highlighted that mothers rarely used aids such as books or videos; they relied on open conversations and verbal explanations when giving information about menstruation, its management, and related hygiene practices. This mode of oral transfer also ensures that the knowledge passed on to adolescents is what their mothers experienced, which may not necessarily be the most up to date scientific knowledge. This transfer of knowledge also explains the transfer of taboos from one generation to another.

When it came to informing sons, most parents used the shield of culture and ubiquitous access to information to defend the lack of initiative on their part. As one mother mentioned in an interview:

So even till now India's culture is not that advanced where we take initiative and talk about such topics openly... we have internet, and kids themselves explore it, there is no eager need to talk about these things (sic). (IPF2)

The popular primary sources of information for our male respondents were male friends (23.85%), books (18.35%), teachers (13.76%), TV commercials (9.17%), and the internet (7.34%). Unlike their female counterparts, they found their sources of information outside their homes. Here, we observed a shift in attitudes across generations. Only 5 of 109 (4.5%) male respondents mentioned mothers as their primary/first sources of information for themselves, indicative of attitudes and practices from the time when they were adolescents. However, 42 of 77 (55%) mothers (31–56 years old) have either already discussed or were willing to discuss MHE with their sons. This data highlights the transition that Indian society is undergoing, where younger mothers are willing to take the first step in imparting MHE to their male and female offspring. There were also a number of parents who were unwilling to initiate discussion with their child of the opposite sex, but were willing to answer questions when approached. For example, one of the fathers we interviewed expressed, *“No, I have not taken any sort of such initiative... with time the thinking is changing so if my daughter approaches me then yes I would talk to her”* (IPF4). In sum, although certain parents may be more forthcoming than others, when it comes to imparting MHE to their children (sons or daughters), there was an overall willingness to assist in the process. This indicates potential that health interventions might explore, by involving parents in the process of MHE while also respecting their boundaries for comfort.

4.1.5 Peers and Media.

India is still a very conservative society, people do not really talk about it especially your family or parents are never going to talk about it especially to guys, but with friends, with the internet and some older friends you get to know about it. (IM2)

In a situation where menstruation is barely talked about and if so, only in hushed voices, it is the peers and the media who present the role of confidant for curious adolescents. Our male participants indicated a reliance on friends and media for their knowledge, making them vulnerable to half-baked information (see Figure 1). One male interviewee reflected on the potential impact a peer can have in such situations:

But peers will give you knowledge when they have knowledge. They can play role on both the sides, if they have half knowledge they can corrupt your knowledge...and the source also matters. For example, if my peer tells me to go and Google it, at Google only I can show you 10 references which are in favor of it and then references which are against it. So what is the credibility? (IM10)

We observed that females felt more or equally comfortable in discussing menstruation with their female friends as with their mothers/sisters/daughters. Also, for 48 (21%) female respondents, their female friends were their primary source of information: *“I was told about this by my friends only... schools were not imparting this knowledge, neither the parents were telling”* (IW9). While more females felt comfortable in discussing menstruation with their male friends, the reverse was not necessarily true. In our survey, 103 (44%) female participants mentioned being comfortable with friends across genders. However, only 36 (33%) males mentioned a female friend among their information sources. As a male interview participant shared, *“Maybe I will wait for her (my girlfriend) to talk about it with me... what would she think of me if I talk about it?”* (IM6)

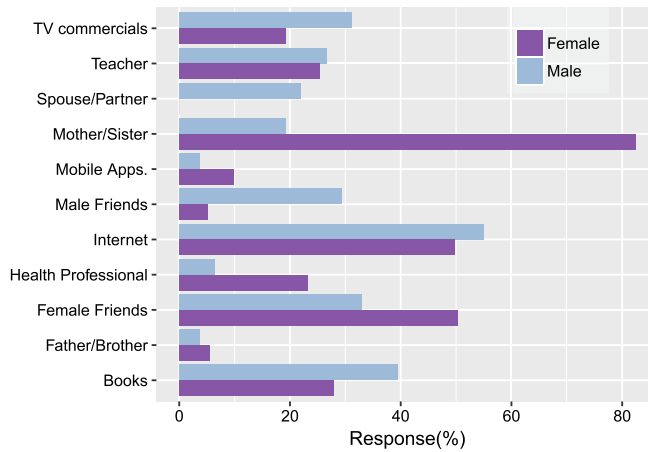


Fig. 1. Survey data: Prevalent sources of information across the genders. It can be seen that males are dependent on media (internet & books) and peers for the information, whereas female show primary reliance on their mothers followed by peers and Internet.

4.2 Stigma Prevents Communication, Provokes Guesswork

We went to competition and the judge who was actually female gave comment, why do you hit such sensitive topic [menstrual health] that too in a street play which is a public thing, this is not something to discuss in public. (IM11)

As the above quote from a male interviewee indicates, menstruation and related topics are considered “sensitive” and the stigma surrounding them prevents information from being shared and understood. A large percentage of female respondents (100/233) mentioned that they use secret words to refer to menstruation: “I keep my volume down while talking about my periods. May be that’s why periods are also called being ‘down’ :P” (SW4). Some of the common terms that females use are “down,” “aunty,” “chums,” “that time of the month,” “date,” and more. Male respondents indicated that they, too, were more familiar with these terms than with scientific nomenclature: “I first got to know it by the name of periods only. I didn’t know the word menstruation at all...I knew it by periods because of these ads from whisper and other sanitary napkins.” (IM2)

Approximately one-third of our female respondents shared that, within their families, they were not told about menstruation until menarche. This was also reflected in the survey where (61%) female respondents conveyed that confusion was the dominant emotion they experienced, as compared to those who had prior knowledge (19%). Survey responses by approximately 32% female respondents also revealed how misinformed they were when they had their first period:

I was in a school... Wearing a white colour uniform...so I thought it must stick smthng on my skirt from my bench...like sm red colour chatani (sauce) or poster color. (sic) (SW150)

I thought I was sick from some big terminal disease! (SW91)

The thought was Am I pregnant and a baby had died inside me that is why i m bleeding... That was too scary...?? (sic) (SW208)

The stigma associated with menstruation has more serious consequences when it comes to school settings. In schools, where the mandate is to teach all students, regardless of gender, the stigma

often leads to gender segregation and delivering content primarily to female adolescents: *“the teacher asked all the guys to move out because she wanted to discuss something with the girls”* (IW9). The teachers also told us how they tended to avoid the discussion depending on the class’ response: *“So we generally decide to skip over that information and try to make it more scientific or leave it all together depending upon whomsoever and how much people are comfortable”* (IT3). In rural areas where this stigma is typically more prevalent, the health workers expressed stronger emotions: *“When we conduct meetings in school, there we invite girls studying in class 8-10. It’s girls only session. We cannot teach this topic to girls in front of boys.”* (IH9)

Discussion of menstruation with young kids is also considered taboo. It is introduced to students in eighth grade, although 57% of our participants indicated that they had hit menarche before eighth grade. Naturally, this is problematic, because a sizable percentage of female adolescents are uninformed when they hit menarche: *“I think generally girls start their periods with in 6th class, I got my period when I was in 7th class, so if I would knew about it before hand then the first one and a half day which were torturous for me as I felt that I am having some kind of severe problem could have been avoided”* (IW6). This was also evident in our survey responses as 34% of our female respondents had no prior knowledge about menstruation when they had their first period, which led them to a state of “confusion” (61%), “fear” (43%), “shock” (27%), “stress” (24%), and “sadness” (18%).

Though many of our respondents recognized that they were ill-informed, they were also in a state of acceptance around how things were. Cultural practices were acknowledged (e.g., females are not supposed to enter the kitchen or go to the temple), but not fully understood. Participants also did not express curiosity about these issues. The limited exposure that is received does not sufficiently explain the various facets of menstrual health. For example, only 34% females were familiar with all available menstrual hygiene products, such as disposable/reusable pads, tampons, and menstrual cups. Prior research on menstrual health tracking behavior also cautions that its findings may not extend to audiences outside of the US [25]. Indeed, we find that there are differences in how our participants tracked menstrual health; only 30% track their periods regularly—using mobile apps or paper—while others either rely on their memory or do not track.

Female participants described the activities they tended to avoid during their periods. Some activities that involved physical strain were avoided solely to reduce the pain felt due to the period, while other activities, like avoiding certain foods as well as places of worship, were imposed on them by others. Some respondents appeared to have adopted cultural restrictions without thinking, since that is all they had ever known. When males were asked if they were aware of these restrictions on female’s mobilities, a large number of our male respondents replied in the negative.

4.3 Proposed Mechanisms for Introduction: Stakeholders’ Perspective

Our diverse participants had recommendations to offer with regards to how MHE could and should be imparted. We summarize the responses we received to the questions regarding who must be informed, by whom, when, and how.

4.3.1 Who Must be Informed? We gathered multiple inputs, particularly from parents, on how information should be imparted to adolescents. Almost all respondents agreed that it was crucial to provide MHE to all genders. While some voiced a clear preference for the menstruating individuals to receive this education, others felt that the information given to the menstruating and non-menstruating individuals should differ, with explicit focus on menstrual hygiene and management for adolescent females, and an additional focus on sensitizing adolescent males. In the focus group, we conducted with social workers, everyone concurred: *“there should be an addition like gender sensitization should be a part for males [sic]”* (IN4). Participants considered it valuable

for males to understand menstruation and its associated effects on females. Approximately 65% of male respondents, including fathers, agreed to the importance of awareness among males about the topic:

surprising how our society has evolved and something natural has been kept so much hidden from half the population... [a lot of] men until their marriage do not know about it, which is really sad. So I think this education is really essential and awareness is essential (IM11).

we live in a co-ed society, men and women are dependent on each other. So if half the population of the planet doesn’t know about the major part of the other half then it is kind of ignorant, I mean how would it work? Like, if men don’t even understand what their other half go through every month of their life, half their life, so that won’t work. I think men should have proper knowledge about this topic (IM7).

Our data shows that majority of our female respondents (90%), including mothers, felt strongly about the importance for men to understand issues around menstruation and menstrual health. This was also reflected in a quote by a female interviewee:

Actually I was in school and around in class 9th I had my first period. So I got a stain on my school uniform... I observed few boys laughing and making fun of that thing. So that was very embarrassing for me. I believe that if they would have been well educated about this, then they would have not reacted in this way.

A recurring sentiment regarding familiarizing sons with the subject was to sensitize them to the experience that their mothers, sisters, and wives go through.

4.3.2 Who Should Inform? Our survey results showed that mothers considered themselves the most appropriate and fathers/brothers as the most inappropriate to introduce and teach the concept of menstruation to female adolescents. One of the fathers expressed, “*We discuss, I and my wife discuss about it (explaining menstruation)... she is of the view that she should talk about this to our daughter*” (IPF3). On being asked about the most appropriate educator for male adolescents, the majority of men, including fathers, preferred health professionals (67%), followed by teachers (50%), and then mothers (27%). Female participants voted mothers (70%) to be the most appropriate person to introduce the phenomenon to adolescent females, followed by health professionals (46%), and teachers (38%). This conveys the preferred approach of preparing prepubescent females to face puberty where a mother serves as the primary source of MHE, followed by the more formal education system. It also conveys the minimalistic role that fathers are expected to play.

4.3.3 When Should They be Informed? The average age for females to experience menarche is 15–16 years in rural India, while females in urban India experience it as early as 8 years of age [56]. However, the CBSE syllabus covers the topic of menstruation in eighth grade for the first time, when most students are 13 years old. In our survey, 188 (81%) female respondents had experienced menarche by the time they were taught about it in school. The teachers in the focus group also acknowledged the existing gap by agreeing with IT15 when she said, “*In today’s scenario, where kids hit puberty at an early age, by class 8 they are already aware about it but in class 5-6, there is no awareness so it is important to inform them at that time.*” Almost all female respondents concurred that it was important to impart MHE to adolescent females before menarche, while male respondents voted sixth–eighth grade (51%) and ninth–tenth grade (30%) as the top two age groups for educating adolescent males.

4.3.4 How Should They be Informed? More than half of our female and male respondents (56% female and 61% male) believed that MHE should be included in the syllabus in a common classroom session. A female interview participant (IW11) said, “*current syllabus that is there, it does not have anything about MHE, it only has the content about the science about it.*” It should be noted here that, although they agreed on missing or limited aspects of the current syllabus, both parents and other adults preferred that MHE be a part of the students’ routine education: “*it would be better if it’s in the syllabus only... they (students) already know it but by doing so they will accept it more willingly, that too at early age, if it would be a part of their syllabus*” (IW6). This indicates their preference for a more systematic approach over the current approach of organizing workshops or special sessions, which are independent initiatives by schools.

As discussed above, gender affects classroom pedagogy during the teaching of sensitive topics. For a majority of male participants, the instructor’s gender did not make a difference. However, while sharing their experiences, teachers acknowledged that female students felt more comfortable in females-only sessions that were conducted by female instructors: “*So they were in fact quite inquisitive and since there were the select groups only girls and only boys so they were more free compared to what I have seen in my classes... usually it is the boys who are more inquisitive—they come up with a lot of questions and girls are usually quieter. But in those sessions, even girls could come up with certain questions*” (IT3).

5 DISCUSSION

Having understood current approaches and attitudes to both imparting and receiving MHE in India, we now turn to sociotechnical implications for designing interventions that target improved MHE. Recent HCI research has affirmed that technology has particular affordances that make it suitable for communicating and teaching sensitive topics [33, 67]. To propose implications for technology design, we engage deeply with our findings and Bardzell’s feminist HCI framework to use its qualities as guidelines in the process [13].

5.1 Fostering Participation

The information on menstrual health which forms a part of the school curriculum is readily available and widely accessible. But, the school curricula are typically designed using a top-down, one-size-fits-all approach, not necessarily involving the participation of different kinds of teachers in curriculum design. We also note that—in their extended learning section—the school texts provide links to health websites from other countries, which can be quite distant from the cultural contexts of Indian adolescents.

In addition to school curricula, several governmental and non-governmental initiatives have designed materials for imparting MHE. As our content analysis demonstrated, however, these materials are frequently limited, and both teachers and students (across genders) find themselves at a loss for comfort when they engage with them. The feminist HCI framework helps us consider how we might foster *participation* [13] in the design of MHE initiatives, so that “users” (learners and educators) are more at ease and willing to engage. This requires a multi-faceted approach where we can consider the crafting of the message (for the learners), as well as the choice of the medium (for the educators to adopt). Not only is it crucial for the *learners* to feel comfortable receiving MHE, but it is also important for *educators* (who could be parents, teachers, or near-peers) to be willing and comfortable to engage in imparting MHE. Also, technology-based MHE must factor in whether the (software and hardware) medium, too, would be easy and comfortable to use for both learners and educators.

5.2 Engaging Stakeholders

If MHE is to be encountered in different learning contexts (schools, homes, workshops, etc.)—as our participants conveyed an explicit need for—then the participatory methods adopted must aim to engage learners and educators as stakeholders from each of these contexts, keeping in mind the different kinds of information they must give and receive. Additionally, there are no directives or tools available for educators at home (parents or older siblings) to use. Although several mainstream practitioners (e.g., [29, 50, 71]) have produced relevant content, efforts to distribute this content are neither well organized nor well understood. The feminist HCI principle of participation [13] encourages user involvement in the design process. We additionally stress the importance of expanding this set of users to include an *ecology* [13] of diverse stakeholders and designing materials with their involvement. The principle of ecology focuses on identifying and creating awareness about all stakeholders—who they are, how they interact with each other, and the systems/artifacts they engage with—during the process of technology design. Different stakeholders bring different perspectives, but as our findings aimed to highlight, each of these perspectives is critical to understand, address, and get on board, if we are to prevent communication around the subject from being strained. This is also in line with the suggestion provided by Eccles et al. [23] that parents and teachers can play a critical role to support healthy adolescent development if they “*work together.*”

We observed, among our participants, the persistent notion that MHE was a topic for women and was best delivered *by them and to them*: “*Its a girl’s thing and should be only told to them. This should not be revealed to others (men) in our case.*” (SW43). We observed the sentiment to be prevalent also in formal education settings (both classroom and workshops), where instructors preferred to conduct females-only sessions even when the curriculum was intended for all genders. On one hand, these sessions can create safe learning spaces for adolescent females and shield them from the embarrassment they might feel (and frequently do, as we found) in the presence of adolescent males. On the other hand, however, such a model of learning falls short of taking an ecological approach. It perpetuates the isolation of the non-menstruating individuals from educational discourses on menstrual health. Non-menstruating individuals may not be the target population for MHE, but they are invariably connected, and often intimately, to individuals who do menstruate. Not involving them in MHE initiatives can inhibit communication and interaction on menstruation and perpetuate taboos, also worsening marginalization on account of such taboos.

Additionally, different ministries operating under the government of India (e.g., Human Resource Development, Health and Family Welfare, Women and Child Development) as well as various NGOs [50, 63, 71, 79] have launched a number of initiatives to address the lack of awareness on menstruation and related practices. However, there is little evidence of collaboration across these organizations and their initiatives. In the interest of achieving ecological balance from a feminist HCI perspective, there is a need to bring these initiatives into alignment, so that different stakeholders working toward synergistic goals might join forces in solidarity to address the needs for MHE [13].

5.3 Embracing a Range of Attitudes

Due to widespread lack of awareness and open communication on the topic, there exists no single, explicit understanding on how MHE might be best imparted and what details must be given about it at what ages/stages. This requires the use of participatory methods with different stakeholders (and different stakes) in the ecology, as discussed above. An additional consideration needs to be the focus of MHE; while school curricula attend mostly to physiological details, we found the focus at home to be on behaviors that must be practiced during menstruation. Bardzell’s feminist

HCI quality of *pluralism* [13] negates the idea of a universal solution and focuses on inclusivity of diverse voices and needs of various stakeholders when designing potential solutions. As designers aligned with feminist HCI principles, it is critical that we advance toward a balanced, pluralistic solution to enhance interactions around MHE, and embrace participation with diverse perspectives in terms of gender, relationships, comfort levels, cultural values, and religion. This is especially true for spaces that are as culturally loaded as MHE is, as indicated by our data.

Much of the data we collected pointed us to different myths associated with menstruation, and the stigma female participants have experienced at different stages of their lives, right from hitting menarche to bringing up informed sons and daughters. For example, we observed that in certain Indian contexts, women are not supposed to enter the kitchen or a place of worship during their menses. In general, we found that there were many restrictive social and cultural norms shaping behaviors during menstruation, depending on how conservative the family was. These attitudes were wide-ranging and occasionally even conflicting. For example, a few states of India celebrate menarche [14, 64], as it symbolizes that a girl has reached marriageable age. Also, there exists a section of society who associate “*menstruation as a period of rest*” [14]. However, several participants explicitly asserted that menstruation was not “*something great to talk about*” or “*celebrated.*” Initiatives designed to impart MHE must first garner awareness about these wide-ranging myths, and consider how far design might be equipped to address them. There is also naturally a tension around which religious or cultural views to embrace, and which ones to reject. If a family feels strongly in favor of limiting women’s mobilities during their menstrual cycles, for instance, then designing educational materials that reject this stance may not be the most prudent or effective approach. At the same time, it is also important to foster awareness across different levels of openness. To design for incorporating the quality of pluralism [13], we must recognize the different kinds of differences across users.

5.4 Promoting Safe Spaces

Practices that are passed on need to be engaged with critically and questioned, and this questioning could be encouraged through effective, targeted design. This is where the quality of *advocacy* can play a critical role [13]. Advocacy is only possible, however, when safe spaces can be designed and developed (with or without technology) for open communication to take place between those present. Here, the designers’ opinions might be quite different from predominant views in society among various stakeholders around MHE. However, even among these stakeholders there are many different views regarding the level of political emancipation that must take place (e.g., as observed, all female participants strongly advocated for the inclusion of males in the discourses of MHE but at the same time acknowledged the need for difference in the depth of the topic and the age to deliver MHE). These need to be communicated through open dialog, for which safe spaces must be created.

Our findings indicate that open peer-to-peer communication on the subject of menstruation does take place intra-group, or within the menstruating/non-menstruating groups. However, there is lack of inter-group peer-to-peer interaction on the subject. To the best of our knowledge, all existing technology-based initiatives [37, 50, 62] are designed for a common user base—the menstruating individuals (particularly adolescent females). Our data conveys that while (young and old) women do need a particular kind of education so they are better equipped to deal with their experience, those who do not menstruate also need to be engaged. There is a need for approaches that aim to deliver content in a manner that not only imparts conceptual information but also improves gender sensitization around the issue, across genders. The challenge here is to find a balance in advocacy such that MHE adoption is not impacted. To design for advocacy, we propose that existing approaches—such as the comics introduced by UNICEF in Indonesia [49], or aforementioned

games that are designed to counter misconceptions and create awareness among menstruating individuals, be extended to devise pathways for non-menstruating individuals to participate and be able to learn about menstruation and related topics.

5.5 Enabling Self-Disclosure

We now touch upon the quality of *self-disclosure* [13]. A significant challenge that surfaced repeatedly was that the delivery of existing MHE curricula took place at certain points in adolescents’ lives, taking into consideration their ages, but not where their individual physical and personal growth stood. An adolescent learner of MHE has either experienced menarche, will experience it in the future, or will never experience it. As discussed in prior sections, the content providers (schools, teachers, and mothers) are responsible for deciding *when, what, and how* to introduce the subject *to whom*. Our data demonstrates that the decision is either influenced by an event (onset of menarche) or psychological development (age or puberty, e.g., class 8th), irrespective of life experiences of adolescents that might shape their attitude toward the subject [26]. The adolescents themselves, regardless of gender, may not be ready to engage with MHE materials. On the flip side, the education might come too little, too late. Ideally, we need an adaptive learning environment to respond differently to the aforementioned cases by considering the user’s behavioral experiences, including their thoughts, emotions, and values. The solution should not typecast the user, rather users should be given an opportunity to define themselves for the solution. As a result, we suggest designers incorporate customizability in their approaches to make them a comfortable and inclusive experience that is adaptive to users’ identities.

Technology design has the advantage of meeting users where they are at, and where they are coming from, also factoring in how much they are willing to learn at a given time [38, 59, 74]. This applies also to the educators (parents or teachers); some might be more comfortable engaging, some might be less. For designing a technology-based adaptive teaching tool, we need to understand (1) what needs to be adapted, and (2) what factors contribute to this adaptation. The age and the past and (potential) future experiences of menarche are fundamental factors influencing the adaptation. To answer the first question, designers may draw on the factors mentioned by Towle et al. [74], which include (1) interaction (one-to-one, one-to-many, or many-to-many), (2) role (user as a beginner or expert to facilitate support to and from different learners), (3) activity (customize the list of activities suitable for the user), and (4) environment (provision of different content, or the same content using different media). This opens up opportunities for design that works to provide support for one or multiple adaptive elements. For example, Menstrupedia [50] is a website designed to support the peer network through “Ask me” prompts, a blog to support one-to-many interaction, and a comic for imparting MHE to adolescents. Its design fails to consider, however, where the user is coming from to provide personalization as appropriate. By devising ways for both learners and educators to indicate their physical and psychological readiness could make a difference toward ensuring their receptivity to MHE materials.

5.6 Extending Engagement

Engaging with MHE materials in a curriculum is essential, our participants felt, but these materials mainly address cognitive awareness, rather than cultivating body-awareness among adolescents. As we observed, the curricula neither include any visualization of phases of menstrual cycle, nor talk about associated hygiene and management aspects. Further, when adolescents are introduced to the topic, they may or may not have hit menarche. These cases need to be dealt with differently, as they result in different body experiences and awareness. We found that many of the female participants were formally educated about menstruation/menstrual health post-menarche, which caused them to experience a complex set of emotions, ranging across confusion, shock, fear, stress,

and sadness. Such experiences may cause psychological trauma, impacting one's self-image or negatively impacting one's sense of identity and self-awareness. This sentiment was echoed by several participants, who claimed that they felt "ashamed" as though they had committed a crime. McPhearson et al. [48] found that females have a more negative body image if they have had a negative menarchial experience as compared to females with positive menarchial experiences: "*Yet it is possible that if a woman felt ashamed of her body at menarche, an event that marks a physical transition into womanhood, her shame and negative feelings about her body could remain years later*". Additionally, the content currently delivered in schools takes a simplistic and conservative view of gender, assuming gender binaries and that all women will experience menarche, which may not be the case.

We must, as designers with a feminist mindset, make efforts to ensure that MHE is delivered to adolescents in a way that respects their awareness and associations with their bodies, so they are able to experience adolescence in a physically and psychologically safe environment. Consideration of the quality of *embodiment* [13] is important so that these adolescents can learn to engage with and feel comfortable in and with their bodies, not just learn about them in theory.

6 CONCLUSION

We conducted an investigation of approaches currently used and stakeholders currently engaged to impart MHE to adolescents in India, where longstanding cultural taboos and inflexible social norms make it challenging to discuss sensitive topics. We gathered perspectives of (male and female) adults, parents, teachers, social workers, and health professionals for identifying design opportunities and potential for impact. Our findings from the content analysis of education and training materials in use—as well as survey, interview, and focus group data—indicated that although detailed and descriptive informational materials are available for use, there exist disconnects among stakeholders' expectations regarding who is responsible for introducing such topics to adolescents and how. Our analysis provided a deeper understanding of attitudes and approaches shaping the distribution of and receptivity to MHE. We also outlined socio-technical implications for design that aligned with the feminist HCI framework [13] to identify potentially effective approaches, drawing on our data as appropriate. Future work could examine how such approaches might be operationalized such that adolescents are able to engage with complete and acceptable content in learning environments and with learning content appropriately designed for them.

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