

MILLEE: SOCIAL DYNAMICS OF MOBILE PHONE USE BY CHILDREN IN RURAL INDIA

ABSTRACT

Providing access to English literacy is perceived to be a very effective means of socially and economically empowering the disadvantaged rural Indian population. While the Indian public education system has vastly improved over the decades, it still falls far short of providing quality education for children in rural India. Furthermore, many rural children are unable to attend school because of work obligations to their families. Mobile phones have tremendous penetration even in poor Indian villages and show great potential as a platform for education that is complementary to the school system. To make effective use of the cellphone as a vehicle to facilitate learning, in the case of working children it needs to happen outside the classroom. Learning applications need to be adapted for enabling spontaneous use by the children and support by their parents. It is important to identify appropriate times and places for learning, which mesh with children's routines. Designing such informal learning applications requires deeper understanding of the socio-economic and cultural forces at play in the children's environments. This paper summarizes the results of three rounds of field-work aimed at understanding, the socio-economic and cultural forces that influence cellphone use by children in rural villages of North India.

INTRODUCTION

26% of children in rural Indian government schools cannot read the English alphabet after a year of attending English classes [1]. There are two main reasons for this state of affairs. Firstly on any given day of the year approximately 25% of teachers in rural government schools are absent [1]. Secondly 43% of children in rural schools do not attend regularly because they need to either work as daily wage labor in the fields or take care of households while their parents work to make ends meet [1]. In such a context informal learning can play a very strong role in helping children in rural India to achieve social and economic upward mobility. Mobile penetration in India is very high at (approx.) 347 million cellphone connections and growing at an astounding eight million (approx.) new connections per month.¹

Studies by Kam et.al have shown that it is possible to teach English to children in rural India by giving them access to educational games on cellphones [11]. This yearlong study is an attempt to find ways of enhancing the efficacy of educational applications on cellphones that facilitate the access to education in informal settings, such as the fields or the children's home. In the course of this study three field trips have been made since summer 2008.

In the summer 2008 study, scenarios were identified for cellphone based learning by children in rural India. I also gained some rudimentary insights into the socio-economic and cultural forces at play that influence cellphone access and use by the children. The current qualitative study, conducted in spring 2009, was initiated with the objective of gaining a deeper understanding of the socio-economic and cultural forces at play, in a naturalistic setting. I sought to understand these forces in the larger context of regular cellphone use by children in rural India.

¹ The numbers are based on a report released by the Dept. of Telecommunications (DoT) in India. http://www.dot.gov.in/network/2008/networkstatus_Dec2008.pdf

This paper is an account of a qualitative study of cellphone use by eighteen children in the villages of Kanaar and Gulab Kheda, located in the state of Uttar Pradesh, India. It was conducted over three months, two field trips and numerous phone interviews with children in India. The main contributions of this paper are:

- (i) To capture the culture and politics of cellphone use by children in rural India
- (ii) To chart the social forces that influence cellphone access and use by these children in a naturalistic setting
- (iii) To gain a better understanding of learning and play practices of these children with regard to cellphone use

Beyond the implications for the design of the specific learning technology employed in this study, I believe the pen-portrait of everyday life of rural Indian families in general and the children in particular, captured through this study could be of value in designing other cellphone based technologies (e.g. pure games or social networking) for rural India.

RELATED WORK

HCI as it applies to the developing regions of the world has been studied extensively over the last decade. Some of the major areas that are being studied in the field of HCI for developing regions are healthcare [7, 12, 5], financial systems [16], text-free systems [13] and communication systems [19]. Similarly many attempts have been made to study HCI as it applies to education in the developing regions [17]. But the specific field of designing for game based learning upon mobile platforms is a relatively new phenomenon.

The use of mobile platforms has been previously studied in HCI in the following contexts- mobile learning for school going children [4], the role of cellphone enabled e-learning games in children's lives and how they might be inter-weaved into their daily lives [2, 10]. Mobile learning has also been examined in the context of specific regions of the world like Africa [3], China [15] and India [9, 10]. But there has not yet been an attempt to study the contextual forces surrounding mobile use and e-learning.

When designing for an audience of semiliterate children from rural regions conventional design methodologies fall short. Eliciting design ideas from children has traditionally been a very difficult challenge in HCI. In the past, a variety of techniques have been employed to facilitate children's participation in the design process with mixed results [6,8, 14]. This situation is further complicated by the influence of the local culture on children's learning practices and value systems surrounding mobile technologies.

Ramachandran et al. studied the socio-cultural factors relevant to the design process for communication and financial systems in the developing regions [18]. The current qualitative field-study is an attempt to do the same in the context of cellphone enabled out-of-school learning in rural India. To this end, in this study, I worked with children from rural India with diverse socio-economic backgrounds in an attempt to understand the social forces that influence cellphone adoption and use by them. Further I tried to examine the influence of these forces upon the learning and play practices of these children.

BACKGROUND

Mobile and Immersive Learning for Literacy in Emerging Economies (MILLEE) is a project whose vision is to design and develop cellphone based games to teach English to children in rural India. It started in 2004 and several iterations of prototype design and deployment have been

implemented over the last five years. In the spring of 2008, a three month long study was conducted by MILLEE team members. The aim of this study was to measure learning gains by children who played cellphone based learning games for two hours a day, three times a week, for three months. This study indicated that these children did indeed acquire new vocabulary and spelling skills [11]. This study confirmed the initial hypothesis that the learning from the English lessons administered by schools to children in rural India can be effectively complemented by giving them access to cellphone based English learning games.

For the past year, I have conducted a qualitative study for MILLEE; this study aims to inform the design of the cellphone based learning games and enhance the effectiveness of the learning technology. This yearlong study has been conducted over three field trips to India and in addition employed a variety of remote data gathering methods. The durations of the three field trips to India were a fortnight, a week and three weeks respectively.

The first field trip to India was in the summer of 2008. I interacted with over 45 children from 20 village households. The participants were familiar with cellphones, since most of their families owned at least one cellphone each. This study was an attempt to define promising scenarios in which children might play learning games on the cellphone. Another goal was to understand the socio-cultural forces that influence the learning practices of children living in this region. The study was divided into two phases with each phase being of one week's duration.

In the first phase participant observation was used to gain an understanding of the socio-economic forces that affected a child's learning practices in rural India. The aim was to observe the influence of the parents, peers, school and the community in general upon their learning practices. During the second phase of the study, cellphones were used as probes to understand the kind of games that children enjoyed playing on them.

Based upon the summer 2008 study, I arrived at potential scenarios for children in rural India to play cellphone based educational games. During this field trip, I gained some rudimentary insights regarding the influence of gender, caste and class upon cellphone usage practices. These glimpses into the rich socio-cultural context that influences and helps define cellphone access and usage practices in rural India led me to believe that further research was necessary to examine these forces in detail. Furthermore I wanted to study the usage patterns of cellphones in a naturalistic setting- to see how, when and where children use cellphones in the absence of monitoring by the researchers. In every study conducted till now, the children were invited to a specific location and given the phones to play with, in the researcher's presence, for a defined period of time over a defined frequency.

One of the objectives of the spring 2009 study was to examine whether and how the children would play these educational games when the researcher was not present, in a naturalistic setting. Some of the other questions that follow are: when and where the children played these cellphone games.

For the purpose of this project, my primary aim was to gain deeper insight into the culture and politics of cellphone use, the influence of gender and socio-economic status upon cellphone use, by children in rural India. In order to inform the learning game design meaningfully, I wished to examine the playing of cellphone based learning games by these children in the larger context of general cellphone use by them in a naturalistic setting.

The spring 2009 study took place at two villages viz., Kanaar and Gulab Kheda in a mango-growing district in the northern state of Uttar Pradesh in India. There were several reasons for choosing this particular community to work with. Firstly these two villages are located in one of the least developed states of India. Secondly MILLEE had an ongoing relationship with them, and this enabled me to gain entry into the community with very little difficulty. Thirdly I had a good estimation of the English and technology baselines for the children in these villages owing to their participation in the previous studies conducted by MILLEE, as also from my first field trip here. In addition, the children knew me and the other under-graduate students assisting me with data collection, from the previous summer's field study. This factor was very important in my considerations, because it is not easy to earn and keep the trust of young participants (children); I had already gained these children's trust, due to my previous association. All the above factors led me to choose the villages of Kanaar and Gulab Kheda as my field site.

Mango groves constitute 70-75% of the land in this district. The remaining 25-30% of this land is cultivated as farmland where crops like rice, pulses and wheat are grown. As such, life revolves around mango cultivation, to the extent that everything from the passage of time within the year to the schedule of the day is spoken of with reference to the work practices around mango farming. Traditionally, people from the upper castes own land while those from the lower castes do not. However, the government has recently given very small plots of land to some of the lower castes, although not to the lowest caste called the "untouchables." As such, the upper castes earn their livelihood on the land or by running small businesses, while the lower castes graze their goats, work as daily-wage laborers or perform menial jobs in the homes of the upper castes. Usually annual household incomes for land-owning and non-land-owning families do not exceed one lakh rupees (US\$2,000) and 50,000 rupees (US\$1,000) respectively.

METHODS

This section discusses the research methods used in the current study, conducted during the spring 2009. This three month long study was launched during my field trip for a week in January 2009 and ended with a three week field trip in March 2009. The goals of this study were informed by the insights gained in the summer 2008 study, regarding the socio-economic and cultural forces that influence cellphone access and use by children in rural India.

Thus the spring 2009 study was designed to examine these forces in greater detail and in a naturalistic setting. This study is aimed at examining whether and when these children play the cellphone based learning games under unsupervised and naturalistic conditions in the larger context of general cellphone use by these children.

Therefore the main goals of the ethnographic study in spring 2009 were:

- (i) To capture the culture and politics of cellphone access and use by children in rural India
- (ii) To understand the social forces that influence cellphone access and use by children in a naturalistic setting
- (iii) To examine the influence of these social forces upon learning and play practices of these children on the mobile platform

All the previous studies had required the children to take a few hours out of their lives and visit the researchers at a given location in the village. The children played MILLEE's cellphone based learning games in the presence of the researchers who observed them for the duration of the session. At the end of these sessions the children returned to their everyday life routines.

The current study was conducted over a period of three months. Since I couldn't be on-site for the entire duration, I employed one set of methods for the duration that I was on-site and another set of methods for remote data gathering when I was away from the field site. I used participant observation and unstructured interviewing during my field trips. For remote data gathering I used phone interviews. In addition, weekly visits were made by the under-graduate research assistants, who assisted me in the study to observe the use of cellphones by the subjects in a naturalistic setting. In addition, I also collected participant generated data e.g. pictures and videos taken by the children, to gain deeper understanding of their natural context.

LAUNCH OF THE STUDY

The study was launched in a week long field trip in January 2009. During my field visits, I lived with a Brahmin (*high caste*) family responsible for conducting services in the village temple and well respected in the village. The family had also started the village school which was now funded by MILLEE's NGO partner, turning it into the best school in the district. Over the years this had led to friendships and acquaintances between them and many influential people in the region. All these factors brought my hosts great influence and social capital in the village.

Phones that were pre-loaded with educational games that teach English were given to eighteen children in the villages of Kanaar and Gulab Kheda. The families of the participating children were told that the phones could be used as the children pleased for a period of at least three months with a possible extension in the future. Since the children were very young I requested that the parents or guardians take responsibility for the safety of the phones. While some of the families could afford to buy phones like the ones given by the researcher, many of them could not afford it. Hence the phone was perceived to be an expensive piece of equipment, a source of unnecessary exposure to risk; especially since it did not belong to the families. Therefore the adults in the village were initially unwilling to let their children participate in the study. Then I requested my host to drop a few hints in the village unofficially that the families shall not be obligated to repay the price of the phone in case of theft or damage as long as a good faith attempt at safe keeping had been made. After this was done the adults became more willing to allow their children to participate in the study. But they still expressed concerns that the children would lose focus on their studies and become overly enamored with the games on the phones. I reassured the parents that they could allow or restrict a child's time with the phone as they saw fit and that I or the under-graduate research assistants would not interfere. They were informed that for the duration of the study they could treat the phone as something they had given the children and hence could do what they felt was appropriate with it.

The children of these villages mostly attended one of three schools in the region. Initially I tried talking to the principals of schools that were in session, in order to seek their help with recruiting children. I believed it would be easier to recruit participants with the support of the school teachers rather than doing it on my own because the school teachers had local standing and were trusted by both the parents as well as the children. The community would listen to them and heed their requests far more willingly. But the school principals were not very helpful due to internal politics amongst themselves.

Then I spoke to my host in the village and sought introductions to families with children in the fifth and sixth grades. Initially he was reluctant to help because he had had less than cordial relationships with some of the departed members in MILLEE in the recent past. Therefore I explained that I had come as an independent entity conducting a study for MILLEE and that I was

not really a part of MILLEE. The next day I spoke to his wife and explained matters; after some convincing by his wife and me, he finally agreed to help me recruit participants for the study.

In the meanwhile I and the under-graduate research assistants went from door to door in the two villages explaining details about the study and inquiring if any of the families had children that might be in the fifth or sixth grade who might be interested in participating. I also mentioned that upon completion of the study each participant i.e. each child who took part in the study would be given school stationery worth Rs 1000 as a token of gratitude from the research team. Initially there was a lot of reluctance from the parents and guardians of the children because participating in the study was perceived as a risky venture. This perception was caused by my request that the adults take responsibility for the phone given to the children.

Although after the first couple of families had agreed to let their children participate I was faced with a deluge of requests in the following twenty four hours. Then I devised a socially acceptable way of rejecting participants I was not interested in without causing undue tensions in the villages. I announced that a qualifying exam would be conducted which every potential participant (child) had to take. I said that I would accept the children who qualified in the exam. I had selected eighteen children who fit all my criteria prior to the exam. They also attended the exam along with the others. At the end of the exam it was announced that the eighteen participants – previously selected by me- had qualified. The remaining children were thanked, given biscuits for their trouble and sent home.

Then I visited the families of the participating children with the paperwork, phones and chargers. After informing them again of the all the details of the study and the uses that the data might be put to, the informed consent forms were signed. I saw that the people of the village perceived both the printed word and signatures to be very important and a serious matter based on their responses to the informed consent forms and other printed matter. Therefore in order to lend gravitas to the act of handing over the phones and to ensure that they took the study seriously I requested that parents of the participating children sign printed receipts for the phones.

PHONE INTERVIEWS

I was not in the field throughout the duration of the study; I was on-site for four of the twelve weeks. Therefore I used weekly phone interviews as a method for remote data gathering. To this end, I arranged for eighteen prepaid connections for the phones given to the children. Incoming calls are free in India and hence the participants did not have to pay anything to receive my weekly calls. But if they desired to make calls they had to put money into the phone connection.

The initial plan was to make hour-long phone calls to each participant every week and conduct a phone interview. During the week I was on-site to launch the study I saw that this wouldn't be feasible. The children got restless after sitting in a place or doing the same thing for more than fifteen minutes at a stretch. So the interview duration was reduced to thirty minutes.

This method did not work very well for two reasons. Firstly there was spotty network coverage; hence many a time the call wouldn't go through when I tried. Secondly there was frequent power outage in the village. Power came on very irregularly and oftentimes did not stay on for more than a couple of hours. The children either were not around to charge the phones when the power was on or drained the batteries very quickly by playing games on the phone, listening to songs on it, taking videos with it, etc...

The problem of spotty network coverage was solved by circulating a timetable for my calls among the children. Now they could bring the phone out into the open at the appointed hour on a given day and wait for my call. But there was no getting around the power outage problem. On an average I managed to reach 2-3 participants a week on their phones.

One participating family had an inverter and the boy's phone was usually charged. He offered to take his phone to some of the other participants' homes. This way I reached more than one participant with a single successful phone call. But I did not ask him to do this regularly, because he waited till I finished speaking to the other participants when he took the phone there. This practice was making his family unhappy. They were afraid that their child's study time would get affected and that he would lose focus on his studies.

WEEKLY VISITS

In addition to the phone interviews the children were visited, twice a week by under-graduate research assistants, who helped me in this study. During the first visit of the week the research assistants uploaded new games or new levels for old games onto the phones. In order to do this, they requested that all the children bring their phones to the private school in the village during after school hours. It took anywhere between an hour and a half to two hours for the process to be done. This allowed the participants to meet each other on a weekly basis outside of their normal social setting. Most of the boys stayed until the under-graduate research assistants were in the village, while girls usually left before dark.

The second visit in the week was to observe the children use 'their' phones in their natural setting and make videos of the children playing games on the phone- if they were playing. They also spoke to the parents of the participants during these visits and addressed any queries or concerns they had.

PARTICIPANT GENERATED DATA

Pictures and videos taken by the participants were downloaded from their phones- the phones given to them. The pictures and the videos I hoped would give a glimpse into the world of these children and what they did in our absence. Songs and pictures that they had downloaded from other phones or the network provider were also recorded.

Phone customizations such as ring tone changes, wall paper settings, display name changes etc... were noted. These were recorded because I believed that the extent and complexity of these phone customizations was an indicator of the phone user's comfort level with that technology. The nature of customizations also indicated who the real owner of the phone was in the family.

PARTICIPANT OBSERVATION

During my three week field trip in March 2008, I arranged for me to be invited to some of the participants' homes. I spent twenty four hours with each participant family that had invited me. This allowed me to watch one full cycle of a daily schedule for the participating children. I stayed with six such families over a week and spent the final day at the home of my host in the village. When I was not staying with the participating families I visited the three schools that the participating children attended and participated in a class in one of the schools. During my stay with the families I observed the children from the time they woke up till they went to bed. I accompanied the participants when they went to school and when they went outdoors to play or work. I tried to live and experience life for the duration of my stay there, like the children did as far as possible. I shared in the family meals and occasionally helped in the kitchen or fetched and

carried things for the “men” of the household. These men could sometimes be as young as nine years of age. After living with six of the families, I visited the rest of the participating families for half a day each and had at least one meal with each of them.

I consciously allowed the children to take liberties with my things in an effort to build greater bonds with them. E.g. the children would sneak away my camera and phone from me. They played with them until the battery ran out. The children in the households I lived with were quite taken with the touch screen on my computer and asked to use it. I let them use it under my supervision. I answered personal questions –topics ranging from my studies to marriage- as far as possible with the adults in order to build bonds with them.

UNSTRUCTURED INTERVIEWS

When the children had left for school I interviewed the members of the household- mostly women. These were unstructured and informal interviews. In the field trip during the summer of 2008 I saw that formal interviews tended to intimidate the subjects, even if they were adults. Hence these interviews were couched as “visits” to pay my respects to the various elders in the families. In the households where I lived with the participating families these sessions usually happened after the children had gone to school. I mostly spoke to women during the day because they were the only people at home then. Also they seemed almost exclusively responsible for the daily lives and schedules of the children. The father provided for the family but did not get involved in the actual upbringing of the children except as a disciplining authority.

I spoke to everyone that might influence the children’s lives- their parents, siblings, relatives, teachers and friends. I also spoke to the children themselves. If I focused my attention upon one child for more than five minutes at a time, she felt flustered and uncomfortable. Hence the conversations were intermittent in nature with long breaks in between questions when the children were either playing or working. Usually I spoke to the children when they had their parents or friends along with them. In these situations I rotated my questions between people so no one felt persecuted or put upon the spot.

PARTICIPANTS

SELECTION CRITERIA

Minimum technology and English baselines were stipulated for the participants of the study. The technology baseline required that the participants be able to use cellphones and play games on them without requiring any significant training or assistance. The English baseline requirement stipulated that participants had to know the English alphabet and be able to build basic words out of them. A third requirement I looked for among the qualifying participants was the ability to communicate to the researchers and give interesting feedback on how they lived their lives and what they did with the phones. I required that every participant either have or be able to build a basic comfort and trust level with me and the under-graduate students on the team. Finally I did purposeful sampling. That is I chose the participants for variety of gender, caste, socio-economic status and sibling combinations in the household. I looked for households where the girl might qualify for the study while the boy did not or vice versa. I also looked for households where both siblings are of the same gender and both could qualify. Such choices were made with an aim to providing opportunities for sharing among siblings. I wanted to examine how the norms regarding sharing were negotiated between the various combinations of siblings like brother-sister, sister-sister and brother-brother pairs. Another issue of interest was the role that the age of the siblings might play in negotiating these norms around sharing.

RATIONALE FOR TWENTY PARTICIPANTS

I decided that twenty participants would be an ideal strength for the study and aimed to recruit as many. Eventually I managed to recruit only eighteen participants. The number of participants for the study was arrived at by attempting to balance the need to ensure the undisturbed continuance of the study in the face of drop outs against the practicality of interviewing each participant every week over a three month period. A strength of twenty participants was considered ideal because it would ensure that the study did not suffer greatly even if a couple of the participants decided to drop out during the course of the study, while keeping the number of weekly phone interviews feasible. It would become impractical to interview each participant on a weekly basis over a period of three months for a group larger than that.

I also believed that there might be difficulties in finding participants for what could be viewed as a potentially risky undertaking by the parents or guardians of the participants. I did in fact have difficulty finding willing participants when the actual recruitment for participants in the study started and I finally settled for eighteen children instead of the target number of twenty. The number was also limited by the number of phones that the study could afford to risk. The perceived risk was the possibility that the children or their guardians might lose or damage the phone unintentionally. My host also mentioned that there was a risk of the phones being sold in the second hand market for money since the participant families had nothing to lose by selling off the phone I gave them.

DEMOGRAPHICS

The children belong to the age group between eleven and fourteen years of age. A more accurate measure of the participants' English literacy is the grade they are in at school instead of their age. The games designed by MILLEE were targeted at children with fifth and sixth grade knowledge of English. Hence I introduced a stipulation that all participants were required to be either in the fifth or the sixth grade at school.

Six children among the participants were from the private school, while nine went to semi-public school and three attended public school. This detail is significant because the quality of education that participants experience differs vastly depending upon the kind of school he or she attended. Thus while fifth grade children in the public or government school could barely recite the English alphabet correctly, children from the private school were reciting Robert Frost. Thus even though all the participants were technically attending similar grades in different school, their English language ability was all over the spectrum. The children attending the private school had the best education among the participants, while those attending semi-public school had a moderately good education and children attending the government school had the worst education amongst the three.

Some details regarding the demographics of the eighteen participants along dimensions such as gender, caste, location and cellphone adoption are shown below.

GENDER AND CASTE

- Gender ratio amongst the participants- Male: Female :: 9:9
- Gender vs. Caste breakup of the participants

	Upper Caste	Lower Caste
Male	6	3
Female	2	7

LOCATION

- Ratio of children by location- Kanaar: Gulab Kheda :: 10:8
- Ratio of households by location- Kanaar:Gulab Kheda :: 8:7

CELLPHONE ADOPTION IN THE FAMILIES

- Parents of sixteen participants of the eighteen own a cellphone.
- There were ten Nokia phones, one Motorola phone, one Tata phone and four 'Made in China' phones

FINDINGS

CHILDREN'S PERCEPTION OF THE PHONES

Participating in the study soon became a status symbol in the village. One of the children not accepted into the study was very upset and got physically aggressive with one of the research assistants. Later his mother and grandmother approached me about including him. When I did not accept him into the study even after that, he tried to talk some of the participating children out of the study. He told them untruthful things such as- I would make them pay the full price of the phone if it was lost or damaged.

In one family where I had given the phone to the sister and not her younger brother, their mother was very upset. She repeatedly requested me to somehow qualify her younger son. When I said that he did not qualify his grandfather was very upset. The mother was agreeable even to my taking away the phone from her daughter and giving it to her son. I then spoke to her son and helped him deal with the fact that he did not qualify for the study while his sister did.

PHONES AND RELATIONSHIPS AMONG THE KIDS

Some children got better at the learning games as well as cellphone operation in general than the rest of the group. Such children who were very good at the games and the phones emerged as "power users" amongst the children of the village. These power users acted as information gatekeepers. They became the "go-to" guys for the rest of the children for every problem that any of them faced with the games or the phone. There was one power user in each village. The power user from Gulab Kheda belonged to the lower caste.

The children from his village sought his help when they met him during the research assistants' weekly visits. Even though the children would not interact with the boy from the lower caste in normal settings, they did so in the presence of the research assistants. The presence of the research assistants created a socially protected space and allowed for free interactions among children of all castes. I asked one of the girls from Gulab Kheda if she knew the power user in her village well. She told me that she and the other upper caste children did not visit his home or talk to him in the village since he belonged to the lower caste. But they did speak to him when they met during the research assistant's weekly visits. I asked her what did they talk about and she said usually the other children approached him if they had any difficulties with the phone or the games. Thus the weekly meeting of these children in the presence of the research assistants enabled new interactions which were sometimes frowned upon in the children's normal settings. The presence of the research assistants created a socially protected space for the children where they were allowed to explore new relationships.

In my interview with the power user from Gulab Kheda, he told me that many of his friends in the village were also learning to play the educational games on his phone. These friends of his were not participants in the study. He was teaching his friends to play the games. His mother said that he had taught her also the English learning games.

The experience of possessing phones distributed in the study seemed to have brought the eighteen children in the group together. I saw a shift in some friendships amongst some of the children between the summer 2008 study and the spring 2009 study. Some of the participants now chose to play with other participants in the study; people they hadn't known before. Thus the study and the shared experience of cellphone based gaming amongst these children enabled new interactions and friendships. Friendships grew between children of like ability in playing the learning games.

But mostly the cellphones reinforced pre-existing friendships among the children. Even when there was a significant disparity in the gaming abilities of children who were already friends before the study, they tended to stick together and the better gamer helped the weaker ones. Children who studied together in the evenings after school, tended to play the learning games also together. Thus overall while new acquaintances were made and some new friendships were formed due to the phones and the educational games, by and large they seemed to reinforce old friendships and pre-existing relationships.

SOCIAL NORMS AND THEIR EFFECTS

Gender Based Issues:

This study reconfirmed that gender played a major role regarding cellphone access and usage norms. In every single instance of the study, where the female participant had a brother the cellphone given to her was taken away by him. The age of the brother did not seem to affect this trend. The brothers gave back the phones every week in time for the weekly visits by the research assistants. Thus in many cases the trend went unnoticed in the beginning. During my three week field trip in March 2009 I lived in the village for the most part. This allowed the above mentioned trend to come to light because it enabled me to pay visits to the participating families without any forewarning. In one family the brother worked as a chauffeur in a nearby city. He owned a cellphone of his own but he liked the cellphone I had given to his sister. So he took it away with him to the city.

In another instance the brother was too young to qualify for the study while his elder sister was a participant. When I visited their home, the brother was carrying the cellphone I gave to her. During the one day I stayed in their home, he had it with him almost the whole day. The brother had put his name on the main screen of the phone. When there was a conflict between his sister and him over the phone his mother asked the sister to acquiesce to her brother, even though the phone rightfully belonged to her.

In a third instance I gave cellphones to two sisters in a household. They had three brothers. During my interviews with the children and the family members in the household I saw that the phones practically belonged to the eldest two brothers. Initially the parents insisted that the girls used the phones all the time and that the boys only used them when they were lying free. I got contradictory stories about when and how the girls used the phones from different people. When I sought clarifications about these contradictions, the truth was revealed slowly in bits and pieces. In the end when I summed up my impression that the boys seemed to have the phones all day, the grandmother of the family agreed. She said the girls hardly got to use the phones and hence had not even learnt to play the learning games on them. I cross-checked this with records of each participant's ability, that were maintained by the research assistants. It was indeed true that the girls barely understood the games and were not very familiar with the cellphones.

Interruptions:

In the summer 2008 study I visited families in the village and requested the children to play the games on the phone for a few minutes in each household. During these visits I observed that the girls were continually interrupted by the members of the family. The girls were responsible for the household chores. They also fetched and carried for the male members of the family. This trend continued even when the girls owned the phones. The girls dealt with these interruptions by carrying around the phones at home and playing the learning games between chores.



FIGURE 1: THE GIRLS DEALT WITH FREQUENT INTERRUPTIONS WHILE PLAYING GAMES ON THE CELLPHONE BY HIDING THE PHONES NEAR PLACES WHERE THEY WORKED MOST E.G., CUPBOARDS (RIGHT) OR THE ROOF BEAMS (LEFT) IN THE KITCHEN. THIS ALLOWED THEM TO FINISH THE CHORE AND RETURN TO THE GAME EASILY WITHOUT LETTING OTHERS STEAL THE PHONE IN THEIR ABSENCE.

The girls hid the phones in safe places while they were doing chores, so that their siblings could not steal the phone while they were away. When they were called away, the girls kept the phones in handy places like kitchen cupboards or hung the phone by the beams supporting the thatch roof. In contrast the boys were usually not disturbed by the family when they were perceived to be occupied with some activity.

Communal Support:

Additionally it was frowned upon for girls to become “overly educated” or accomplished with technology. Parents feared that the girls would not make good wives if the girls were educated or accomplished. Another concern for the parents was also the increased dowry they would have to give if the girl were accomplished. Thus most parents tried to keep the education and technological literacy of the girls to a minimum. Nine out of ten girls were married before they completed 12th grade. If the girls were seen playing on the phones for long hours they were scolded for it by their parents.

One of the female participant’s father said, *“It is all very nice to say she should study and learn all this [cellphone gaming]. But who will marry her after she gets too big for her shoes? If she does a B.A [Bachelors] I will have to find a boy with an M.A. [Masters] at least and they are very expensive. More importantly there are no boys with M.A. around here in our community. So shall I educate my daughter and then make her sit at a home as an unmarried maiden all her life?”*

Sharing Within Genders:

When girls played on the cellphones among themselves, they decided the next move together. But took turns with the cellphone to actually implement the decided move. Each group of girls used a different heuristic to decide when the next girl got her turn. Usually the phone changed hands when the current holder of the phone made a mistake executing the move. When boys

played amongst themselves they decided upon the next move together, but fought over who would actually execute the move on the cellphone. All of them wanted to do it at the same time.



FIGURE 2: CELLPHONE SHARING VARIES BY GENDER. BOYS FIGHT FOR POSSESSION OF THE PHONE (LEFT). ON THE OTHER HAND, GIRLS WAIT FOR THEIR TURN TO USE THE CELLPHONE (RIGHT)

Sharing Across Genders:

The spring study reconfirmed the summer study findings regarding gender related issues: It was seen that girls had far lesser access to the phones than boys. To alleviate such access issues games that encouraged sharing between boys and girls were designed and deployed. But instead of inviting their sisters or other girls to play the female roles in the games the boys played both male and female roles amongst themselves. Thus no sharing across genders occurred in spite of the attempts by game designers to encourage such sharing. During the interviews it was seen that the concept of boys and girls playing together or sharing playtime on the cellphone did not occur spontaneously to the children.

I asked the boys or their sisters whether they shared the cellphones or played together. Given below is a snippet of a typical response,

Researcher: *“Does your brother share his cellphone with you”*

Participant’s Sister: *“Yes! He does. He is very nice to me”*

Researcher: *“So how do you share time on the phone between the two of you?”*

Participant’s Sister: *“Oh... he plays for some time and then I play for some time”*

Researcher: *“How do you decided who gets how much time with the cellphone?”*

Participant’s Sister: *“Hmm... he usually plays games on the phone in the morning before going to school. I play games on the phone when he is not at home and so is not using the cellphone.”*

In twelve of the fifteen participating households participants had siblings of the opposite sex. The responses I received in interviews in each of these households were a variation on the above conversation. Girls usually seemed to play on the phones when the boys were not around or when they were not using the cellphone.

Except for three boys, two of whom were power users none of the other participants carried the phones with them wherever they went. They usually left the cellphones at home. Most of the participants carried their phones to the mango groves or fields though and wherever else they played with other children. The cellphone was usually not taken to schools- there was a rule

forbidding it in the schools. The teachers in all three schools that the participants attend said during their interviews that there were concerns about divisions and fights arising between the haves and the have-nots at school. They were afraid that the possession of the cellphone would give the children a way of flaunting their social superiority.

Parental Support:

In the households where the mothers were supportive, the girls had far greater access to cellphones than in households where the parents were not engaged. This enabled the girls to be engaged with the learning games far more in the supportive households than in the non-supportive ones. This difference between the influence of engaged and uninterested parents was not as dramatic among the boys but was true to a lesser degree. Thus in general it was seen that in homes where the parents were engaged with the child's learning, the children performed better and learned more. The daily upbringing of children is almost exclusively the affair of the mothers. Hence the interest or lack thereof shown by the mothers for the learning games influenced how well the children learnt them. This was particularly true of the girls and to a lesser degree for the boys.

EFFECT OF SOCIO-ECONOMIC STATUS

Children belonging to the wealthier families who usually were also the upper castes had greater access to cellphones than children in the lower classes. Children in the lower castes worked as daily wage labor in the fields and mango groves during holidays and sometimes school days too. Therefore children in the lower castes had less free time to play games on the cellphones even if they were given one or already owned a phone. In contrast children in the upper castes were either free or supervised the laborers in the fields and groves. This allowed children of the upper castes to play cellphone based games even when they were in the fields or groves.

ENHANCING LEARNING AND BUILDING CONFIDENCE

Many parents reported that their children were doing better at school in general and not just in English after the children were given phones. Mothers in nine of the fifteen participating families said that the children's general performance in school had become better. Mothers in three participating families said that their children behaved more confidently and asked more questions in the three months since they were given the phones. As one mother put it, *"The boys are constantly tinkering with it [the phone]. They know how to do a lot of things with that phone. Somehow they are getting better marks since the phone came, even though they spend all day playing with it."*

The larger project of MILLEE focuses upon English learning gains caused by playing cellphone based games. But this was not the focus of my study. Logs of the game play behavior for each session were downloaded on a weekly basis from the participant's phones by the research assistants. Two types of logs were used. One log captured the timestamp of each application coming on or off e.g. camera, mp3 player etc... A second log captured every move made in the learning games as well as details like when and for how long each game was played. This aspect of the study shall continue through June. Since learning gains in English is not the focus of this study, I shall not discuss it further here.

GAME SPECIFIC FINDINGS

During my stay in the village some prototypes for multi-player games were deployed. In these games the boys who were participating reinterpreted the rules. In one such instance the rule required that each boy pick fruits of a certain color. The first boy to finish picking all the fruit of

his color was declared the winner. If a boy picked the wrong colored fruit, it got blocked in his stack of fruits. The player had to pop out even the correct colored fruit he had picked after the wrong colored one. The game designers assumed that the boys would define winning as successfully picking all the fruit of their color first.

But the boys defined, making sure that their rival could not win, as winning too. No player could complete the game or win it without capturing all fruit of the color assigned to him. Boys purposefully captured the wrong colored fruit to block the rival player. This way even though the player had to pop out the wrong colored fruit later and pick his own fruit twice, he could ensure that the game did not end, avoiding defeat after a fashion. When the research assistants suggested that, this wasn't the way to play the game, one of the boys said- *"I won anyway. What matters is that he [the rival] did not win. So what if our rules were different from yours?"* Thus the children reinterpreted rules to define winning differently.

INFRASTRUCTURAL CHALLENGES

Some of the infrastructural challenges faced by the children for cellphone use are discussed below. There were frequent power outages. During my field trips in the village power was available in the village for barely two hours a day; sometimes not at all. This caused the phones' batteries to be discharged most of the time, thus rendering them unusable. When power was present there were large fluctuations in the voltage and frequent power surges. This caused the chargers to be blown out and the phones getting damaged. The nearest shop where the phones could be charged for a fee was two miles away from the village. This was a challenge for the poor children rather than for the wealthier children in the village. The more prosperous households had inverters that supplied power during power outages.

IMPLICATIONS FOR DESIGN

FACILITATION OF POWER USERS

We saw in the findings that power users had arisen in the community of children playing the educational games. They helped the other users adopt the new games and taught them how to play these games. This led to greater engagement not only by the power users themselves but also by the rest of the community. Therefore the games need to be designed so as to encourage children to become power users. Power users, possibly could be rewarded by being given special privileges or abilities in the games. This is likely to provide incentive to the other children and give them something to aspire for. It could set an environment of healthy competition.

NEED FOR SOCIALLY PROTECTED SPACES

In the findings, the effects of allowing the children to meet in a socially protected space regularly, has been discussed. It led to new interactions. The subjects learnt from children they wouldn't have spoken to, outside of our presence, due to social restrictions. Therefore regular meetings in a socially protected space allow the children to explore new relationships and opens up opportunities they wouldn't otherwise have had to learn from each other. This might be a means of breaking down the social barriers and restrictions based on caste and gender.

INTERRUPTABILITY

The girls are responsible for household chores and fetching and carrying for men in the house. They are continually interrupted by these responsibilities. Thus games designed for girls need to support interruptability. This can be achieved by implementing micro-sessions in the games. Games should not require the player to remember moves from the past. Every micro-session

needs to be independent of each other. Such designs shall allow the girls to play these games conveniently between chores.

DIFFERENCES IN PLAY PRACTICES

As discussed in the findings the girls naturally shared the cellphone among themselves by taking turns. Thus games designed for the girls should support turn taking. Boys tended to fight over the cellphone, everyone desiring to use it at the same time. Thus games developed for boys need to support simultaneous multi-player participation.

SHARING ACROSS GENDERS

It was seen that the concept of boys playing with girls or sharing time together on the cellphones did not occur naturally to the children. This shows that trying to go against prevalent social norms can be a challenge and not always successful. It suggests that creating technology that works within the social system and respects the prevalent norms might lead to greater success in its adoption and use.

FACILITATION OF PARENT-CHILD ENGAGEMENT

In the findings it we saw that in households where the girls had their mother's support, they had far greater access to the phones. This seemed to hold true not only in the case of access to phones and gaming but also for access to education in general. Thus the games will have to facilitate the child's attempts to engage its parents in the learning experience. This could help alleviate the access issues faced by the girls and provide greater support for boys too.

FLEXIBILITY IN GAME RULE INTERPRETATION

In the game specific findings it was seen that children reinterpreted the rules of the game in a way that was different from the interpretation of the game designer. The game will need to have some in-built flexibility to support such behavior. The game should support some leeway in the interpretation of rules so as to allow for the children to exercise their creativity and customize the game rules to suit them. The children were more engaged in games when they were allowed to reinterpret the rules of the game. Game designers need to be aware that children will not always play the game the way they intended it to be. Therefore, they need to support the ability to change the rules of the game, knowing that children will change them anyway.

REFLECTIONS AS A RESEARCHER

RECRUITMENT OF PARTICIPANTS

Persuading people to participate in the study was very difficult in the beginning. People were suspicious of the sudden "bounty" and wondered why I was giving away expensive phones to people I did not know. They were also afraid that accepting such a "gift" might have some unforeseen consequences. Thus gaining people's trust regarding my intentions and convincing them that I had no ulterior motive was challenging. The fact that I was not getting paid to do this work and was volunteering seemed to add to my credibility. But the real breakthrough came only when my host in the village spoke to the villagers and vouched for me and the study. Hidden costs and liabilities associated with the phone were another source of concern for the parents who were considering participating in the study. I had to layout the financial implications of both the connection and the phones very clearly, before they made a decision to join.

The magnitude of the "tokens of gratitude" at the end of the study was another difficult issue. It had to be large enough to convey the fact that I was truly grateful but not so large that it became the motive for participating in the study. I sought my host's advice in arriving at an amount of

money that would be considered appropriate. The dispensation of this money was another issue that had to be taken into consideration. My host warned me that if I simply gave money into the hands of the parents it might not be used for the children participating in the study. Therefore I finally settled on giving school materials worth the decided sum of money to the children upon completion of the study.

CHILDREN AS SUBJECTS OF RESEARCH

The participants were very young. Therefore engaging their attention and maintaining their interest in a conversation was challenging. I learned that indulging in the child's need to talk about a certain thing and then gently steering them back to the topic of the conversation was more effective than requesting that they pay attention. Drawing activities and video games I discovered were very useful as tools to keep the conversation focused. Getting the child to play with the researcher was a powerful way to connect to them and facilitate the sharing of confidences. Pacing the questions and giving significant time intervals between questions seemed to help the children feel more comfortable with the interviewer and less intimidated by him or her.

Another lesson I learnt was that when young children were research subjects, it was more productive to look at the whole family as the subject of research and not just the individual child. The child's behavior and responses often were a reflection of the forces within the family. Many a time during my research in the past year I saw that the child's actions and responses acted as a kind of weather vane of the value system the family actually lived by; which sometimes was not identical to what the family might profess. Such contradictions were easiest to catch by listening carefully to the child and observing his or her interactions with the family.

PROS AND CONS OF BELONGING

I had greater access to the participants' trust because they believed I understood what they were experiencing. Therefore I was given access to places in their lives that an alien to the culture might not have been allowed in. They had a certain comfort talking about sensitive issues like caste discrimination because I belonged to their culture and was familiar with these norms.

Since I belonged to the same culture as the participants I had to be far more careful with how I presented myself. While they were tolerant of a "foreigner's" mistakes they were not very forgiving when a "local" made the same mistake. So I was expected to not only understand but also follow many of the social norms that dictated how Indian women could and could not behave in public or in the presence of men.

There were situations and events that were inaccessible to me because I was a female researcher in my own culture. The villagers believed I would understand if I was refused entry to some experiences. E.g. every year on the seventh night after *Holi* (An Indian festival) all the men in the village sing songs in praise of God at the village temple. I requested that I be taken along. I was told by my host for that day that I could watch from a distance but could not participate in the event since I was a woman. I mentioned that they would have taken me if I had been a foreigner. He responded by quoting scripture which said that a "guest" was God's incarnation and hence should be waited upon as such. He then said that I was almost a member of the household and understood the local culture and so was expected to respect local traditions.

I learned to respect the social norms of the village while I lived there. As per these norms, it was unacceptable for me as a person belonging to the higher castes to live in a low caste household.

Therefore in spite of trying very hard to convince my host in the village, I was not allowed to stay at the homes of any low caste household participating in the study. My host informed me that I would be denied entry into almost all higher caste homes, if I defied tradition and spent a night in a low caste household. If I was from a low caste: this might have completely altered the nature of my access to the upper caste homes and upper caste children. On the other hand, if I had been a foreigner, I might have been received very differently all its attendant issues. In sum, this study is what it is because of who I am: *an Indian female belonging to the higher castes!*

LOCATION SPECIFIC CHALLENGES

Staying in the villages of India especially in the less developed regions is challenging due the lack of even basic infrastructure like sanitation and plumbing. Extended power outages is another major issue along with wildly fluctuating voltages which tends to blow out any electronic equipment one might plug in.

ALIENATION AND LONELINESS

Due to the power outages and spotty network coverage I couldn't use my laptop or the phone after the first two days. Being cutoff without connectivity to the outside world and no access to comforting activities like reading a book- all I had were e-books on the computer- was very painful. I had to deal with depression and acute loneliness caused by living amongst people and a culture that was unfamiliar to me. While I am from India, I had only lived in South Indian villages which are very different in every aspect- whether it was cuisine, clothes or even Gods. The lack of basic facilities like lack of plumbing, sanitation and power in addition to the lack of sleep caused by biting insects aggravated my depression and loneliness.

ISSUES OF INFORMED CONSENT

Seeking the participants' permission to use their pictures and interview data seemed an unusual practice for them. They were excited that a lot of people who lived very far away would hear what they said and see their pictures. Thus conveying the gravity of the process of informed consent was a challenge.

Since this was a relatively long drawn study people tended to forget what they had given permission for at the beginning of the study. They believed I had come to visit them and see how they were doing like a relative might do. Thus I dealt with this by reminding them that I would show the pictures I was taking and play these interviews for others to see and listen. The most common response to that warning though was how the audience would understand what the participants had said since they spoke in Hindi and not English.

DISENGAGEMENT

Since the children had owned the phones over a relatively extended period of three months, disengagement of the study was a source of concern. Both the parents and I were concerned about the suffering it might cause the children if the phones were taken away from them at the end of the study. I explored possible avenues for providing support and to help the children deal with the sense of loss. It was finally decided that the phones would be left with the children with the parent's permission. I had to also think about how or even if, I was going to maintain relationships with the participating families and the village community in general after the study had ended. Some of the women had grown attached to me and were in tears when I left the village at the end of the study.

FUTURE WORK

One issue that requires further investigation is the question of how much did the children actually learn, by playing cellphone based learning games in an unsupervised and naturalistic setting. A six month long study to answer this question is in the nascent stages of design by MILLEE. The plan is to contact the participating children only to update the games and conduct English learning tests at regular intervals. The goal of this study will be to quantify and measure the English learning gains of children playing cellphone based learning games in an unsupervised and naturalistic setting.

Games designed based on the findings of the current study shall be tested in the summer of 2009. The games shall be deployed in a remotely run, large scale, longitudinal experiment, expected to last for one academic year. The aim of this study is to investigate a scalable solution for deploying cellphone based educational games on a countrywide basis. An additional goal is to conduct a rigorous experiment to prove that learning gains in English are caused by playing cellphone based learning games. The planned strength of the participants is eight hundred children- four hundred children in the experimental group and four hundred in the control group.

CONCLUSION

Lack of access to proper schooling and education is a major issue in rural India. Alternate solutions for educating rural India are being explored. One such example is cellphone based learning games. Given that mobile penetration is very high and growing at an astounding rate, using cellphones as the new computing platform makes particular sense in countries like India. But to design meaningful and socially appropriate cellphone based learning technology in this context, one needs to understand the culture and the politics of cellphone use in India. The socio-economic and cultural forces that define and influence social norms regarding cellphone usage need to be examined and considered.

This study is a yearlong attempt at charting these forces and the resultant social norms regarding cellphone usage. It attempts to capture glimpses of the culture and politics of cellphone access and use by children in rural India. This study is an exercise in understanding cellphone based gaming in the larger context of cellphone use in general by children in rural India.

Since the researcher was not present on-site throughout the duration of the study, a combination of data gathering methods were used. Some appropriate for gathering data on-site and others for collecting data remotely. Participant observation and unstructured interviews were employed to collect data during field trips. Phone interviews and videos of children using cellphones- made by research assistants- were used to collect data remotely.

Findings were made regarding the influence of social forces like gender, employment, caste and socio-economic status upon cellphone access and use by children in rural India. Girls had very little access to phones and their becoming technologically accomplished was frowned upon. If the mothers were engaged in the girls' learning and education, the girls' access to cellphones and support for using them increased manifold. Boys had greater access to cellphones as well as greater support from the parents and the community to learn new things. The girls were interrupted continually during whatever they were doing- whether it was work, study or play. The shared experience of owning cellphones with learning games on them brought the children together. Some of the children found new playmates, but with most of them the phones reinforced existing relationships. Power users emerged in the community of cellphone gamers. Periodic meetings among the children, in a socially protected space led to new interactions and

learning. Parents reported that children who were given the cellphones for the study were doing better at school than they did before. The concept of sharing cellphones or playing cellphone based games with children of the opposite sex did not occur spontaneously to the participants. The children sometimes reinterpreted the game rules in the middle of a game. Infrastructural challenges like chronic power outages and voltage fluctuations led to the phones batteries being discharged; rendering the phones unusable.

This understanding of the social dynamics of cellphone use by children in rural India can be used for more than just developing learning games. This knowledge is of value for designing a variety of cellphone based applications for rural India such as social networking applications, and pure games. Furthermore ICTD researchers might find knowledge of the social context of cellphone use in rural India captured in this paper, useful for designing their future research studies.

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