I want to be Sachin Tendulkar!
A Spoken English Cricket Game for Rural Students

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ABSTRACT
We present a mobile phone based cricket game for improving the spoken English pronunciation of school children designed and tested within a specific socio-cultural context in rural India, the Mewat district of Haryana State. The development of the game concept was informed by a field study, which identified cultural restrictions respected by the community as well as community interests and motivations. The game was accessible using a low-end mobile phone and evaluated with a group of 63 students from classes 4 and 5 of a rural school. The results suggest that the cricket game can be effectively used to engage students and to improve their spoken English skills in the given setting. Further, the game serves as an informative example of how factors impacting the acceptability and appropriation of a technology in a particular setting can be taken into account from the very beginning of the design process.

Author Keywords
Spoken English; mobile game; cricket; commentary; rural India; speech recognition; education.

ACM Classification Keywords
H.5.1 [Multimedia Information Systems]: Audio input/output;

INTRODUCTION
A good command of spoken English unlocks enormous opportunities in India for personal and economic improvement. In this paper, we take a broad perspective on English language learning and investigate three factors prevalent in India: an awareness of the importance of English, the lack of means to learn spoken English and the enormous popularity of the game of cricket. These three factors emerged from a field study, which revealed that their co-occurrence opened a previously unidentified possibility to support improvement of spoken English skills using a mobile phone based game.

How these factors interact to create the context for the game is better understood by examining each in turn. The importance of spoken English skills in India is well established, as reflected by studies that have been carried out across different communities. In [1], hourly wages of men were reported to be 34% higher in case they know English. In [10], observations are made on the sociolinguistic implications of English and its growth towards dominant social and administrative roles. Not only is English important, it is also widely perceived to be important. Due to this community awareness, school children, even in rural areas in India, are interested in learning spoken English.

Despite the awareness of the importance of English, there is widespread lack of a means and a motivational environment in which spoken English can be learned. Primary school education in India is impeded by a shortage of quality teachers, especially for the English language, and high drop out rates. In [9], the drop out rate is reported to be 39% with 37% of respondents to a drop out survey reporting that drop out was caused by the child not being interested in the studies. Clear potential exists for providing engaging learning contexts for spoken English that will leverage the underlying awareness of its importance.

The game of cricket in India enjoys a seemingly boundless power to engage and fascinate. The game’s audience has been recorded to be more than 200 million in a particular tournament [14]. Most households followed this game either on television or on a radio. More recently, people have started to follow the radio commentary through their mobile phones. Most low-end mobile devices can receive radio signals. The importance of cricket in the Indian context is reflected in popular media, e.g., in the title of a recent book, “If cricket is a religion, Sachin is God” [17]. ‘Sachin’ is a reference to the widely admired cricket star Sachin Tendulkar. We include his name in the title of the
paper to emphasize the strength of the power of engagement of the game of cricket over fans, for whom Sachin serves as a role model in India. A priori, cricket, provides a good fit with a collaborative language learning scenario. Since it is a team game, students work together to score well for the team; however, as suggested by the existence of cricket idols, individuality is still preserved, and a single person responds at a time with the emphasis on improving their individual spoken English pronunciation skill.

The existence and importance of these three factors were established by a field study in Mewat, a district in north India. The study was open ended in that it was constrained only by the context of a highly abstract goal: to develop new applications for mobile speech that would support the efforts of underprivileged communities to achieve economic development and improvement of living conditions. The insights and findings of the field study gave rise to the design of the mobile phone based cricket game. The game provides students with spoken English words and asks them to speak them back over phone. Cricket commentary makes the game exciting and engaging. The quality of the students’ pronunciations determines the scoring and the follow-up commentary.

This paper makes three contributions: First, we report on a field study that identified both challenges and opportunities for mobile phone applications in primary schools in rural India. The field study is carried out in Mewat, a district whose unique culture contributes to a set of specific restrictions and opportunities for designing applications that not only address community needs, but are also consistent with available technologies (i.e., low-end mobile phones). Second, based on the insights gained from the field study, we describe the design and implementation of a mobile phone based cricket game. The game is evaluated with a group of students at a rural school. Evaluation results demonstrate the ability of the game to engage the students and improve their spoken English pronunciation. Third, we provide an outlook on future design possibilities beyond the specific setting of Mewat in the form of a concise discussion on the possible generalization of our design insights. These insights could be expected to extend to other settings in which application design would stand to benefit if both socio-cultural limitations and community motivations could be taken into account from the very beginning of the design process.

The paper is structured as follows. After describing the study and reporting its results, we present the design of the cricket game, which was created on the basis of the findings of the study. We then present the evaluation of the game, conducted with 63 students at a rural school in Mewat, with the goal of determining if the game has the ability to engage students and improve their spoken English. Finally, we give an outlook on the generalization possibilities of our design insights to future work and summarize our conclusions.

RELATED WORK
Work related to our own falls into three categories: first, the potential of collaborative interaction with mobile devices for engaging learners, second, designing technology for children, and, third, the use of games in education.

The use of collaborative systems and mobile devices has clearly demonstrated potential in educational settings. The Moglass system [20] provides a collaborative environment to help in understanding and ultimately also to support the creation of music through networked mobile devices for children. The Meaning [16] system uses mobile devices to capture children’s activities in kindergartens and presents to parents, allowing increased communication within families. LeafView [19] system is a tablet PC application that aids in identification of botanical species, providing support for student field trips. Explore! [2] is a mobile-learning system that helps students acquire historical knowledge. These examples provide evidence that education in the Western world is undergoing a significant change in terms of the content and its delivery methods. There is a clear trend toward increased use of multimedia content and of engaging, collaborative interactions.

The space of technology design for children has been extensively researched in [4,5,8]. These studies have effectively utilized the creative skills of children in developing search interfaces [4], mobile storytelling [8] and their experiences in interacting with digital library [5]. Authors in [18] also emphasize the value in co-designing with children using a layered elaboration technique. Such interactive techniques clearly highlight the importance of an iterative design approach when building interfaces for children. In this paper, our design incorporates close interaction with children via both the initial field study and also the validation within the context of a tournament based on the theme of the dream, “I want to be Sachin Tendulkar!”

Other work has focused explicitly on the ability of games to support education. We adopt the guidelines for educational games of [13], which emphasize the importance of fun, flow, engagement, feedback, goals, problem solving, game balance and pacing, and fantasy narrative. For rural regions, authors in [11] propose the use of traditional rural games to design digital games and their study shows that if a digital game has the same game mechanics as a traditional game, then rural children are easily able to relate to it. The authors use these design guidelines to develop localized games on mobile devices to improve spoken English in [12]. The game design is centered on local themes such as trying to protect the crops from thieves and animals in a farm. Language learning is integrated into the game by displaying words and asking students to speak them. A speech recognition system drives the scoring, which is then translated to the game. This game differs from our own in that it needs a high-end mobile device, which can display rich visuals and also run speech recognition software.
SOCIO-CULTURAL SETTING
Mewat is a district located in the Haryana state in northern India with a population of approximately 1.1 million and is one of the least developed districts of Haryana. Despite its proximity to the metropolitan area of New Delhi, a large percent of the population (ca. 88.6%) lives in utter poverty in rural areas. The rural areas of Mewat lack basic infrastructure, such as water supply, electricity, and sanitation. It is important to mention that the level of penetration of mobile phone infrastructure in Mewat is high. The contrast with the availability of other infrastructures is striking and the ubiquity of mobile phones served as one specific motivation to focus on this region.

Mewat enjoys a socio-cultural uniqueness, not only because it is the only Muslim population pocket in Haryana, but also because the historically the population has roots in Hindu culture, which are cherished and preserved. This unique ethnic group is commonly referred as ‘Meos’ or ‘Meo Muslims’. The main motivation for the choice of the Mewat district was the observation that there is great potential for improvement in the educational system. The 2011 Census of India reports that Mewat’s average literacy rate is 56.10%, while female-literate remains very low at 37.1%.

The people of Mewat speak in Mewati dialect, Hindi, Urdu and Haryanvi dialect. Arabic is spoken in ‘Masjid’ or Mosque for religious teaching of the Quran, but is not used for everyday communication. The students are taught English in school, but it is not used locally, making it difficult to acquire command of the spoken language.

Kanwarsika and Salaheri Villages
Two villages in Nuh block of Mewat district were chosen on the basis of their representativeness for the region. Kanwarsika Village (cf. Figure 1, left) is located just off Gurgaon-Alwar State Highway (SH-13) and it is one of the more urbanized villages in Mewat. The population of Kanwarsika is 1646 (848 male/798 female) with a total of 235 households. Kanwarsika School consists of two public (i.e., government) schools, a primary and a middle school, sharing the same campus, and is considered a model school in Mewat. Kanwarsika School has a total of 274 students (123 male/151 female) and 9 teachers (4 male/5 female), making the student-to-teacher ratio ca. 30:1.

Salaheri Village (cf. Figure 1, right) is ca. 3 km removed from the SH-13 and it is considered to be a ‘remote’ village. Salaheri is one of the lesser-developed villages of Mewat. The population of Salaheri is 5457 (2839 male, 2618 female) with a total of 713 households. Two public schools, a primary and a middle school, are located close to Salaheri, and have a total of 1559 students (818 male, 741 female) who are taught by 28 teachers (26 male, 2 female), making student-teacher ratio ca. 56:1.

FIELD STUDY
This section reports the setup of the field study and its findings, which provided the basis for the design of the mobile phone cricket game discussed in the next section. The use of a field study to inform the design process was motivated by our underlying appreciation that the intersection the culture and the availability of technology in a particular setting gives rise to constraints, motivations, opportunities, as well as user needs, that impact the acceptability and uptake of applications in that setting.

Field study background and methodology
The field study was conducted in February and March 2012 for duration of six weeks. The study was carried out by a male design researcher, who was able to communicate with local community members in Hindi, but was otherwise an outsider to the community and had no previous acquaintance with the community history or its social tradition.

The field study engaged a variety of local actors in the research. A total of 51 students (33 male/18 female) from Kanwarsika and Salaheri primary and middle school participated in 6 sessions (group interviews and brainstorming sessions). A total of 19 teachers from Kanwarsika and Salaheri School participated in 22 sessions (group interviews, in-depth interviews and brainstorming sessions). A total of 17 local villagers (14 male/3 female) participated in informal discussions on village life. It is worth mentioning that the gender and identity of the field-researcher (male and ‘outsider’) limited the possibility of engaging female members of the local community in the research. A total of 10 field-officials and program coordinators of a local NGO [Name Removed for Purposes of Anonymization] participated in 15 informal discussions on variety of issues relevant for the research.

The other important participants in the field-research are: a ‘Maulavi’ (a local religious teacher), a local historian, a local poet, two Radio Mewat officials, a Mewat Development Agency Official. The field-research also incorporated visits and informal discussions at 5 different local mobile phone shops in Kanwarsika, Salaheri and semi-urban center of Nuh.

A variety of methods were employed in the field study: group interviews, in-depth interviews, participant observation, village transect walks, resource map drawing exercises, and field-notes. The group interviews, in-depth interviews and informal discussions varied between 30 minutes to 3 hours of time duration.

Field study findings
The findings of the field study are reported organized around the major themes.
Mass media and ICTs. The Meo’s cultural and religious identities are inter-twined and have a significant impact on their consumption and appropriation of mass media and ICTs. Traditionally, the local population respects strict restrictions on the use of photography, videography and digital editing. Many locals view photographs as the prime reason for religious objection to Hindi newspapers, which are read by a negligibly small portion of the population. Salaheri Village has only 25 television sets in total, most of which are installed in local tea or snack shops.

The orthodox locals and religious leaders raise serious objections to any image, sketch or photograph of any ‘living’ object. The local ‘Maulavi’ attributes this categorical opposition to their interpretation of Islam. He further added that there is no religious objection to visual representation of ‘non-living’ objects or in use of human voice in any application like a mobile or computer game. He explained that Nokia’s popular mobile game ‘Snake’ is objectionable to the local community as the game entails a digital representation of snake, a ‘living’ object. If the game had been modelled as ‘Rope’ or any other ‘non-living’ object, the game would not violate religious sentiments and then had better possibility to be accepted by the local community. Restrictions on imagery provide a possible explanation for the immense popularity of the audio-only medium of radio in Mewat. It has a local FM Radio Station called Radio Mewat. Most people have radio sets at home; mobile phones are also popularly used to listen to FM radio.

Desire for spoken English language skills. There is an overwhelming desire amongst the students of Kanwarsika and Salaheri Schools to develop English language proficiency. Most of the participants including students, teachers, local villagers, local NGO officials, and religious leader voiced the need to focus on development of English language skills. The study participants consider English language skill to be important for improving the employment opportunities and self-esteem of the students.

The English language education starts from Class 1 in schools in Mewat but many of the schoolteachers acknowledged not having sufficient proficiency to teach English language skills. Some confirmed having problems in understanding even a basic letter or announcement published in English by the Education Ministry or in having a simple conversation in English. Further, students and teachers informed us that although written English is a focus of the curriculum, there is hardly any opportunity for students to learn and practice spoken English. One of the common issues that the students report is the lack of a conversational partner. Many of them report being very unsure of their English pronunciation and state this uncertainty also negatively impacts the self-esteem. A group of male students narrated how they experience low self-esteem and self-confidence when they visit Delhi or Gurgaon (highly urbanized centres) and see their city peers conversing in English. The schoolteachers point out that students need constant encouragement to overcome their inhibition to speak English.

A general awareness was observed regarding the potential of mobile phone technology for supporting English learning and the limitation of the currently available applications. Some students demonstrated mobile phone based applications, like a English-to-Hindi dictionary, which they have downloaded and installed. The students pointed out various limitations of these applications: lack of coherence of the content with English curriculum taught in school, lack of focus on spoken English and lack of possibility for structured language learning.

Popularity of cricket. In general sports are very popular amongst the students of Mewat. Recently, Salaheri School hosted a state-level wrestling competition. Also, teachers proudly mention the athletic meet held in the school compound few years ago and the huge support and participation of local community. Some of the more popular sports amongst students are cricket, kabbadi, kho-kho, track and field, volleyball, and wrestling. One unique aspect of cricket in Mewat is its huge popularity amongst both male and female students. Although female students are excluded from many other sports, it is not an uncommon sight to see female students playing cricket in the same sports compound as male students during lunch breaks.

All student participants of the field study reconfirmed the popularity of cricket. The traditional and still the most common way of following cricket matches is listening to

Figure 2: Use of mobile technology young users Mewat (left) & A mobile shop in Kanwarsika Village (right).

An interesting recent development is huge penetration of mobile phones in Mewat (cf. Figure 2). The households, even in the remotest of villages, have multiple mobile phones. All the participants in the field study including students and teachers reported multiple mobile hand-sets in their individual households. The presence of various flourishing local mobile shops and businesses in villages and semi-urban centre of Nuh further confirms the popularity of mobile phones in Mewat. Many local villagers perceive mobile phone as ‘neutral’ and as a device that does not violate or challenge the local religio-cultural identity. Mobile phone use is asymmetric between the genders. The household’s mobile phones are invariably ‘owned’ by the male members of the family and the female family-members ‘borrow’ them in order to use them. This gender disparity parallels a deeper gender asymmetry rooted in the traditional social set-up of Mewat.
live radio commentary. The local villagers are well attuned to the voice modality and nuances of cricket commentary.

**GAME CONCEPT AND DESIGN**

The field study provided us important insights that informed the development of the spoken English cricket game. The following are the key insights and the design choices that were derived from the study:

1. **Input from teachers and observation of parents** highlighted that students need a self-engaging mechanism to improve their education since most parents are not literate enough to help their children at home. Therefore we realized that the application has to be engaging and motivating, which led to choosing a game as the application.

2. **The study clearly highlighted that cricket is a popular game among both male and female students while other sports, like wrestling, were not popular amongst female students.** Further, the students are well aware of nuances of cricket and are accustomed to listening to cricket commentary on radio. **We therefore chose cricket as the game on which to model the application for the students.**

3. **Interaction with teachers and students revealed that spoken English skills are in need and highly desired, but go unaddressed due to lack of English speaking teachers, parents and fellow students.** We therefore chose spoken English as the teaching material for the game.

4. **The field study documented high penetration of mobile phones even in the remotest of the villages of Mewat. Furthermore, the practice of listening to the radio, including cricket commentary, on mobile phones is very common.** Hence, we were assured that the mobile phone is a relevant platform for the application.

**The Spoken English Cricket Game Design**

The game experience for students is set as an Interactive Voice Response (IVR) system implemented on a server. There are no visuals provided to the user. This ensures that the game can be accessed using any low-end phone device by dialing a phone number. The students hear commentary similar to the one that they would hear while following such a game on the radio.

In order to understand the game design, it is necessary to understand at least the basic structure and nomenclature of cricket. We supply a high-level description, for readers who might be unfamiliar with the game. Cricket is played between two teams as shown in Figure 3. Fielders and bowlers are from one team and batsmen are from the other team. Periodically, the team that bats (hits) and team bowls (pitches) switch roles. The action involves a bowler pitching the ball towards the batsman; batsman swings at the ball with the aim of hitting it and scoring as many runs as possible; fielders attempt to prevent runs by catching the ball. The action is an individual act between the bowler and the batsman and the team aspect involves the individual batsmen working to add to their team score.

**Figure 3. A visual depiction of the player roles and the action in the game of cricket. Bowlers and fielders (in blue) form one team while the batsmen (in green) form the second team.**

Our cricket game provides an audio realization of the basic action of the cricket game. Instead of the bowler pitching the ball, the system speaks a word to a student (batsman) and the student is supposed to hit it (speak the best pronunciation) in order to score maximum runs. The better the student pronounces a given word/phrase/sentence, the higher the score. The system speaks the result of the action in a commentary, which takes the same form as used in a real cricket broadcast, and keeps track of the score for the game. The action (“pitching” of the word by the system and “hitting” its answer by the user) is repeated multiple times.

**Figure 4. The components of the spoken English cricket game. Students access the game by a mobile phone. The game is deployed on the server.**

A logical system diagram of the designed game is shown in Figure 4. It consists of four components: Commentary Engine, Content Delivery Engine, Pronunciation Checker and the Scoring Engine. The blue line shows the action flow while the green (dashed) line shows the interaction with the user.

**Commentary Engine**

The Commentary Engine provides the feedback to the user about the progress of the game. It takes the scoring input
from the Scoring Engine and based on the score of the current hit by the user, it generates a relevant commentary in cricketing terms. In order to provide a realistic commentary, following sets of dialogs are provided:

- Feedback commentary: There are three categories of dialogs for providing the user with a feedback of her current hit (speech input). If the user does not provide any input, a dialog from the no-input set is played as the commentary. Dialogs in the no-input set are mostly of the type where the commentator says that the ball was a very good one and the batsman was not able to play any shot (i.e., did not swing or could not hit). If the users provide a completely incorrect pronunciation, for which the scoring engine returns a 0 value, then a dialog from the no-match set is played. The no-match dialogs mention that the user played a shot, but it was fielded by a fielder and so the batsman could not score any runs. If the Scoring Engine returns a value greater than 0, then an appropriate commentary is played, which mentions the number of runs scored by this ball along with a description of how the ball was played. In order to provide a realistic and a non-repetitive experience to the user, each set of dialogs has 10 variations and any one of them is played out at random. Specifically, the Commentary Engine has 10 dialogs for no-input situation, 10 dialogs for no-match situations and 40 run dialogs for the four situations of different runs (which in our game is 1, 2, 4 or 6 runs). The run dialogs include the sound of applause and cheering to provide a realistic commentary experience.

- Encouragement commentary: These are generic dialogs that mention how the team is performing. They are not played after every ball, but are randomly inserted after every few balls. One of the dialogs is chosen at random from a set of 6 dialogs.

- Ball commentary: Before a word is spoken to the user (for which the user has to speak back the pronunciation), the Commentary Engine explicitly prepares the user for the word by mentioning that the next ball is about to come. The specific dialog is also chosen randomly from a set of 10 such dialogs.

- Transition commentary: The game involves several transitions when different events happen. These events could be change of fielding positions, change of bowlers. To parallel the real commentary, like encouragement commentary, these are also played out randomly after a few balls. One of the dialogs is chosen at random from a set of 6 dialogs.

- Total score commentary: This commentary provides the total score of the team so far through a set of 10 sentences, one of which is randomly chosen each time.

All the commentary is provided in a male voice in the local language Hindi, as this is usually the case with the radio commentary, to which users are used to listening.

Content Delivery Engine

The content delivery engine consists of an English word/phrase/sentence that is spoken by the engine to the user. In order to clearly distinguish the content from the commentary, the content is spoken in a female voice. After the word is spoken, a beep sound prompts the user to respond back. Once the user responds, irrespective of the quality of the user response, the meaning of the word/phrase/sentence in Hindi and the spelling (only in case of words) is spoken back to the user.

The need for coherence of the content of the game with the English-language curriculum of the books was clearly established by the discussions with the students and the teachers. For the prototype of the game, we decided to select ten words each for ‘easy’, ‘medium’ and ‘difficult’ category. Similarly we selected ten phrases and ten sentences for the game. Therefore the game had a total of 50 pronunciation “balls”. We selected the words, phrases and sentences randomly from the English curriculum books of classes 3, 4 and 5. The content presented to the user is changed based on the user performance in the game. If a user is performing well, the content category is changed from easy to medium and then to difficult words. On the other hand, if a user’s performance in a given category is poor, then words from an easier category are presented. The content delivered to the user is therefore a function of the total score of the team in the game in a particular instance.

Pronunciation Checker

The Pronunciation Checker is a speech recognition system that captures the user input and passes it to Scoring Engine. The speech recognition system uses a fixed grammar of one word/phrase/sentence and performs a forced alignment [6] of the word with the user input and generates a probabilistic score \( p_{asr} \) and passes to the Scoring Engine.

Scoring Engine

The Scoring Engine translates the user input into a score formulated in cricketing terms. The probabilistic scores returned by a speech recognizer range from 0 to 1. We map these scores such that any value less than 0.5 is considered to be a no-match and therefore zero runs are provided to the user. Values from 0.5 to 1 are mapped to scores of 1, 2, 4 and 6 in the following manner:

\[
\begin{align*}
0.5 \leq p_{asr} < 0.6 & \Rightarrow r = 1 \\
0.6 \leq p_{asr} < 0.8 & \Rightarrow r = 2 \\
0.8 \leq p_{asr} < 0.92 & \Rightarrow r = 4 \\
0.92 \leq p_{asr} & \Rightarrow r = 6
\end{align*}
\]

\( p_{asr} \) is the speech recognition score and \( r \) is the number of runs assigned by the Scoring Engine. Since scoring 6 runs in a ball is very rare in cricket, a higher threshold of 0.92 has been selected for the game.

Referring back to the previously mentioned design principles [12] concerning game features: fun and engagement are provided through the concept of increasing
score and the excitement to score more runs; feedback is provided through the feedback commentary; the response to content forms the problem-solving aspect; pacing and fantasy narrative is covered through the running commentary. The collaborative aspect of the interaction is derived from the fact that students form teams and then collaboratively try to defeat other teams by scoring better.

**EVALUATION EXPERIMENT**

The evaluation experiment was conducted in three phases over a period of three weeks. Our goal was to investigate:

(a) whether the game is engaging enough that students play it multiple times, and, (b) whether the game helps to improve the pronunciation skills of the students.

The first phase of the experiment involved recruiting 63 (41 male/22 female) students of Class 4 and Class 5 from Kanwarsika village. Students were aged from 8 to 11 years. We chose students from these classes because this is the level where most students drop out of school [9] and also because their pronunciation skills had sufficient scope for improvement. Then we conducted manual pronunciation test of the students by asking them to speak a total of 20 words, four from each category: easy, medium, difficult, phrases, sentences. Each user input was graded at three levels: zero marks were given for incorrect pronunciation, two for an exactly correct pronunciation and one for an acceptable pronunciation. While these scores do not map exactly to the scores provided by the game, they relate well to how the teachers measure the pronunciation at school. This score formed the baseline for evaluation.

We then asked the students to dial the spoken English cricket game using their families’ phone from home for a period of one week. We informed the students that this call would be toll-free. We also mentioned that there would be a tournament in the upcoming weeks on this game and so they were asked to practice for it. We did not provide any specific training to any of the students on how to play the game. The practice session in the first phase did not involve any collaboration between players. We maintained system logs of the usage of the game by students during this period.

In the second phase, we returned back to the school after a period of one week and then conducted another round of manual pronunciation tests of the same students using the same set of words. We then announced that the tournament will be conducted in a week’s time and asked students to form teams of six students each for the tournament. They were again asked to continue to practice during this phase, but in teams. System logs were captured in order to observe the usage of the game by students in this period as well.

The final phase involved conducting the tournament where each team of six students was asked to “play” 30 “balls”, i.e., speak the pronunciations for 30 words. The interaction took place using a mobile phone that was connected to a speaker so that all members of the team could hear the commentary. Each student in the team would use the mobile phone to “play” one word or phrase and then pass the phone on to the next student, who would take the next turn. After six balls, the students repeat the same order – of course with different words each time. The team that scored the most runs was declared the winner and the student who scored the most runs was declared “Sachin Tendulkar”. After the tournament, we conducted one final round of manual pronunciation tests of the same words with the same students.

**RESULTS**

Figure 5 shows scores for the first manual pronunciation tests (solid line). This forms the baseline for our experiments. Of a maximum of 40 marks, the highest score was 30 and lowest was 0, which was observed for three students. The average score for the 63 students was 9.22 with a high standard deviation of 6.76.

![Figure 5: Changes in manual pronunciation scores of students over one week, in decreasing order of PhaseI – PhaseII scores.](image)

After this manual test and after advertizing the game and the tournament to students, 46 of the 63 students tried the game at least once. Only five students tried the game more than five times, with most trying only once. A total of 554 balls were played by the students over the course of the week. On the average, each student played 12.04 balls, with a standard deviation of 5.4 balls.

![Figure 6: Correlation of number of balls played by a student with the relative percentage improvement in pronunciation.](image)

In the second phase of the experiment, when we performed the manual pronunciation test, 27 of the original 63 students...
were not present. Out of the common 36 students that were present in the phase 1 and phase 2, a relative improvement of 20.53% was seen. We plot the relative percentage of improvement for each of these 36 students in relation to the number of balls that they had played on the game during the one-week period (Figure 6). The Pearson correlation of the improvement in pronunciation score with the number of balls played is 0.24.

The week in which the participants were asked to form teams for the tournament saw significant activity on the cricket game. A total of 2187 balls were played by the students in the third phase. When the final manual evaluations were conducted, of the 36 students common to both phase I and phase II, 26 were present for the phase III evaluations. These 26 students were part of the final tournament. They were joined by 28 other students (some of whom were part of the phase II evaluations) and out of this total of 54 students, 9 teams of six students each were formed for the tournament.

A comparison analysis of the 26 students that were common to all the three phases of the experiment is shown in Figure 7. The figure establishes that most bars (i.e., students) finish with their highest score being in the phase III, thus establishing that their pronunciation did improve through the process of practicing for the tournament and eventually participating in it.

The most significant evaluation of the game was to compare the manual performance of the pronunciation tests with the individual scores made by the students. The Pearson correlation between the individual scores in the tournament and the manual improvement made from phase I was 0.49 for these students.

Eventually the team that won the tournament also had the student that made the maximum score and hence was given the title “Sachin Tendulkar”. The manual pronunciation test scores of this student in the three phases were 24, 28 and 29. The scores indicate that he had good English pronunciation already at the start of the tournament and therefore did not gain significantly from the game. However he did practice the game multiple times and had played 284 balls before the tournament.

The analysis of the experimental results revealed that (a) the students played the game multiple times and (b) the students’ pronunciation improved as a result of playing the game. The improvement was reflected in both the manual evaluation of their pronunciation as well as in the pronunciation level as reflected in the scores that they achieved in the game. An important finding was that the pronunciation improvement found in the manual evaluation was reflected by parallel improvement in the game scores. Enthusiasm levels were high and game-play was observed. The game gave rise to collaborative interaction leading to team building. Players also were observed expressing frustration with other team members, in the context of high levels of excitement generated by the competition.

OBSERVATIONS AND DISCUSSION

In this section, we discuss in more depth additional observations made during the tournament. In total, 66 students were observed in action with the game.

Team Formation and Selection. When students were forming their teams, we observed that each team was built according to the current social circle of the captain. Later, all the teams got restructured in the process. We observed that the nominated captains tried and in few cases fought among themselves to form their teams consisting of students who regularly attended the school or who were supposedly good in the studies. A captain said, “I won’t let Ashima [another student] leave my team, she knows lot of English words and other team get benefits” Another captain looked worried and told us, “All of my friends are skipping school and I fear that they might not come on the day of tournament. I will make a new team.”

Collaboration and Team Work. The competition was titled “Who wants to be Sachin Tendulkar?” and prizes were announced for both the “most valuable player” of series (“Sachin Tendulkar”) and the winning team. During the final round, we noticed among all the teams, the major focus of each student was that their team wins. There were lot of giggles, applauses and pats when any team member answered correctly and the team scored. In case of a wrong answer, the team members reacted by sighs, holding their heads or demonstrating frustration. We also observed whispers and prompts to weaker team members on various occasions (cf. Figure 8, left). A loosing captain commented after the game, “I told Anil [student] to practice more, it’s due to him our team has suffered.” While Anil complained, “I got the harder words than the others”.

The team engagement and passion for the game continued beyond scoring; after some incorrect attempts by a team member, other members later spoke the correct answer, perhaps to establish that they knew the answer. The room in which the competition was held was surrounded by the other teams, who were interested to see and hear how the
Gender and User Experience

Several observations were made during the tournament concerning the students’ user experience with the game from the perspective of gender. Because the evaluation did not focus on gender-specific aspects of the game, these observations are informal in nature and comprise a series of remarks, which we loosely structure according to the framework of Forlizzi & Battarbee [7]. This framework divides user experience in three parts: “experience” as related to users achieving their goals within the usage context, “an experience” as reflected in interactions and emotional or behavioral changes, and “co-experience”, when shared with others in social context.

In terms of “experience”, both male and female students were observed to achieve the goals of successful game play. Although the overall winning team was composed of male students, a female team won the competition at the level of class 4. The reactions of the students during play suggested a tendency of male students to assess goal achievement with respect to their individual success and react more strongly to their own individual failure. In terms of “an experience”, teams of female students demonstrated reactions that could indicate the game gave them a different feeling of completion than experienced by teams of male students. A number of captains of the female teams that lost requested another chance or another tournament in the near future. In terms of “co-experience”, observations suggested that the experience of the female teams was more inclusive than the male teams. Their attempts to answer were more collective, giggling and applause often ensued when any team member scored runs, and shared happiness with team success was more visibly externalized.

Phones and Phone Sharing. The mobile telephone as a platform was apparently appreciated by the students. They showed visible signs of enjoyment while interacting with the system. The average duration of a use session was in the range of 15-20 minutes. This observation was particularly gratifying in light of exploratory studies with other applications carried out in rural areas located in other parts of India, but sharing similarity with Mewat. During these studies, IVR systems are not well received by users, who experienced high levels of frustration with interacting with the system. In the case of the cricket game, the students did not demonstrate any evidence of facing similar usability or acceptability problems.

In rural regions of India, often the mobile phone is not a personal device but is readily shared amongst the family members. We observed that although most of the parents shared their mobile phones with the students, a few students could not practice for the tournament as their family members refrained from sharing their phones due to infrastructural issues. For instance, one student complained, “My elder brother didn’t give the phone to me. He said it will drain the battery and he can’t charge as electrical supply is being short these days.”

GENERALIZATION OF DESIGN INSIGHTS FOR FUTURE APPLICATIONS

As previously mentioned, the field study that led to the design of the cricket game was motivated by our underlying appreciation that the intersection of a local culture and technology reveals various constraints, motivations, needs and opportunities for the design of any application of technology. This perspective is shared, sometimes implicitly, across a wide range of design practices that focuses on specific socio-cultural settings. Best representative of our own perspective, is that of Dourish and Bell [3], as expressed by their statement, “We start from the position that technology and social life are not easily separated – that social life is already entwined with technologies and technological practices of all kinds, and that technologies and their designs are embedded in social systems that they reflect, reproduce and transform.” (p. 59).

In order to allow future design efforts to make more optimal use of the lessons learned during the development of our cricket game, we include here a short discussion on the possible generalization of our design insights (as they are stated in the section “Game Conceptualization and Design”) to future settings and applications.

First, the field study revealed that the application must be highly motivational in order to compensate for lack of opportunities within the community for students to engage in the interactions necessary to improve their spoken English. Generalizing this point, we can anticipate that engaging activities and practices that are already established in the community can provide a vehicle for extending motivations to domains that reach beyond capacity of the community.

Second, the field study identified cricket as the particular vehicle suited for Mewat because of its popularity and acceptability in the community. The most obvious generalization of this point is that the popularity of cricket extends to other parts of India and also other developing regions like Pakistan, Bangladesh and Sri Lanka. In cricket, the game scoring and the commentary track reinforce progress and success within the game. Users transfer their understanding and interest in the progress in a cricket game to their own progress in pronunciation improvement. The
structure of the game encourages both collaboration and individual achievement. Further generalizing this insight, we expect that the effectiveness of cricket as a vehicle might extend to other learning goals beyond spoken English and also that the application could be based on other highly popular games, for example, soccer.

Third, the field study identified high motivation in the community for learning spoken English skills and acknowledgment of the lack of community resources to support this learning. We would like to highlight this point as an important aspect of the cricket game and one that was probably essential to the engagement of the users with the game. We must be careful when generalizing this point, since within our setting we only developed one application. However, we can state that we believe that by concentrating on a goal shared within the community and consistent with commonly held values, we were able to help to ensure that the resulting application faced a lower threshold for acceptance and appropriation, since in a sense it already “belonged” to the community from the beginning of the design process.

In this way, our work is related to the larger issue of how to design technologies that are “born appropriated”. Here, we would like to specifically mention that a designer focusing on existing goals and motivations may be better able to avoid becoming an all-controlling puppet master, discussed by McGonigal [15], who dictates the goals of players in a game during the design process.

Fourth, the field study documented high penetration of low-end mobile phones in the area. Generalizing this point, we would like to emphasize the importance not only of the availability of the mobile phones, but also the importance of patterns of accessibility and use of mobile phones and voice modality. The students were “allowed” to play the game by their parents and in general the community response suggested that the game was welcome. The borrowing of mobile phones by the students needed to be negotiated within families, but in general this proved possible, even in the case of female student. The voice modality circumvented restrictions respected in the community on the use of images and the game could be accepted as an extension of listening to cricket on the radio, already a well-established and accepted pastime.

In sum, the success of the application in turn reflects the viability of an approach that allows the design of an application concept to be informed by a field study. The main design insights of the study show potential to generalize beyond the particular socio-cultural setting in Mewat, suggesting the conclusion that design processes can benefit if the design process begins with a field study that allows both socio-cultural limitations and community motivations to inform the design process.

CONCLUSION
This paper has presented a mobile phone based cricket game for improving the spoken English pronunciation of school children. The game was designed and tested within a specific socio-cultural context in rural India, the Mewat district of Haryana State of India. The paper reported on a field study that identified challenges, opportunities, and community needs for mobile phone applications in primary schools in this context. The field-study informed and shaped the design and implementation of the mobile phone based cricket game. The paper described the evaluation of the game with groups of students at a rural school in Mewat. The evaluation demonstrated the potential of the game to engage students and facilitate improvement in their spoken English pronunciation. Finally, the paper provided a discussion on future design possibilities beyond the specific socio-cultural setting of Mewat.

Our future work will involve investigating spoken English learning amongst students on a long-term basis. A possible approach is to run the game for duration of an academic year and simultaneously developing the game’s content parallel to the English curriculum of the particular class of the school. This broader engagement will involve more extensive testing on aspects of learning and investigation into ways in which the mobile cricket game could be developed to complement education for schools in rural areas. For example, we noticed an increase in the competitive urge among the students as the tournament approached. We would like to gain a deeper understanding of the balance of competition and collaboration necessary to promote optimal learning and how our application can achieve this balance.

The mobile cricket game serves as an example of an application that helps to uncover the potential benefits of a design process that takes socio-cultural limitations and community motivations into account from the very beginning of the design process. In the future, we will explore similar mobile phone applications that make possible learning of subjects and skills that go beyond spoken English and that are based on games that go beyond cricket, to include other popular sports, such as soccer. We also will focus on extending the game beyond the specific social-cultural setting of Mewat. This extension will allow us to gain an even deeper understanding of how mobile phone applications and social life are entwined and how to design applications at the intersection of technology and local culture.

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