A teachers' voice forum for disadvantaged schools in India

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Please write a 3-4 sentence description of project (not to exceed 50 words). This description will be used throughout the application process to explain your project to application screeners, judges and others involved in the process. Use simple, common terms so that those who do not have a technology background may also understand the project's concept.

We work with needy schools in rural areas and urban slums in India, many of which are isolated single-teacher schools that lack training and expertise. We are building a virtual voice forum that allows these teachers to share with peers elsewhere and better trained counterparts in good urban schools. Such a forum allows the teachers to seek advice, receive feedback, share experiences, conduct virtual student and teacher activities. We must accomplish this in a resource-constrained environment that has no smart phones, no Internet, no computers. We discuss how we build the forum with only "dumb" phones and "phone radio boxes" that derive their "smartness" from connections with voice servers in the "cloud." Our ambition is to make the system reach about 100,000 under-served schools in the impoverished state of Uttar Pradesh in the coming years.

(too long, rewritten to be less than 50 words:

We work with needy schools in rural India. Many are isolated single-teacher schools that lack resources. We are building a virtual voice forum for teachers with "dumb" phones served by voice servers that implement the sharing intelligence.)

2. Social Need

• What is the social need addressed? Give a general overview of the issue which is being addressed. Try not to describe how your technology impacts this issue; that will be covered in section 3. This is the section to describe the problem you are addressing.

• Please address what geographic areas this issue affects and the extent of the issue in these areas.

Digital StudyHall (DSH) develops and deploys low-cost, practical, and effective technologies to help improve education for disadvantaged schools in some of the poorest areas in India, Pakistan, and soon, Tibet. Many of these are single-teacher schools in rural areas and urban slums. They lack knowledge and training. They have to cope with difficult social economic issues such as child labor, child marriage, gender bias, and caste bias. Many are in remote areas. It's understandable that often a sense of frustration, isolation, and hopelessness can set in at such a place.

A possible solution to this problem became apparent during the face-to-face workshops we conducted with teachers from some of these schools. The workshop had a packed agenda, but the attendees spent an unexpectedly large amount of time in spontaneous discussions with each other; the discussions were lively and substantive; it was often a
difficult decision to force an end to a discussion so we could move onto the next item on
the agenda. The attendees remarked they felt that the discussions and exchanges left
them renewed and reinvigorated when they departed the workshops.

The problem, unfortunately, is that these face-to-face workshops are difficult to arrange.
Because the schools are spread apart far from each other, we need to overcome difficult
logistic challenges, such as arranging transportation and coordinating scheduling. When
teachers leave their schools to attend workshops, they have to cancel classes. It's a
deeply conservative society and many still feel uncomfortable about the idea of female
teachers traveling without the company of male "guardians." The end result of all these
difficulties is that these workshops, though widely perceived to be very productive, are
rare events.

What we would like to provide is a continuous virtual "forum," that allows these teachers
to communicate and share with other teachers, some of whom are peers elsewhere, and
some are better trained counterparts in good urban schools. Such a forum allows the
teachers to seek advice, receive feedback, share experiences, conduct virtual student
and teacher activities. The forum doesn't just allow mere one-on-one conversations; its
perhaps most important capability is enabling sharing: an exchange that has occurred
between a pair of teachers, if relevant, for example, could be stored and shared with a
larger group. In this way, a physically isolated teacher may feel that she is constantly a
part of a larger caring virtual community, a community that shares and understands her
problems and frustrations, a community that is eager to speak up to offer timely and
relevant advice, a community that can provide a much needed virtual pad-on-the-back
when she accomplishes something against all odds.

How does one go about implementing such a forum? These are extremely resource-
constrained areas. There is no computer, no broadband. (DSH helps solve electricity
issues, a necessity for some of the other DSH technologies and programs.) There is
often cell coverage, but our teachers cannot afford smart phones; people just have
"dumb" voice phones (which are more than adequate for them). In our experience, due
to lack of familiarity (not lack of smarts), something that western users might take for
granted, such as a hierarchical voice menu, is difficult for audience to grasp.

So this is what we set out to build: an easy to use voice forum that enables sharing, in
an extremely resource-constrained environment.

3. About the Project

• What is your project?
• How does it address the need/ issue described in section 2?
• How does it build on existing technologies?
• What makes your wireless related innovation unique or different?

We call the system we are building the "DSH Voice Forum." In its simplest form,
functionally, here's how it works. At times picked by participating teachers, the system
calls the teachers. During such a call, a teacher hears a message left on the system
earlier (and stored in a voice database) by others, and after that, she gets to optionally
record a message of her own (to be hard by others) before hanging up.

Here are some example calls made on a prototype system that we have been piloting. A
teacher from an urban slum school says: "Girls as young as twelve years old get married
off in my school. This is wrong. When I hear this, I visit the girls' families and talk to the
parents to try to stop or delay the marriages. I think all the teachers should do this."
A few days later, a rural teacher follows up with this message: "Yes, girl students are treated unfairly. Parents tell us that girls need to help in the field during harvest season; otherwise, they say they will starve. But parents are much less likely to say the same thing about boys."

This lively thread continues for about a month, with teachers from all the schools chiming in with their own experiences. Towards the end of the thread, yet another teacher says: "This discussion has been wonderful. This kind of conversation would never have occurred in our school or in our village if we hadn't heard it on the voice forum."

About 15% to 20% of the participant teachers are active contributors; the rest are "lurkers"—they listen diligently but seldom speak up. This is not unexpected—one of the intended purposes of the system is to get some of the more passive and less progressive participants to learn from the more proactive ones, for without the voice forum, it's not easy for someone in a one-teacher school in the middle of nowhere to have role models to look up to.

Technically, how is our voice forum interesting? We discuss three aspects. First is its "edge-only" light-weight implementation. Traditionally, such an application is typically developed with expensive proprietary PBX equipment and software, often in conjunction with carriers. Such an approach is costly, difficult to customize, and difficult to justify for very small groups of users. Our system is built on top of cheap ISDN line cards plugged into conventional PCs and the open-source Asterisk framework. (The voice servers simply sit in our regional offices.) The decentralized development and deployment is low-cost, provides extreme ease of customization, makes it feasible for us to experiment with tailor-made solutions for small groups of teachers.

The second innovation is its interface. As mentioned earlier, we were forced to conclude that a traditional hierarchical voice menu wouldn't work—if it's not something that our teachers feel comfortable with, they simply wouldn't use it. After much experimentation, we have settled on a simple menu-less interface: during each call, a teacher gets to hear a message and at the end of it, optionally gets to record a message of her own. That's it! The voice server, however, gets to do something clever during a call. Because the server "knows" who the user is and her entire call history, the server gets to "guess" the "best" message to play at this moment for this user. (As an obvious example, if a teacher has recorded a message of her own earlier and someone else has later recorded a followup reply, that followup gets played to the first teacher when she visits the voice forum again.) There's a whole series of heuristic rules that the voice server employs to decide what messages to play. In a sense, the interface "intelligence" is moved into the "cloud," where far richer data is available to enable good decisions; the result is something that's both extremely simple to use and relevant to callers and listeners.

The third interesting aspect is the way the voice forum integrates with the Internet. The voice servers housed at individual regional offices communicate with each other to form a network of voice servers. While our teachers at the remote schools exclusively access the voice forum with simple voice phones, other users (including staff, more sophisticated teachers in urban schools, and education experts and partners) get to access the voice forum through a web interface served by one of these voice servers. For example, our collaborators at the education schools of University of Washington Seattle and University of California Berkeley access the forum via a US-based voice server. After browsing or searching the incoming messages, a US-based collaborator can easily use the built-in VOIP features to send a message to either a specific Indian village teacher or a group of teachers. Therefore, the voice forum is a "hybrid network" that, irrespective of the technologies people use to access it, allows everyone to share and contribute equally.
We have also placed "phone radio boxes" in some of our schools: these are phone boxes that are equipped with amplified speakers and microphones. Such a box allows student group activities such as singing, science question, and poetry reading competitions; so students at a small isolated single-teacher school can compete against kids elsewhere.

We have started working with state teacher training institutes so that the trainers and trainees at these institutes will participate in the voice forum as well. As we allow selective "cross talk" between regular teachers’ groups and the trainees’ groups, the trainees may benefit from experiences and insights gained in real schools. This contributes to much needed reform at the training institutes, which have been traditionally disconnected from real school environments.

Yet another group that will gain their own voice forum is a local grassroots HIV/AIDS awareness campaign organization: the organization works along highways where professions such as truckers and sex workers have played major roles in spreading the virus. The voice forum will allow the villagers, staff, and health professionals elsewhere to share their concerns and knowledge.

4. Stage of the Project

At what stage is your project (ie. prototype, field testing, etc)?

We started developing the voice forum about seven months ago; field testing involving about 80 teachers (in the state of Uttar Pradesh, one of the poorest states in India) have been ongoing in the past three months. It has been an iterative refinement process so that new requirements are being continuously gathered from field testing and newly implemented features and changes are immediately rolled out for field trials. We have found the fine-grained feedback loop essential as we have seen time and again that our initial assumptions and designs often proven flawed when facing an audience and environment that present unique challenges.

The prototype voice forum can be accessed at our US-based voice server:

http://dsh.cs.washington.edu:8080/admin/db/

The system is constantly evolving: as it reflects almost daily changes, a visitor to the prototype site may experience occasional bugs.

As of January of 2010, the prototype has logged a total of about 2,000 calls, lasting 257,000 seconds. About one fifth of these, lasting a total of 46,000 seconds have been new messages recorded by teachers.

5. Project Implementation

- How long do you anticipate before you will be able to implement your project?
- What steps will you take before you implement your project?
- What steps will be taken to implement this innovation in the field?
- What key partnerships have been established for implementation?
- How do these partnerships form a multidisciplinary capacity?
- Are there partnerships that will need to be established in the future for successful implementation?
- Describe how the project has evolved to date and how you see it evolving over the
next three years.

As discussed earlier, the implementation and field piloting of the project has already been ongoing in the past half year or so.

The acute need for something like the proposed voice forum has only been recognized in the context of the other programs of DSH (such as a teachers' video sharing system) that have already been working in the field in the past five years. As a result, there is an existing network of schools and teachers that are ready and eager to participate in the new pilot from day one. There are about 20 schools that we work with in Uttar Pradesh, nine of which have been participating in the initial pilot in the past half year or so. The remaining eleven would be incorporated gradually as the development of the system continues. DSH also works in Calcutta, Pune, and Islamabad (Pakistan). We anticipate work in Tibet to begin sometime during the coming year. These other regional "hubs" would be incorporated into the voice forum in the coming years.

Recently, we have established new partnerships with the network of teacher training institutes run by the state government of Uttar Pradesh. It's been recognized that the curriculum and activities at these training institutes have been disconnected from real teaching environments and reform that would more closely tie the training activities to real schools, their activities, and their teachers is sorely needed. The proposed voice forum will be extended to the trainers and trainees in the coming months so that the members of the training institutes can join discussion groups formed by other teachers.

As discussed earlier, we are also working on extending the voice forum to community health awareness campaigns. We are partnering with several organizations that have an excellent track record of outreach programs. Two of these organizations in Lucknow are "Lokarpit," a grassroots HIV/AIDS awareness campaign organization, and St. Mary's Polyclinic, a hospital dedicated to serving the rural poor and run periodic "health camps" in villages. The aim of extending the voice forum to these organizations is to allow the currently limited information exchange and sharing to benefit more people and to occur more consistently.

The work conducted by DSH in general and the voice forum in particular are multi-disciplinary by necessity. The technical platform must serve the needs of the aims defined by education experts and teachers; these aims include pedagogy dissemination, combating social biases, strengthening a sense of community, and others. DSH is led by Dr. Randolph Wang, an ex-faculty at the Computer Science Department at Princeton, and Dr. Urvashi Sahni, who has a PhD in education from the University of California and runs a foundation that works with a network of schools in India. We collaborate with faculty at the colleges of education at University of Washington and University of California. The diversity and quality of the student interns that we have attracted over the years is perhaps one indication of the multi-disciplinary nature of our work: today, the ex-interns of DSH are in graduate programs that include Computer Science at Stanford and Berkeley, Education at University of Washington, Public Health at Berkeley and Columbia.

Here's a little more on how the voice forum evolved. DSH started in 2005 as a community video sharing system for poor schools: the best grassroots teachers' lessons are filmed and distributed on DVDs to disadvantaged schools that lack trained teachers and content. (http://dsh.cs.washington.edu) We provide low-cost player and electric solutions so the videos can be played in classes. The local teachers "mediate" the videos, so they can train themselves as well as giving better lessons to their students. DSH has won numerous awards in recent years. Despite the initial successes, the voice forum discussed in this proposal evolved out of recognizing some of the shortcomings of the video sharing experience: the DVD sharing program is mainly one-way (from the "producers" to the "consumers"), has high latency, and is most suitable for bulk data. Among other things, the voice forum is a perfect complementary program: it's more
peer-to-peer and allows broader participation; it's instantaneous and convenient so it's easier to provide and receive quick feedback; the relatively small amount of voice information involved means the system is cost-effective and agile while being capable of reaching a large audience.

As the development of the voice forum continued, we increasingly recognized that many assumptions of a typical IVR system wouldn't work in our environment. We must work closely with teachers and adapt. The need for a menu-less interface, discussed earlier, is such an example. We had to confront many other issues. For example, many of our teachers earn less than $2 a day and it was important for us to work out a way that doesn't impose an undue monetary burden on our teachers while still retaining usage convenience. The system can only work and achieve broad acceptance only if we resolve all the many subtle complications. As we gradually refine the system and expand the participant base, our ambition in the next three years is to make the system available to all schools in the state of Uttar Pradesh: there are about 100,000 under-served schools in this state alone, and we believe that the voice forum, in conjunction with some of the other DSH programs, can play an important role in improving the quality of basic education at these needy places.

6. Measuring Impact

How do you propose to measure and evaluate the innovation’s impact?

The proposed voice forum is one of several programs that DSH conducts with its network of needy schools. There is an existing evaluation mechanism that assesses the overall academic improvement at these schools. For example, there are unit tests and quarterly tests.

There are also non-quantitative evaluations, which can sometimes shed better insights than mere quantitative results. Periodically, our staff, acting only as passive observers, film classes in the schools that we work with. We invite our collaborators at education colleges at UC-Berkeley and UW-Seattle to help analyze the resulting footage, carefully documenting details such as the types and frequency of interactive exchanges conducted by teachers, questions that require more critical thinking (instead of memorization-centric approaches, which, unfortunately, are all too typical of Indian school culture), the level and type of student responses etc. These are indicators of changes of general classroom culture, which we expect the proposed voice forum should play an important role in effecting.

In addition, we collect teacher feedback on the various DSH programs. The voice forum is a perfectly suited vehicle for gathering feedback about itself. Statistics such as the number of participants, the volume of traffic, the variety of topics and activities, the sophistication level of the messages are all indicators of how well the system is received by its target audience.

7. Scalability

If successful, how will your innovation scale? How will long-term financial sustainability be achieved?

Ever since almost the beginning of the DSH efforts in 2005, we have been in close contact with the state government of Uttar Pradesh and the government has been an
The fact that we are currently piloting a preliminary version of the voice forum with selected district teacher training centers (run by the government) and, soon, eleven additional government schools is no accident. As we gain experience and continue to refine the voice forum, we expect to bring more of the government-run teacher training centers and schools into the system. As discussed earlier, our aim for the voice forum is to reach all the teachers of the more than 100,000 government schools in the state of UP.

A key theme of all the undertakings of DSH is cost-effectiveness: we work on ideas that utilize practical and cheap technology components so there's hope of large-scale deployment. In the case of the proposed voice forum, we do not demand that users possess smart phones; "dumb" voice phones would do and our target audience already have them. (For those who don't, as discussed earlier, we are distributing shared "phone-radio boxes.") The only question is how to make the "dumb" devices that people already have do more interesting things. The "intelligence" of the system is implemented in the voice servers. So the proposed voice forum does not require a massive investment in new end-user devices. The only infrastructure investment required is the modest needs of voice servers and line cards; unlike expensive proprietary PBX equipment, the open-source line cards and regular PCs are cheap, so the equipment needs of a large-scale realization of the proposed voice forum, unlike most of the technology-for-education initiatives, can be realistically and easily met. The state government, for example, is quite willing to make this modest investment.