



## *Learning English as a Foreign Language in Developing Regions*

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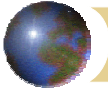
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This material is based in part upon work supported by the National Science Foundation under Grant No. 0326582.

(The entire script takes approximately 20 minutes to read aloud. The italicized text can be skipped if shooting for a 15-minute talk.)



## Outline

- ✦ Problem statement
- ✦ Literature review
- ✦ Design patterns
- ✦ Fieldwork + key results
  
- ✦ Proposed solution
- ✦ Expected deliverables



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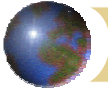
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Before I start, let me clarify that even though our work targets both spoken and written English in developing regions, it is potentially applicable to native language literacy as well. But given that English is the primary language that we are familiar with, we decided that it is most practical to focus on English as our test case.

I will first talk about what we have been doing for 1.5 years and some of our initial results. I will then show how these results motivate the technology solution that we are proposing for learning English as a foreign language in Third World regions.



## Problem Statement

### ✦ Unmet demand for English literacy in

- ✦ Bangladesh
- ✦ Cambodia
- ✦ China
- ✦ India
- ✦ South Africa
- ✦ Sri Lanka
- ✦ Other developing countries

### ✦ Both conversational and written English

Sources: Informal interviews and some fieldwork in above regions

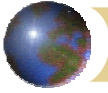


We have been having conversations with educators, international development professionals and our colleagues who work in other developing countries listed on this slide. *Something that we keep hearing over and over again is that a fair proportion of the local population wants to develop their skills in conversational and written English.* (pause)

To some extent, this demand is currently unmet. In India, the state government of Uttar Pradesh made English lessons a compulsory part of the curriculum due to demand from parents. But during our fieldwork in Uttar Pradesh, we were not able to interact with children from the urban slums and the rural schools – or even their teachers -- in English. In fact, many of the children had more than two years of English lessons but were unable to read every letter of the alphabet to us.

*Similarly, I have heard from a colleague, who does fieldwork in Sri Lanka, about a village with 50 young people keen to learn English. But no English teacher was willing to travel to this village. Similarly, I understand from her that many high school graduates in Sri Lanka could read some English material but may not necessarily comprehend its meaning. This is commonly described as being “functionally illiterate.”*

*There are other related stories from informants familiar with the other developing countries listed on this slide.*



## *Importance of English Literacy*

- ✦ Employment opportunities
- ✦ Internet and computer usage
- ✦ High school and higher education

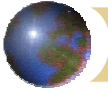


*Since English is an international language used for global trade and commerce, it comes naturally that English literacy is important to a certain extent. In Bangladesh, for example, multinational corporations look for the ability to speak English when interviewing job applicants.*

*But economic opportunities for the English-literate are not restricted to urban centers. As an example, I am told that in Sri Lanka, there is a large potential for Business Process Outsourcing (BPO) centers in the rural areas. A minimal level of English literacy is required, but a year of English lessons is anticipated to be enough for most of these activities.*

On top of that, since much of the content on the Internet is currently in English, it is almost impossible to be an effective Internet user without being English literate.

*We therefore believe that conversational and written English is a good test case to focus on for a start.*

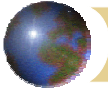


## *Lit. Review: Language Acquisition*

- ✦ History of literacy and schooling
- ✦ Theoretical issues in literacy
- ✦ Best practices for teaching English as a foreign language



In order to take a human-centered approach to designing a technology solution, we looked at the literature on best practices for teaching English as a foreign language.



## *Lit. Review: Educational Technology*

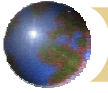
- ✦ Computer-assisted language learning
- ✦ Electronic games for education
- ✦ History of educational computing in developed and developing countries



*And how these best practices are embodied in existing work on computer-assisted language learning.*

*We also look at how technology can be used to make the learning process more enjoyable, such as through electronic games.*

An important thing to remember is that educational computing is not totally new in developing countries. Over 10 Third World countries have experimented with computers in schools since the 1980s. It is therefore important that we learn from their lessons.



## Design Patterns

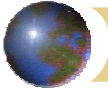
- ✦ Capture essence of design problems and their proven solutions in compact form
- ✦ Benefit: reuse solutions to frequent problems; avoid reinventing the wheel
- ✦ A *pattern language* is a collection of related patterns



Along the same line, today's commercial products for language learning incorporate a number of effective methods to help the user learn new languages. It is therefore important that we reuse these solutions and not reinvent the wheel.

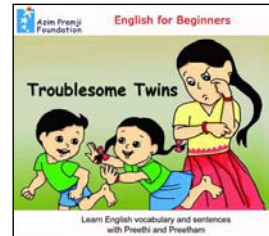
One way to do this is to make use of design patterns. A design pattern is basically the essence of a design problem and its proven solutions, that you distill and represent in its most skeletal form.

And once you have many patterns that are related, you can organize them into a collection known as a pattern language. Just in case I'm confusing you here, a pattern language is not a computer programming language.



## Language Games for Children

- ✦ 8 localized English learning packages, Azim Premji Foundation, India
- ✦ Who is Oscar Lake?, Language Publications Interactive
- ✦ ACHIEVE!: Writing & Language Arts, The Learning Company
- ✦ Caillou Magical Adventures, Brighter Child Interactive, LLC.
- ✦ Clifford The Big Red Dog Reading Pack, Scholastic
- ✦ I Spy Fantasy: Brain-Building Games, Scholastic
- ✦ Mia: The Kidnap Caper, Kutoka Interactive
- ✦ Reader Rabbit, Riverdeep Interactive Learning



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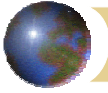
In order to derive design patterns from existing products, we have been looking at language games that target children.

*In particular, I want to draw your attention to the top two games on this list.*

The Azim Premji Foundation in India has developed 8 localized English language learning software packages for use in over 10,000 affiliated rural schools in India.

There is also “Who is Oscar Lake?”, which is a highly-rated adventure game for learning a foreign language through fun and immersion. In this game, the player needs to apply his command of the foreign language in order to solve the mystery and win the game. This game provided some inspirations for the solution that I am going to propose. Hence, I will be showing some screenshots from “Who is Oscar Lake?” to illustrate the proposed solution.





## Best-selling Foreign Language Packages

### ✦ Interactive software

- ✦ Hindi Level 1 (Personal Edition), Rosetta Stone
- ✦ Instant Immersion Mandarin + Spanish v2.0, Topics Entertainment



### ✦ Audio CDs

- ✦ Hindi (Compact) Pimsleur Language Program, Simon & Schuster



We also looked at a couple of best-selling foreign language packages.

*In a short while, I will show you an example of a design pattern that we distilled from all of these commercial products.*

**Fieldwork**

- ✦ Uttar Pradesh, India
- ✦ Collaboration with Dr. Urvashi Sahni (Study Hall Educational Foundation)
- ✦ Summer 2004: needs assessment
- ✦ Winter 2004: feasibility study (urban slums children)
- ✦ Summer 2005: feasibility study (rural school children)

Reference: Kam et al. **Designing Educational Technology for Developing Regions: Some Preliminary Hypotheses.** Presented at IEEE 3rd International Workshop on Technology for Education in Developing Countries (Kaohsiung, Taiwan), 2005.

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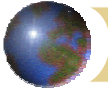
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To complement the background research that we have been doing, we conducted three field studies in Uttar Pradesh to familiarize ourselves with the ground-level conditions of educational settings in a developing region. Our field studies were hosted by Dr. Urvashi Sahni, who is herself a Berkeley graduate. She received her Ph.D. in Education from UC Berkeley’s Graduate School of Education and is widely recognized for her efforts to reform education in India.

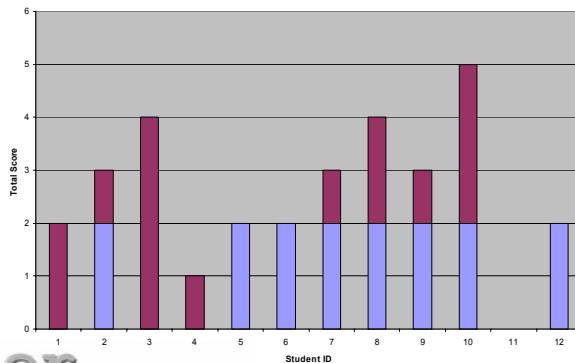
*From our first field study, we identified some ideas for potential technology solutions.* In subsequent field studies, we set out to explore if some of these ideas would work, by performing feasibility studies using off-the-shelf software that most closely meet our needs. In doing so, *we found out that some of our initial ideas were not feasible.* We saved ourselves a lot of pain down the road, without having to invest considerable time and resources into implementing complete systems only to learn later that they cannot work in practice.

I won’t go into detail about our ideas, which you can read about in our IEEE workshop paper. Instead, I want to highlight only three key findings from our field studies that motivate our proposed solution.



## Key Results from Fieldwork

- Children learn English vocabulary through game (Word Munchers Deluxe)



■ Pre-test scores  
■ Post-test gains

p-value < 0.01  
 std. dev. = 1.4

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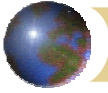
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Firstly, we conducted a pre-test with 12 children at a rural school children. After that, we broke them up into small groups and assigned each group to a shared computer. We gave each group about 1.5 hours to play this English vocabulary building game -- Word Munchers Deluxe. After that, we conducted a post-test to determine if they had learned some of the words that this game was trying to teach.

*The mean score was initially 1.3 and rose to 2.6 after Word Munchers was introduced. The post-test gains were statistically significant and we conclude that it is possible for rural school children to learn English by playing electronic games.*



## Key Results from Fieldwork



- ✦ Children are responsible with digital cameras loaned overnight (and weekend) to them
- ✦ Time demands on children restricted their use of computers at schools and telecenters



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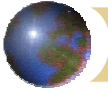
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Secondly, we loaned low-cost digital cameras to rural school children to take home overnight throughout a 2-week period. The purpose was to have the children tell us more about their everyday lives using photographs. We learned that they can be trusted to be responsible with these mobile devices. In particular, there was at least one day when it rained, but the children nonetheless kept the cameras dry and returned them to us in good condition.

Thirdly, we learned that children in Uttar Pradesh have numerous demands on their time, such as the need to do extensive housework, help in the fields, participate in festivals, and so on. We learned this fact the hard way when we actually had to cancel two sessions with children from the urban slums because they had other commitments cropping up at the last minute. *On top of their time commitment, there is the more basic problem of having very little time to practice using computers because of the very limited number of computers.*

On the other hand, we learned from their photographs that they have snippets of time in their waking hours for homework (points to photo on left), to play (points to photo in center), and to congregate at places of worship (points to photo on right).



## Solution Overview

1. **Mobile learning** on cellphones:  
Personalized coaching and feedback in private at flexible hours, locations



2. **Immersive learning** on shared computers:  
Practicing and testing of English proficiency in multi-player adventure game



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What all of these findings suggest is that any practical technology solution for English literacy cannot rely on the assumption that learners will have adequate time to access computers in shared computing centers and other centralized locations. Instead, technology must enable learners to learn at convenient times and places. A mobile device such as the cellphone that provides the learner with this convenience together with personalized coaching and feedback thus seem appropriate.

But at the same time, adventure games for the computer such as “Who is Oscar Lake?” can provide an immersive virtual environment for language learners to practice their English language skills in semi-authentic settings. And immersive learning in authentic settings is an effective approach to language learning. (pause) To provide an enjoyable play experience, however, the computer may be a more appropriate user-interface than the cellphone.

**Example of Design Pattern**

May I help you?

- ✦ Builds vocabulary of common phrases
- ✦ Develops listening comprehension

Don't remember what "May I help you?" means

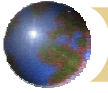
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To help you better understand the proposed solution, let me start by giving an example of part one, which is mobile learning at a convenient time and place, such as the learner's home. *After that, I will give an example of part two, which is immersive learning in a virtual environment.*

*As you might remember, a design pattern is a compact way of representing a common design problem and effective solutions to this problem. A design pattern for helping learners to develop a vocabulary of common phrases and listening comprehension could work like this:*

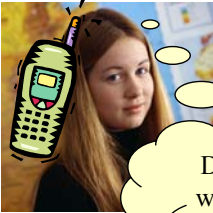
Suppose that the learner does not understand what "May I help you?" means when she hears it. A cellphone that implements this pattern could speak "May I help you?" and at the same time, display an icon that represents this idea.



## Example of Design Pattern

Goodbye. See you tomorrow.

- ✦ Builds vocabulary of common phrases
- ✦ Develops listening comprehension



Don't remember what "May I help you?" means

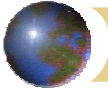
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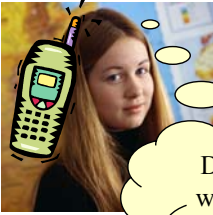
The cellphone next speaks, "Goodbye. See you tomorrow" and display a corresponding icon.



## Example of Design Pattern

Goodnight.

- ✦ Builds vocabulary of common phrases
- ✦ Develops listening comprehension



Don't remember what "May I help you?" means

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And after that, the cellphone says "Goodnight" and displays an icon for this idea.



**Example of Design Pattern**

- ✦ Builds vocabulary of common phrases
- ✦ Develops listening comprehension

May I help you?

Don't remember what "May I help you?" means

- 1.
- 2.
- 3.

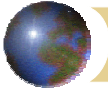
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Finally, it is time for the cellphone to quiz the learner. The cellphone speaks “May I help you?” and displays three icons for the learner to choose from.

If you put yourself in the shoes of the learner, you will realize that the sequence of three spoken phrases followed by the quiz keeps the learner on her toes. If she had been actively engaged with this exercise, she is likely to remember what “May I help you?” mean and pick the correct answer.

*In general, this design pattern can be implemented by randomizing over a sufficiently large question bank.*



## Reading Skills

A photograph of a train schedule board in a station. The board is titled "itinerario de trenes" and has three columns: "destino", "hora", and "número de tren". The board is flanked by two wall-mounted lamps. A person is standing in front of the board, looking at the schedule. The board is mounted on a wall with a grid pattern.

destino	hora	número de tren
Guadalajara	17:45	789
Acapulco	18:15	786
México, D.F.	19:30	785

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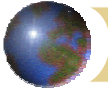
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Now that I have given an example of mobile learning in the home, I will give an example of immersive learning using a shared computer.

An adventure game world is a virtual environment in which the printed word and the written word is ubiquitous. Learners encounter these words as they explore the virtual world and need to be able to understand these words in order to win the game.



## Listening / Reading Comprehension

Habla la Sra. Velásquez.  
Compra un billete. Toma el  
tren de las 5:45 para la  
Ciudad de México.

This is Mrs. Velásquez. Buy a  
ticket. Take the 5:45 train to  
Mexico City.

el auricular  
the receiver



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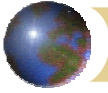
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These words can be presented as oral or written instructions, depending on whether the goal is to develop oral or written language skills.

Here, the player is required to buy a ticket for the 5:45 train to Mexico City.



## Vocabulary Building



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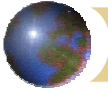
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This screenshot is not a very good example, but you get the idea.

On his way to the ticket office, the player builds up his vocabulary if he needs to identify and even interact with certain objects to win the game.



## Conversational Practice

¿En qué puedo ayudarle?  
May I help you?

una ventanilla  
a ticket window

Un billete para la Ciudad de México, por favor.  
One ticket to Mexico City, please.

Quisiera comprar un billete.  
I'd like to buy a ticket.

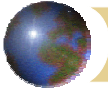
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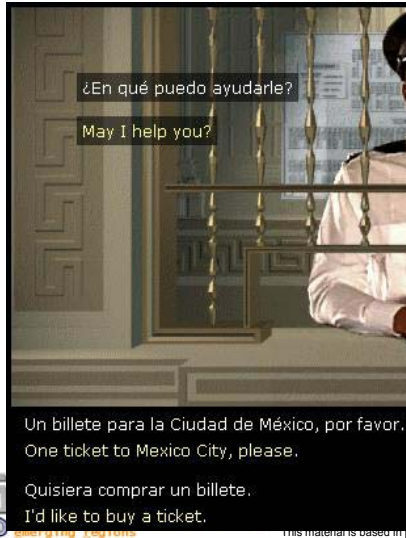
A small inset image in the bottom right corner of the screenshot shows a ticket counter with a sign that says "á a a".

As the player reaches the ticket office, the ticket seller asks: “May I help you?”

The player therefore gets an opportunity to practice communicating in English.



## Multi-Player Gaming



- ✦ Competitive and cooperative play modes
- ✦ Bottleneck: one mouse, keyboard, screen, speaker, microphone



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One of my colleagues who does fieldwork at rural schools in India observed that it is very likely for the kid sitting in the center to monopolize the computer. It therefore makes sense for the adventure game to be designed as a multi-player game, which makes it different from “Who is Oscar Lake?”

Suppose that the game supports both competitive and cooperative modes.

In competitive mode, the first player to provide a correct response to the ticket seller gets the points. But with only one keyboard and one mouse, it can be challenging to determine who gave the correct answer.

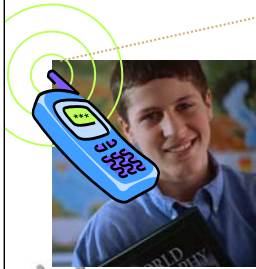
In cooperative mode, each player gets a turn to respond and receives personalized coaching, either from the computer or his group members, until he gets his answer correct. And the game does not proceed until every group member gets the right answer. But with only one set of input devices for the entire group of users, the drawback is that other group members cannot submit their answers in parallel and have to wait for one another.



# Cellphones as Gaming Consoles



Bluetooth connectivity



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The solution that we thought of is to use the same cellphones as gaming consoles. Each player sitting in front of the computer is holding onto a cellphone that is connected to the computer using Bluetooth.

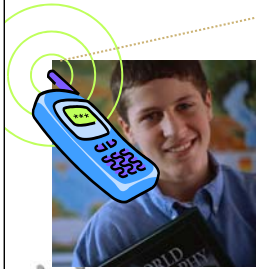




## Multiple-Choice Response



Bluetooth connectivity



Yay! I remember  
what "May I help  
you?" means!



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*If you remember, I gave an example a while ago that shows how you can learn to comprehend the phrase "May I help you?" through mobile learning.*

The girl in the middle remembers what the phrase "May I help you?" means. So she looks at her cellphone's screen for the correct answer among the multiple-choice options that are displayed, and presses the corresponding button on her cellphone's keypad.



**Personalized Coaching:  
Pronunciation Drill**

*I'd like to buy a ticket.*

Bluetooth connectivity

*I'd like to buy a ticket.*

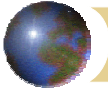
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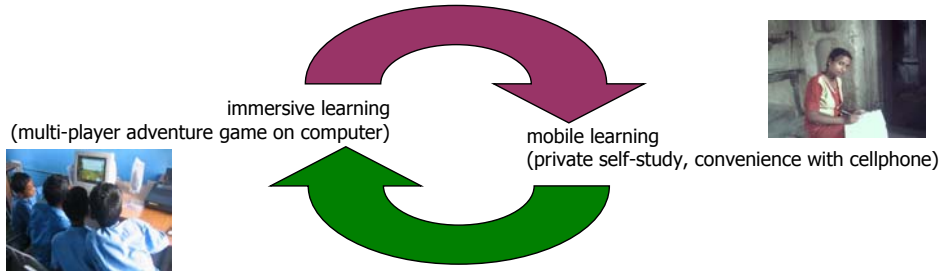
The boy on the left also remembers what this phrase means. But he is ambitious and wants to give the response orally, so that he can get more points. Since he is playing the multi-player adventure game at a higher level of difficulty, unlike the girl in the center, his cellphone's screen does not display a list of multiple-choice options for him to choose from. Unfortunately, he was not able to pronounce his answer accurately. So his cellphone gives him feedback by repeating the correct pronunciation until he gets it right.

It is important to note that this technique for human-computer interaction allows us to accommodate a group of learners with different levels of English ability. This is important because small-group cooperative learning is more likely to be effective when the group composition is heterogeneous.



## Benefits of Hybrid Approach

- ✦ Adventure game motivates learner to learn at convenient hours and locations



- ✦ Private self-study prepares learner for cooperative learning in multi-player game

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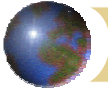
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Our hybrid approach that integrates cellphones with personal computers provides two advantages due to the synergistic relationship between immersive learning and mobile learning.

First, because learners need to have a certain command of the English language in order to win the adventure game, it can be an enjoyable way of motivating learners to take their lessons on the cellphone more seriously.

Secondly, it is tremendously helpful to practice a foreign language in private before practicing it in a social setting. As you would know if you had tried to learn a foreign language before, one obstacle to picking up a foreign language is the fear of making an embarrassing mistake in front of others, such as mis-pronouncing words.



## *Expected Deliverables*

### ✦ For learners

- ▣ Game world runtime environment (PC + cellphone)
- ▣ Mobile learning exercises (cellphone)

### ✦ For content developers

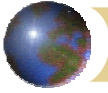
- ▣ Pattern language (booklet)
- ▣ Authoring software, e.g. dialogue scripting and game world construction from photographs



*For our deliverables, we expect to develop runtime environments and a limited set of mobile English language learning exercises for the learners.*

From our experience, we have learned a lot about designing English language learning software from the design patterns that we distilled from commercial products. We believe that content developers will also benefit from these design patterns if we document them in a printed form, such as a booklet.

We will also develop authoring tools for constructing practice conversations, and for creating a game world using photographs of local places. By using these photographs for the virtual world, we hope to create game worlds that feel less culturally removed to learners.



## Contact Info

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To conclude, due to the allocated time, I was only able to allude very briefly to how this solution could foster the ability to read and write English. Along this line, I believe that our proposed solution is also applicable to learning how to read and write in native languages.

And with that, thank you very much for your attention.