

STANFORD

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Rural Entrepreneurship Models for Cellphone-Based Language Learning in India



Matthew Kam

Ph.D. Candidate

Department of Electrical Engineering and Computer Sciences, and

Berkeley Institute of Design

University of California at Berkeley, USA

Education in India



- 87% of 900,000 schools are located in villages
 - 16% of children attend private primary schools in villages, largely due to English medium
- Only 25% of schools have electricity

Source: *India Today* (August 21, 2006)



Education in India



- 25% of government primary school teachers are absent from work annually
- 19% of primary schools have only one teacher
- 70% of schools have pucca buildings

Source: *India Today* (August 21, 2006)



Relevance of English as a Second Language (ESL) in India



- English is a global language: 1.2 to 1.5 billion people in >170 countries (Crystal 1997)
- ESL is taught in almost all schools in India
- Mastery of English is the “**single most influential factor** that determines access to ... important avenues of economic and social advancement” (Kishwar 2005)
- 90% of indigenous web content in India is in English



“World Language” Fluency

- Low-income populations in Africa, Asia and Latin America desire to improve command of an appropriate “world language” (Clegg, Ogange & Rodseth 2003; Faust & Nagar 2001; Kapadia 2005)
- English, Mandarin Chinese, Spanish, etc.
- National languages co-exist with regional dialects
- “World language” fluency **opens the door** to further education, “New Economy” jobs, higher incomes, social prestige, etc.

But Schools Are Not Delivering



- Many schools in developing countries have limited impact
- For example, in India:
 - ESL teachers felt uncomfortable speaking in English; communicated with us through interpreters
 - Non-regular school-goers comprise 43% to 61% of school-going-age children (Azim Premji Foundation 2004)



Our Envisioned Solution



- Mobile games that target **learning anytime, anywhere**
 - Make ESL learning resources more accessible
 - Make learning process more enjoyable
- Mobile games run on cellphones, the fastest growing technology platform in the developing world
- Target local language learning needs
 - Early literacy
 - Listening comprehension
 - Conversational skills
- Support reuse and scalability in localizing content for other communities



Case for e-Learning Games



- Enhance motivation and learning (Jenkins 2005)
- Incorporate good learning principles (Gee 2003)
- Experimental results (Banerjee et al. 2005)
 - 2 years, >10,000 urban slums students in India
 - Played math computer games twice per week
 - Significant gains in math test scores



Current Progress

- Five rounds of field studies in India
 - Children from rural areas and urban slums
 - Two weeks per study
 - Assisted by bilingual interpreters
- Summer 2004: needs assessment (rural + urban)
- Winter 2004: feasibility study (urban slums)
- Summer 2005: feasibility study (village school)
- Summer 2006: small-scale pilot (urban slums)
- Winter 2006: small-scale pilot (village school)



Approach to Instructional Design

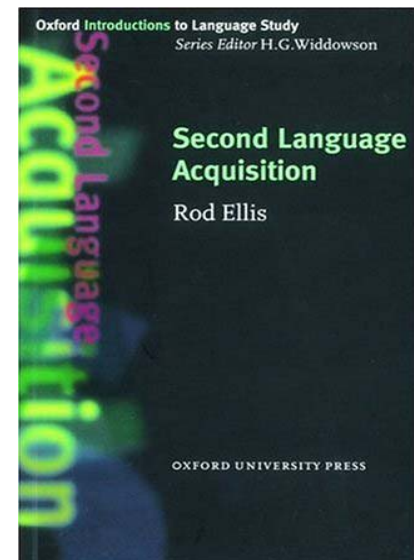
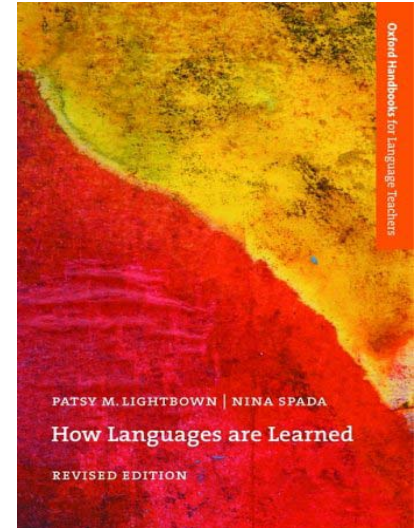


• Theory

- Second language acquisition (Bialystok & Hakuta 1994; Ellis 1997; Lightbown & Spada 1999; Krashen 1981; Nunan 2004)
- Reading acquisition (Snowling & Hulme 2005)

• Practice

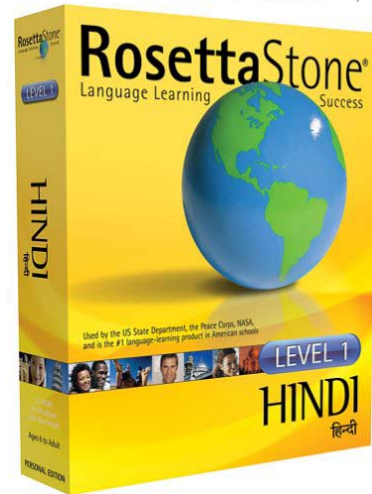
- ESL teaching methods (Krashen & Terrell 1983; Larsen-Freeman 2000)
- ESL teachers with 30+ years experience in India and USA



Best-selling Foreign Language Packages



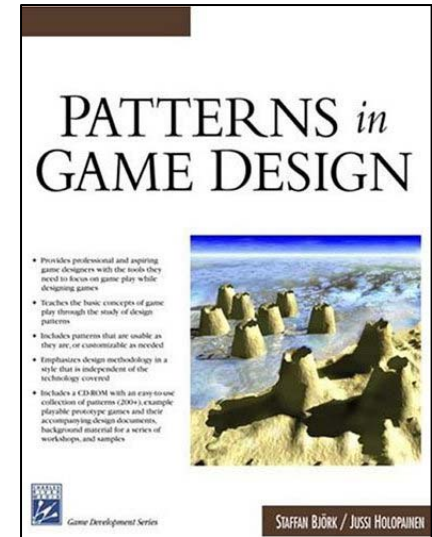
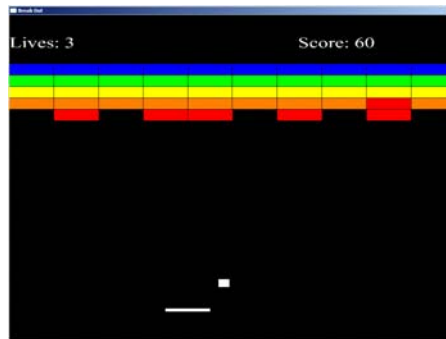
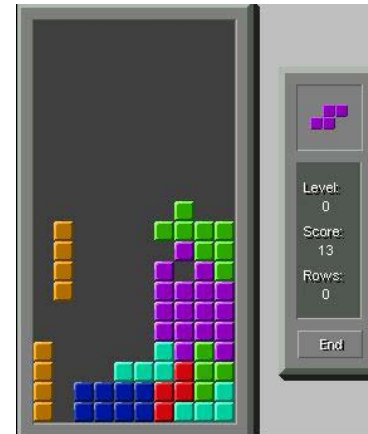
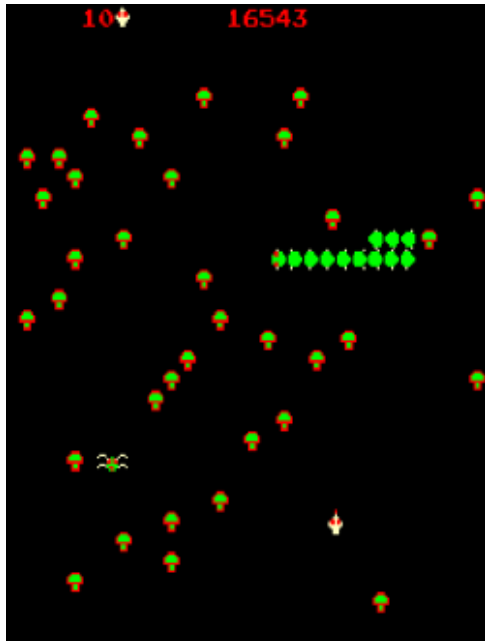
- Avoid reinventing the wheel entirely
- Reuse **best practices** from most successful language learning packages
- Reviewed sample of >35 applications
- Distilled >50 best practices in the form of “design patterns,” or motifs



Lessons from Successful Games



- ~ 300 game design patterns
- Most successful mobile games and casual games



Cultural Relevance to India



- Relate game challenges to everyday tasks



- Adapt game mechanics from classical games

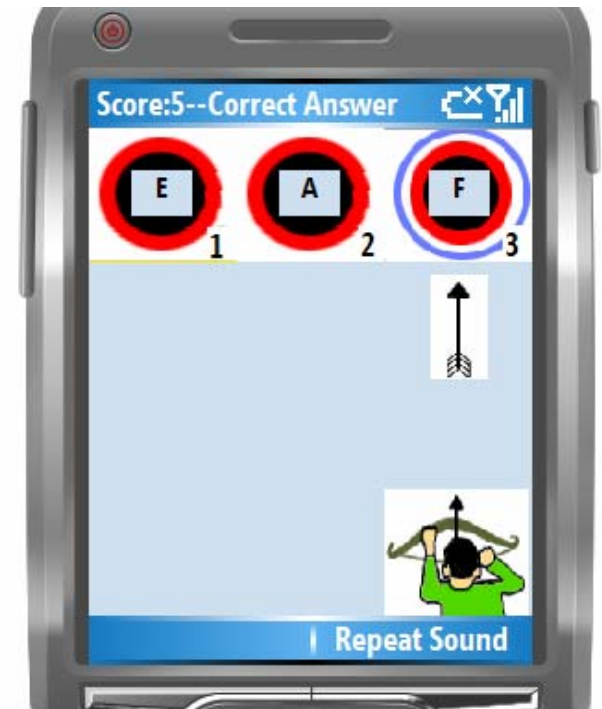


Example Game:

Phoneme → Grapheme association



- A shooter game is used to identify letters and sounds
 - The game plays the sound of one of the letters
 - Player must aim and shoot that letter
- Promotes spelling skills, letter-sound correspondences



Initial Results

- Significant learning gains over 1 week with small sample in Summer 2006 ($p < 0.001$, effect size = 1.16, $n = 11$)
- Test users found prototypes to be engaging



Next Steps



- Spring 2007: Redesign prototypes
- Summer 2007: Field trials and design revisions
 - 3 months in India
 - Longest study to date
- Mid-2007 to Mid-2008: Longitudinal evaluation
 - Supervised by Indian collaborators
 - Regular visits by Berkeley team
 - Develop complete curriculum

Taking it to Larger Scale



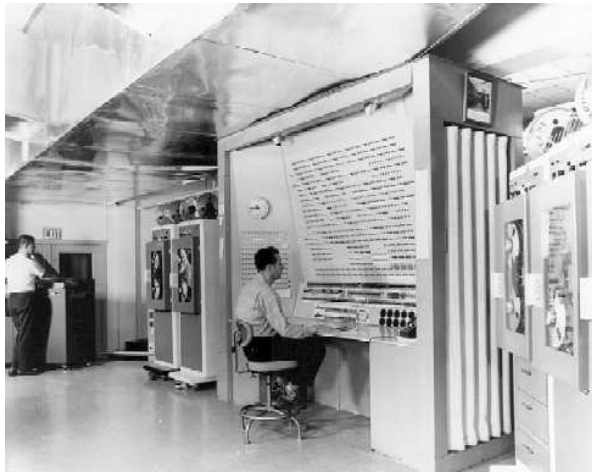
- Content development
 - NGOs
 - State's textbook committee
- Distribution
 - Cellphone carriers
 - Web hosting
- Service delivery
 - Credentialing



Drawing Parallels



- “I think there is a world market for maybe five computers.” – T.J. Watson, IBM chairman, 1943



Inventing the Future



- Bill Gates's bold vision in the 1970s:
“A computer on every desk and in every home.”

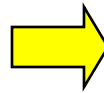


Inventing the Future



- How about this vision for our work?:

“A mobile language lab in every underserved learner community.”



Community Learning Center



- Local entrepreneur given loan to start computer-equipped training center
- Community members attend regular classes
 - English as a Second Language
 - Computer literacy
- Community library that loans resources such as books





Brainstorming Question

- How can the community learning center be a starting point for delivering cellphone-based language learning in developing regions?
 - Profitability?
 - Accessibility by the poorest?
 - Educational attainment?
 - Replicability?

Space of Service Providers



Government

Non-Government

Technology
focused

Education
focused



Mission 2007



Internet kiosk



Community center



Government school

Government-aided
school

Private school

Tutoring center

Market Size

- What is a reasonable clientele to sustain the delivery model?
- Typical village population: 150 people
 - 50% people are children age 6-14; there are also adults interested in learning ESL
 - Landless laborers comprise >50% of village population



Revenue



- What is an appropriate pricing model?
 - Price discrimination? Cross-subsidization?
 - Bulk discounts?
 - Loyalty programs?
- Monthly income for farming family: Rs.3,000 per month
- Private school fee: Rs.100 to 200 per month
- Internet kiosk charges Rs.10 per hour
- External funding and subsidies? How long?

Technical Requirements



- Color screen
- Programmable
 - J2ME
 - BREW
- Headphone jack
- Micro/Mini-SD expansion slot
 - ~15 MB memory per game
- Speakerphone for group interaction
- Supports over-the-air / cable downloads



Motorola C975
(US\$70 used)



Nokia 3595
(US\$10 used)

Ultra-Low Cost (ULC) Handsets



- GSM Association's Emerging Market Handset Program (EMHP)
- Motorola has largest market share (~80%)
- Motorola C113a

- Monochrome screen (96 x 64 pixels)
- Pre-loaded games and screensavers
- Pre-loaded applications, i.e. calculator, alarm, stopwatch and currency converter
- Does not appear to support programmability



Motorola C113a
(US\$40 new)

Ultra-Low Cost (ULC) Handsets



- ULC handsets prices expected to drop to \$28 in 2010 from \$40 in 2005 (Wireless Watch, Mar 27, 2006)
- TTPCom's Sub-\$20 cellphone (Mobile Magazine, Feb 9, 2006)
- UC Berkeley's \$10 cellphone (EE Times, Apr 10, 2007)
 - How come none of us know about it?!?!?
- Tension b/w market share and profit margin
 - Less enthusiasm in ULC segment from Nokia
 - Can market share be eroded by depreciation?

Cellphone Shared Ownership



- >1 billion people still can't afford cellphones in near future (GSM Association press release, Feb 13, 2006)
- Local entrepreneurs sell airtime on cellphones
 - Grameen Village Phone (Bangladesh, Uganda, etc.)
 - SharedPhone (South Africa)





Total Cost of Ownership

- In addition to prices of cellphones
- Recurring costs include
 - Updating phones with new content
 - Maintenance and technical support
 - Tutoring
 - What else?

Train the Trainers

- Digital StudyHall
 - Help motivated teachers improve teaching skills
 - Facilitate peers to conduct classes
- Digdarshan
 - Courseware for science lessons in rural school



Low Power Consumption



- Problem of power shortage is over-hyped
 - Cellphone power consumption is minimal compared to desktop computer
- Alternative sources of power
 - Bicycle dynamos
 - Wind-up cellphone charger
 - Solar energy





Educational Attainment

- Learning outcomes: demonstrate that average participant performs well on major exams
 - Indian Certificate of Secondary Education (ICSE)
 - Central Board of Secondary Education (CBSE)
 - State board syllabus
- Higher school attendance rates

My Two Cents on Some Myths



- Myth #1: Commercial sustainability is everything
 - Positive spillover effects justify government subsidy
 - How should social ROI be computed?
- Myth #2: Technology replaces or undermines teacher
 - Technology augments the teacher's ability and authority
 - What would be appropriate relationship b/w child learner and adult facilitator that technology mediates?
- Myth #3: Technology promotes learning at all stages of learning trajectory
 - Technology develops foundational skills
 - What's an appropriate end-point?

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National Science Foundation
WHERE DISCOVERIES BEGIN

