Spreadsheets, Formal Methods, and Winning the XPRIZE

Byron Davies, Ph.D.
ByronDavies@starshine.us

StarShine Academy
StarShinePlanet.com

RacketCon 2015
Tool Development
for
System Integrity Analysis

Byron Davies, Ph.D.  http://ontopilot.com
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UNLOCKING MINDS. EMPOWERING FUTURES.

GLOBAL LEARNING XPRIZE
Empowering Young Minds Everywhere
GLOBAL LEARNING XPRIZE
EMPOWERING YOUNG MINDS EVERYWHERE
Prize is launched, teams are recruited (6 months)

Registered teams develop, design and test solutions (18 months)

Finalist teams prepare for field deployment (3 months)

Teams' solutions distributed to villages and used in the field for 18 months; regular updates allowed (18 months)

Final judging, award and post award activities (6 months)
forum.xprize.org
Racket as the Platform for Winning the Global Learning XPRIZE

September 27, 2015
**Why Are We Competing?**

- Education is broken, globally.
- We don’t want the XPRIZE to be exclusively about reading, writing, and arithmetic (and test scores).
- We have a great team of systems thinkers, computer scientists, arts integrators, and educators.
- We have our own laboratory for testing solutions.
- The solution will be as valuable for our students as for preliterate and illiterate children around the world.
How Are We Competing?

• Systemic solution: it’s not just about technology, but about learning, children, their peers, their community.

• The order of things:
  • A theory of learning
  • Content and internationalization
  • Experience design
  • System design
  • Programming
Progress

• We researched “Black Swans of Learning.”

• We found very promising non-technology solutions in math and reading, with high potential for automation

• Central Theme: “Guided Discovery”

• We have developed relationships with key collaborators, on both coasts and in Canada.

• We have begun testing the pre-technology solutions at StarShine Academy.
Why Racket

- Why use anything but the second-best programming language?

- Powerful, cohesive, solid, reliable, interactive, graphical, parenthesized programming and execution environment — batteries included

- E.g., picts! (in the REPL)

- E.g., Pollen
Why Racket
Why Racket

```
> (sentence->phonetix "this is more fun than sex")

S Z M4 fN Sx
```
Why Racket

> (sentence->phonetix "this is more fun than sex")

S Z m4 fun Sex

> (sentence->kindercode "this is more fun than sex")

s ~z m fn ~sx
Why Racket

> (sentence->phonetix "this is more fun than sex")
> (sentence->kindercode "this is more fun than sex")
> (sentence->funetix "this is more fun than sex")
Why Racket

> (sentence->phonetix "this is more fun than sex")
> (sentence->kindercode "this is more fun than sex")
> (sentence->funetix "this is more fun than sex")

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B C D f g h J L M n p R S T V W Y Z
Projects

- Porting Racket to Android
- Implementing Guided Discovery for math, early reading, and systems thinking
- Architecture for managing a top-level learning loop: present, prompt, problem solve, assess.
- Math exercise generator to generate a tablet-based experience from a database of thousands of printed exercises.
- Publishing phonetically annotated versions of existing books.