Table of Contents

Introduction to Worldreader..............................................3
The Need for Power..............................................................4
Experiments with Microsolar Solutions...............................5
Judging an E-Reader by its Cover...........................................6
An Existing Prototype ............................................................7
Unlimited Power for Reading...............................................8
Appendix: Technical Specifications......................................9
Introduction to Worldreader

In much of Africa, there is a lack of access to books – UNESCO reports that there are a quarter of a billion schoolchildren in sub-Saharan Africa who have inadequate access to books of any kind1.

Three years ago, Worldreader introduced something revolutionary to the developing world. Using e-readers, this non-profit organization made it possible for any person – in even the most remote of locations – to hold a library of books in their palm of their hand.

Since then, Worldreader have successfully piloted e-readers in classroom and library settings at scale across sub-Saharan Africa. Worldreader has delivered 608,894 books to about over 10,000 children. In addition to using e-readers, Worldreader now also works with mobile telephones, reading half a million users a month on a device they already own.

Worldreader’s e-reader programs use devices that are pre-loaded with thousands of local and international textbooks and storybooks. Each device comes with a protective case, zip-around jacket, cable, and battery-powered book light so the children can read after sundown. Worldreader drives capacity building among teachers, and partners with literacy organizations to help them teach and motivate their students to enjoy reading.

1 Sacmeq II: http://www.sacmeq.org/reports.htm
The Need for Power

E-readers require electricity. However, they use an e-ink screen, which draws less power than the LCD screen more commonly found on laptops and tablets. The e-readers that Worldreader uses are the Kindle 4 WiFi and the Kindle Keyboard. These devices have 150 and 300 hours of battery life, respectively, requiring charging weekly or fortnightly rather than daily. This brings them closer, in terms of power consumption, to the basic mobile phones that are already in the hands of three out of every four people in Africa.²

For many of Worldreader’s projects, the need for such occasional charging has not posed a problem. They use cabinets, such as the one above, which have power strips mounted to the mesh back to allow the devices to be charged while they are kept safe. While access to electricity on the grid is not constant, having battery life measured in the hundreds of hours lends flexibility – reading is possible even if the power is out for days.

However, some project sites are located off the electric grid entirely, like The Kilgoris Project’s Ntimigom School, where the head teacher, Shadrack Lemiso, can be seen trying to start a diesel generator to charge their 175 e-readers. It was for these schools – and to reach the many others where we do not yet work – that

Worldreader decided to look into solar solutions. It was quite the sensible choice to attempt to harness this renewable energy that is plentiful in sub-Saharan Africa.

Experiments with Microsolar Solutions

Worldreader’s earliest forays into solar power had involved a macrosolar installation in a small village in Ghana. These installations worked perfectly to charge e-readers; however, taking on a project to bring a solar installation to a school or village was a task in itself. Worldreader noted that successful solar installations were revenue generating, in order to fund the maintenance and upkeep of the installation. Unless a community already had plans to install solar panels, managing such a large project was overkill for just needing to keep some low power consumption devices charged.

Worldreader experimented with various microsolar options, some of which were donated by generous manufacturers. In field testing, three important considerations soon emerged.

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http://www.worldreader.org/blog/ghana-kindle-battery-life-and-access-to-power/
First, these microsolar devices came with a number of different components and connectors, which were prone to getting lost. Second, recipients were often more excited about seeing what else their solar device could charge rather than using it for the e-readers. Solar power itself is a social good, yet in an environment where Worldreader was reaching the youngest and often disenfranchised members of society, the result was that others would take their solar chargers, leaving them unable to charge their e-readers. Finally, ease of use was an issue – a 7-year-old with a very limited command of English had to be able to charge her own e-reader.

**Judging an E-Reader by its Cover**

Meanwhile, Worldreader had gained a significant amount of insight into what made for a good protective case for the e-readers being used by children all over Sub-Saharan Africa. First, they had to be of a material that would wipe clean. Any washable material would be scrubbed to pieces by the kids, who every week would take a stiff-bristled brush and a bucket full of soapy water to their e-readers, merely to keep them free of the ever-present African dust. Secondly, they had to fully enclose and protect the e-reader against any impact or pressure against the screen – the most fragile component of the e-reader. After adopting these guidelines, Worldreader saw device failure rates drop down to manageable levels of well under 10%.
In addition, ideally a good case would also come with a long strap, so it could be worn across the body like a satchel. This would mean that students would be able to keep their readers safe, especially while eating. In the past, some of their more creative solutions to this conundrum had to be sitting on the device, so that they would not be stolen while a student was eating. Unfortunately, this also meant that some devices failed due to screen pressure in this way.

**An Existing Prototype**

After testing an existing solar charging case for the Kindle e-reader, Worldreader discovered that the majority of its needs were already met with the integrated solar case for Kindle offered by SolarFocus. Specifically, the e-reader would be charged even when the solar panel was only in indirect sunlight, the reserve battery allowed for charging even when not in the sun, the device was easy to use, and served a single function. However, with a price tag of about $100, this solution was not going to be economically viable⁴.

Unlimited Power for Reading

Armed with a list of requests, Worldreader proceeded to open a conversation with SolarFocus. After sending photographs of the SolarFocus charging case being used in Uganda (one of which is shown above), Worldreader received a positive response from Dick Lu, Jr, of SolarFocus.

After talks with Mr. Lu, Worldreader and SolarFocus signed an agreement in which Worldreader raised funds to pay for the tooling and production of 200 sample units. These charging cases would meet all Worldreader’s requirements – they would cost significantly less, wipe clean, come with a cross-body strap, and contain an internal battery for charging anytime, anywhere.

The 200 units are currently being tested in Ghana. Worldreader hopes that it will be able to iterate on the current design and specifications, and work towards rolling out an integrated Kindle e-reader solar charging case in all its programs throughout Sub-Saharan Africa, introducing more and more children worldwide to the power of reading.
Appendix: Technical Specifications

Current Worldreader Solar Charging Case being tested in Ghana (Cross-body strap not pictured)

Input connector: Micro USB B type connector
Input voltage: 5Vdc +/- 5%
Input current: 500mA (Max.)
Solar power: 1 watt panel
Built-in reserve battery: Lithium Polymer, 3.7V, 1500mAh
Operation temperature: 32° to 95° Fahrenheit (0° to 35° Celsius)