ColorBoard – A Product and Process to Enable Quality Education for All

Social Justice

Education

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INTRODUCTION

Nearly a billion people entered the 21st century unable to read a book or sign their names (Shah, 2010). A quarter of humanity lives without electricity, and even though we are a decade into the 21st century, the digital divide remains. While Finland recently became the first nation to make access to affordable broadband a right (Hooper & Saeed, 2010), we cannot assume conventional information, communication technologies - ICT (e.g. computers, Internet based resources, etc.) will provide quality-learning opportunities and much needed resources to the most vulnerable in our society.

This paper 1) proposes both a product and a process to provide access and opportunity to learning, 2) offers a way to encourage the participatory development of appropriate, relevant resources, and 3) shares findings from a recent field trial of our approach in East Africa. We recognize many of us have offices filled with more resources – books, materials, and technologies - than many classrooms or entire schools in developing contexts, so it is with extreme humility we share an approach to bridge this obscene chasm between have and have not populations, recognizing that "Knowledge [has the potential] to make everything easier" (Maeda, p. 33, 2006).

BACKGROUND

Curtis Bonk (2008) writes "In the twenty-first century, education trumps economy as the key card to participation in the world" (p. 8). However, our work in rural, and not so rural, settings in Asia and Africa suggests access to information, education and training remains a challenge. If the 21st century is being defined by those with human and knowledge capital, recognizing both contribute to health, nutrition, skill acquisition, and economic mobility; those unable to read or write are basically resigned to marginal, peripheral participation. Because approximately a quarter of humanity live without electricity, it was projected by 2007, fewer than 1 in 5 people living in the developing world would be online. In countries such as Myanmar, Bangladesh, Cambodia, and Nepal the number is closer to 1 in 10, compared to over 6 in 10 in the developed world. Consequently, more than 5.2 billion people cannot use the Internet – the tool touted as the panacea for contemporary learning / training and the way to access information, resources and learning opportunities.

When the General Assembly of the United Nations drafted the Universal Declaration of Human Rights, access to free, basic education was determined to be a fundamental right, at least in the elementary and fundamental stages. The declaration further stated education, whether for children or adults or healthcare or training or ongoing professional development, was central to achieving the Millennial Development Goals and critical to the development and maintenance of a

civil society. The question, of course, is how best to make such a declaration actionable and relevant to the lived experiences of those for whom it was drafted?

Running parallel to offering education is the need to prepare and support teachers who are called upon to provide basic education programs in these challenging contexts. A recent United Nation's report notes "Most teachers attempt conscientiously to do a good job, often in difficult circumstances. Yet millions of children face restricted opportunities to learn in an appropriate language and millions more are taught by overstretched, under motivated, untrained teachers in overcrowded classrooms lacking basic teaching materials" (EFA Global Monitoring Report Team, p. 187, 2010). Their report shares an integrated framework designed to tackle marginalization through:

Policies to improve accessibility and affordability

- Cutting fees and associated costs

- Providing targeted incentives

- Investing in school infrastructures

- Bringing classrooms closer to children

Strategies for entitlements and opportunities

- Developing poverty reduction strategies

- Tackling early childhood deprivation

- Providing social protection

- Allocating public spending more equitably

Practices to enhance learning environments

- Equitable allocation of teachers

- Recruiting and training of teachers from marginalized groups,

- Provision of additional support to disadvantaged schools,

- Development of relevant curriculum, and

- Facilitation of intercultural and bilingual education.

In this paper, we describe a sustainable approach for building and supporting enhanced learning environments, using appropriate technologies and sound instructional design principles. Our approach rests in simplicity, honoring Einstein's belief "Everything should be made as simple as possible but not simpler." It also follows the thinking of Negroponte, founder of the XO laptop, who suggests "A lot of learning can happen without teaching." This stance is echoed by Sugata Mitra, who has created a digital "village well, where children assemble to draw knowledge and, in the process, engage in meaningful conversation and immersive learning activities that broaden their horizons" (Hole-in-the-Wall, 2009). While Negroponte and Mitra direct their innovations toward child access, our approach enables adult access to information and a process for distribution and development of quality, local content.

ColorBoard, the process and product shared in this paper, was born from experiences in a basic education project situated in Western China in 2004. Content for teacher professional development was delivered to rural schools using a satellite download system and stored on a

local computer. Teachers were expected to share a computer(s) and study from the materials. In the evenings, many of the schools opened their doors to villagers who used the satellite system to download content on agriculture, health or general interest. Community workers could also download materials to support adult literacy programs.

During one school visit, Susan and her regional colleague asked how the system was working and what users thought of the content. Even without translation, it was obvious users were frustrated. They could not understand why they had to download content to the computer, wrestle with file management, incur significant electricity costs, and risk file corruption when data transfer was affected by lightening strikes and power interruptions. Why, they asked, couldn't the project just supply content on a DVD player that they could power with rechargeable batteries?

Why indeed – and hence the inspiration behind the ColorBoard approach. Since then Susan has wrestled to source an offline, HTML reader that would support multiple literacy levels through the use of contextually specific, locally developed, multimedia content. She envisioned ColorBoard as

- an innovative yet cost effective concept to bridge the digital divide and address the UN Millennium development goals,

- a way to develop processes for creating access and opportunity to learning and training,

- a sustainable approach to content development, distribution and use,

- a way to work collaboratively with regional partners and experts to develop context specific materials using open source web authoring and multimedia software, and

- a way to sustain development projects beyond their initial life span and build capacity among project participants.

ColorBoard is more than a DVD / multimedia eReader. It is a simple way to digitally *tell* content, *watch* a pamphlet, *read* information, and *build* instructional capacity through the thoughtful development and delivery of relevant content. It recognizes that while half the world has a foothold on the development ladder, one sixth of humanity is not even remotely close. And, not because they don't want to be, truly

> They are ready to act, both individually and collectively. They are already hard working, prepared to struggle to stay afloat and to get ahead. They have a very realistic idea about their conditions and how to improve them, not a mystical acceptance of their fate. They are also ready to govern themselves responsibly, ensuring that any help that they receive is used for the benefits of the group rather than pocketed by powerful individuals. But they are too poor to solve their problems on their own " (Sachs, 2005, p. 19).

ColorBoard believes in the participatory development of relevant resources, and the delivery of those resources through the most appropriate technology possible. It is designed to support blended learning and self-study for teachers, trainers, healthcare workers, etc. by providing access to resources required for the building of background knowledge that supports deep learning and understanding (Grant & Fisher, 2010). It also recognizes that in countries such as "Benin, the cost of a generic PC is equivalent to a teacher's salary for eight months," so the tool and its content better be worth the cost (Trucano, 2010).

THE COLORBOARD APPROACH

ColorBoard is both a process to develop and access content and a product to distribute and display it. The process provides an effective, educationally sound, collaborative content development approach and an online repository to store and catalogue it; the product researches / recommends robust yet inexpensive hardware solutions that can be powered by alternative

energy sources such as solar. ColorBoard is grounded in the principles of sustainability, renewable resources (both human and physical), and simplicity (elegance of design).

There are four components to ColorBoard (see Appendix A – ColorBoard Components)

- a system for content development,

- a place to store and share content – a shared knowledge base,

- recommendations for appropriate software and hardware solutions, and

- training to support the development of local, accurate content and the use of the ColorBoard approach for education, health care, agriculture, development projects involving training and education at the project, NGO or institutional / government level.

In essence, ColorBoard is the World Wide Web for those with no Internet access. This is significant because approximately 5.2 billion people in the world today do not have Internet or electricity. Critical to ColorBoard instructional design process is awareness to the evolving standards for ePublication (Anderson-Inman & Horney, 2007). As digital media and hypermedia becomes easier to author, educators have an increasing role to utilize appropriately and designing it efficiently, keeping learning packets small and simple for distribution on handheld devices.

ColorBoard aggregates field-tested, open source software applications to support user engagement with media through

- courses / training modules (authored in HTML)

- audio files such as podcasts, music, language instruction, etc. (created in .wav / mp3)

- texts and resources (written in PDF)

- markup and annotate PDF files for personal reference and learning

- images – pictures, maps, illustrations (saved as jpg, etc.)

- movies for training and education (saved .wmv)

- ebooks

ColorBoard content can be developed, collected or modified from a range of sources (e.g. learning objects, existing curriculum, training modules, Internet sites, government materials, etc.) and activities (e.g. worksheets, model construction, hands-on training, workshops, etc.). Content developers are encouraged to use the ColorBoard repository to store their curriculum assets. We consider every part of the curriculum design process valuable, and encourage users to store initial concept maps, storyboards, raw and edited video and graphics, and individual lessons, activities, and modules. This way, other educators can build from the assets and modify them by language, culture, context, and literacy levels (see Appendix B - Content Development Workflow). Content developed can be distributed via USB memory sticks or SD cards – a variation of the original Sneaker Net (Sneakernet, 2010). An adage attributed to sneaker net is "Never underestimate the bandwidth and speed of a van filled with CDs, DVDs, and other memory storage devices!"

Users of this content might be learners engaged in training (e.g. construction of small hydro systems, health care issues), formal course work (e.g. high school completion, college preparation), or general interest lifelong learning pursuits (e.g. literacy support, nutrition,

agriculture, woodworking, sewing, etc.). The learning environment afforded by ColorBoard is flexible and open ended, supporting blended and mLearning strategies.

Learners and facilitators working with ColorBoard function as co-constructors of the learning experience. Learners, in consultation with the facilitator, can choose from a range of course offerings or multimedia resources that meet their goals and similarly explore content for self-study or personal knowledge building and awareness. The facilitator matches the learner's goals with the specific needs by providing relevant and timely activities. In actual practice, this interaction might involve a potential learner in a community or refugee camp coming to a center, such as a community hall, library, or public meeting place, in which there are ColorBoard units, looking at a list of available courses, talking with the facilitator about the potential offerings and programs (see Appendix C – Suggested Deployment).

Initial Findings

The ColorBoard system was field tested June 2010 in East Africa. Findings from this test are informing modifications to our approach. During the field trial, Brown asked educators in Nairobi, Kenya to try the various software applications installed on our current device and to explore sample content (a course on School-based Teacher Training – Assessment Strategies; a PDF journal article and a book from the Commonwealth of Learning, and a short movie). He also led participants through a usability test of the device. These educators were graduates from Aga Khan University in Dar es Salaam and former students / colleagues of Brown.

The final initial findings are positive. Educators found the content inviting and useful. Participants recognized that this device was the Internet for those without the connectivity, providing a World Wide Web environment contained on the device's SD card or USB drive. The Open Source applications were powerful and deemed useful by the participants. In particular, they felt the audio and video players would support multiple learners and provide important visual / auditory access to content for those with limited or low literacy levels. They felt two of the applications had direct transfer to their mobile phones and therefore made there use easier. Participants struggled a bit with the stylus required to manipulate the device's interface, but once they became comfortable and started using it like a pencil / pointing device, they were fine.

We are heartening by the findings from our first field trial and see promise for the ColorBoard system and its accompanying solar power option. Our field trial participants recognized the importance of this approach for rural, remote learners, trainers, and teachers. They saw immediately the potential of multimedia to support low literacy learners, and they understood how this approach could put an entire library of resources, professional development, and support materials at peoples' fingertips. They felt the price point for this approach would allow individuals to own their own devices, download additional content, and use the alternative power option for domestic solar lighting.

CONCLUSION

We believe the ColorBoard approach is a powerful yet simple solution to some of the issues related to the digital divide and access to quality learning and training. It supports Sach's recommendation "… to train very large numbers of people at the village level in creative and targeted ways, specifically for the main tasks at hand. For example, every village should aim to have a group of village experts, who, like the barefoot doctors of China, have enough formal training to address basic technical needs at the village level" (Sachs, 2005). We see Colorboard content as a sustainable replacement for the traditional trainer-the-trainer paper based binder – ironically at a similar price point and far easier to replace, update and transport, and must more suitable to a range of literacy levels and learning style preferences.

As Kofi Annan, the former United Nations Secretary-General, said, "Literacy unlocks the door to learning throughout life, is essential to the development and health, and opens the way for

democratic participation and active citizenship." Systems such as ColorBoard can help by providing access to resources, materials, professional development and learning.

While currently we recommend one hardware option, the Smart Q used in our field trial, we anticipate an increase in options as tablet devices become more popular. These devices signal a shift from the desktop / laptop / netbook units to handheld devices. Current examples include the iPad, iPod iTouch, eReaders, and some multi-function smart phones. However, many of these are either quite expensive, proprietary in terms of content development, and/or tied to high speed Internet access. Critical design points for ColorBoard devices include

- adequate screen size – 7" seems minimal for sustained viewing / reading
- ability to read content from external storage (USB or SD cards)
- ability to run open source applications rather than proprietary "apps"
- reasonable power consumption / capacity to support a range of voltages

We see ColorBoard as a system with significant potential for local relevance, sustainability in content design and development, and access to learning opportunities. It is a way to bridge the resource divide and provide individuals with access to books, media, resources, and quality teaching and learning experiences and improve literacy in marginalized communities. However, Schrum and Levin (2009) remind us that literacy is no longer just reading, writing, and arithmetic. "The new literacies, which are necessary for everyone to learn in order to survive and thrive in the 21st century, include information literacy, media literacy, and information, communications, and technology literacy" (p. 4) as well as visual literacy, multimedia literacy, and cultural literacy. Many scholars note global economic competition requires the sharing of information and being able to participate fully in the exchange of constant communication with others around the world. Simple solutions like the ColorBoard system attempt to address the new literacies by providing access and opportunity in a small, handheld device and the option to work with Open Source applications.
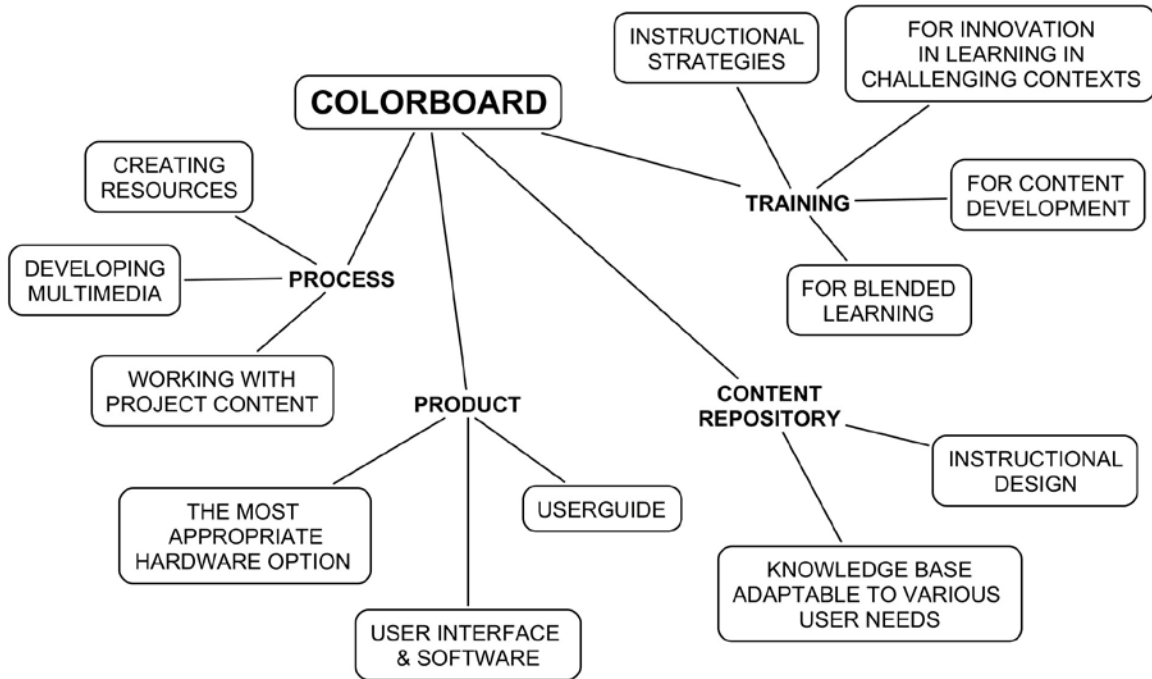
While the problems are many and the need is great, we take strength in the words of Pilloton (2009) who states "When you are designing for social good ... you've changed the bargain between producer and consumer; you've added elements of social currency" (p. 7). We believe that by enhancing social currency we improve both the social and human capital required to participate fully in the 21st century, and inherent in that is enhanced literacy and access to the world of learning and training.
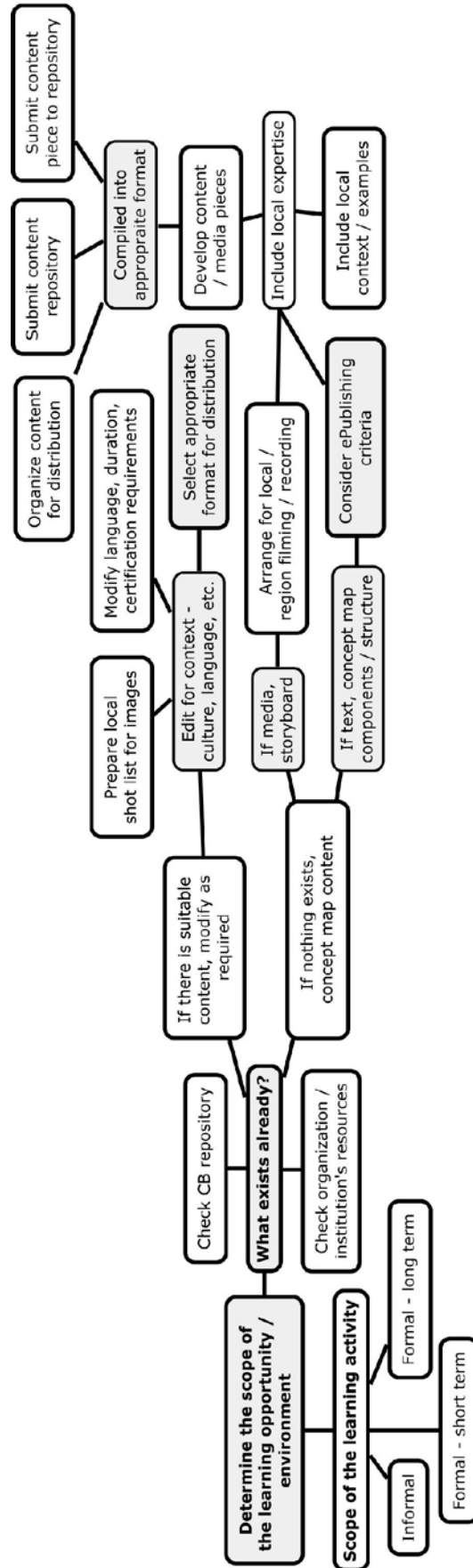
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Appendix A – ColorBoard Components

Appendix B - Content Development Workflow

Determine the scope of the learning opportunity / environment

Scope of the learning activity
- Informal
- Formal - short term
- Formal - long term

What exists already?
- Check CB repository
- Check organization / institution's resources

If there is suitable content, modify as required

If nothing exists, concept map content

Edit for context - culture, language, etc.
- Prepare local shot list for images
- Modify language, duration, certification requirements

If media, storyboard

If text, concept map components / structure

Arrange for local / region filming / recording

Consider ePublishing criteria

Select appropriate format for distribution

Organize content for distribution

Develop content / media pieces
- Include local expertise
- Include local context / examples

Compiled into appropriate format

Submit content repository

Submit content piece to repository

Appendix C – Suggested Deployment

Content is developed in a media centre (e.g. central office that has a basic media production software, Internet access, and stable electricity). Recommendation equipment for media centre:

- Apple iMAC computer (http://www.apple.com/ca/imac/) - approximately $1700 CDN and includes basic media production software – photo and movie editing and podcast creation

- Open Office software (http://www.openoffice.org/) - free, open productivity software

- Concept mapping software (http://cmap.ihmc.us/) - free, open software

- FLIP HD video camera (http://www.theflip.com/en-ca/) - easy to use, high definition – approximately $180 CDN. The HD version is essential – other options do not produce high enough quality video. Audio quality is very good.

- Canon G11 camera (http://www.dpreview.com/reviews/canong11/) - simple camera capable of shooting stills in RAW format for advanced editing – approximately $450 CDN

- Small tripod for extended video shooting (http://joby.com/gorillapod) - small assize is adequate for both the FLIP and small Canon cameras – approximately $20 CDN

- Flash card reader – USB reader used to transfer content from computer to SD cards that are used by the ColorBoard devices

- USB hub – useful as it provides additional USB ports for camera, flash card reader, and other peripheral devices