

# Transforming Textbooks to Chalk Dust

## *A Path to Open-Source Textbooks*

Gary Dunn  
Open Slate Project  
<http://openslate.org>  
[osp@aloha.com](mailto:osp@aloha.com)

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### **Cost and content**

If you are like most people you take it for granted that textbooks play an effective role in education. Effective or not, one thing is certain: textbooks are expensive. Every year, as Labor Day approaches, a fresh crop of news stories deplore the high cost of college textbooks – roughly \$100 a book. A hot topic this year was the option of renting rather than buying, an intriguing alternative to buying new and selling back as used at the end of the semester. Either course of action faces two defensive strategies used by publishers to discourage the used textbook market, bundling of one-time use features such as CD-ROMs, web site keys, or workbooks, and frequent new editions. With regards to K-12 textbooks, few news reports address the cost directly because so many students attend public schools, where books are provided. At these lower grade levels the cost is often presented in terms like the total annual cost of textbooks. Sun's co-founder Scott McNealy puts the figure between \$8 billion and \$15 billion per year in the U.S. Similar cost data at the college level is not available, but the U.S. GAO pegs the per student cost for textbooks per year at just under \$900. Surprisingly close and possibly more than the annual cost per student for undergrads.

Cost is not the only hot button topic in the K-12 textbook market. Another is content. Unlike college texts, K-12 textbooks are scrutinized by self-appointed guardians of public morality, to protect children from everything from sex to Darwin. The Texas Board of Education plays an indomitable role in controlling what appears in K-12 textbooks, because enough other states follow their lead that publishers cannot afford to ignore them. This is not a case of peer review. The people who decide what is in and what is out are only considered subject matter experts by people ignorant of the subject. Picture a bonfire, and an angry, emotion-charged mob throwing classics into the conflagration. Brave New World, Catch 22, Catcher in the Rye, Fahrenheit 451. Hardly the stuff of a freedom loving society. Now, instead of books, picture words and ideas. How does a parent know what has been expunged from their child's textbook

when they cannot trust the people who publish them?

## **Chalk Dust, open-source, and sharing**

For as long as there have been computers there has been a tradition of sharing software. The process could be as simple as a breakout session at the monthly meeting of the Stanford Deep Thought Users Group where source code print-outs were traded, or as elaborate as the the software archives maintained by Keith Petersen and Frank Wancho on the SIMTEL20 computer at White Sands, New Mexico. Nowhere was this more evident than the version of the Unix operating system developed by students at U.C. Berkeley, known as the Berkeley Software Distribution (BSD). In the late 1980s, after ten years of rigorous development, BSD came under attack from the owners of the commercial Unix copyright. In response, Richard Stallman created, along with Eben Moglen, the Free Software Foundation (FSF) to encourage programmers to continue to develop software that would remain free. Ironically, the power to do so is derived from U.S. copyright law. Many others, including Bruce Perens and Eric Raymond, helped to define and promote the open-source movement. This concept of free, unencumbered software is what brought about the Internet. Without it we would still be using dial-up modems and America On-Line.

The goal of the Open Slate Project is to improve education through better use of computers. A cornerstone of the project is Chalk Dust, which is all about content. While Chalk Dust is primarily about what would traditionally be called textbooks, it includes the delivery process as well, because the two are inseparable. Chalk Dust incorporates the open-source philosophy, not only for the software but, significantly, for the content.

## **Dynamic content**

To think that creating an electronic textbook simply involves moving the content to a PDF file is to ignore the potential of the personal computer. If the goal is simply to recreate a print edition, say a reprint of Voltaire's *Candide* or the latest novel by Nora Roberts, then by all means a PDF version viewed on a Kindle is fine. Want to have page turns look more realistic? Get an iPad. Unadorned text is a great way to allow the reader's imagination to come into play. An emotional connection at that level elevates the reader's satisfaction, while being told every detail is just boring. But what is true for fiction is not necessarily true for non-fiction, and, literature classes aside, textbooks are supposed to be firmly rooted in reality. Textbook publishers have for years used eye-catching illustrations, photographs, and side bars to make textbooks appear less dreary, but with little success. It is a rare student who eagerly opens, much less reads a textbook in their spare time.

## Computers in the hands of students

Back in the 1970s something very special happened. A few forward thinking teachers brought personal computers into the classroom. Not for word processing, but for kids to explore through programming. The *lingua franca* of early personal computers was BASIC, but when a group of educators, which included Seymour Papert, brought the LOGO language to the personal computer a revolution began. It was Papert who observed that kids typically had to be reminded to do their homework, yet would spend hours programming and playing games. (Keep in mind that computer games in those days were nowhere near as complex as now.) Why not make use of this observation and make learning more like playing computer games? Around the same time a pioneering group at Xerox's Palo Alto Research Center led by Alan Kay, Dan Ingalls and Adele Goldberg created the first computer system with a graphical user interface. They named the language used to create this environment Smalltalk. Later, while working at Disney, the same team extended the language to include a new programming paradigm called Morphic, and in honor of their employer named the new language Squeak.

Alan Kay had another vision, a small, portable computer that children could carry with them wherever they went. He called it the Dynabook. It would run Smalltalk. It could access data stored on the machine, and connect to on-line databases via a dial-up modem. If this all sounds familiar, remember that this was in 1968, years before microprocessors made personal computers possible, more than a decade before the GRiD Compass. Today we have gotten even closer to Kay's vision with the OLPC XO-1, a project Kay participates directly in. Open Slate is different than OLPC, yet close to Kay's Dynabook.

## Accommodation, assimilation, bureaucracy

As can be expected, the idea that teaching should change to accommodate the influence of television and personal computers was soundly rejected by the mainstream education establishment. Papert himself predicted that schools would at first resist the change that computers represented, followed by a period of accommodation until such time as the new technology could be assimilated into the established curriculum. This is precisely what has happened. For years computers have been relegated to a lab, a subject to study. Where in the past students might learn to type, the new replacement was called keyboarding. What is causing so much ruckus today are nothing more than eBook readers which substitute a glowing LCD panel for a sheet of paper, used to display costly content developed by commercial publishers. The assimilation is complete, school as we know it marches on, unscathed.

## Content delivery and instructional activity

There are no constraints on what application can be used to deliver Chalk Dust content, other than it run on the approved Open Slate environment and is it-

self open-source. If a simple PDF file will get the job done, then the Evince document viewer should work. Another promising tool is Inkscape, the vector graphics editor. But to take full advantage of the slate platform, to make content come alive, to make it engaging and memorable, something more is required. From what is available today, the best choice is a pair of morphs from Squeak, specifically the StackMorph and the slightly more complex BookMorph. Combined with other morphs – Text Morph, Button Morph, Rectangle Morph, just to name a few – it is possible to build a rich, dynamic, interactive presentation reminiscent of Bill Atkinson’s HyperCard.

But wait. The average reader will have no idea what I am talking about. Squeak? HyperCard? Morph? That these things are unknown to educators is testament to how little the personal computer has penetrated traditional education.

## Super Chalk Board

The ultimate Chalk Dust delivery application does not exist. It has a name, Super Chalk Board, and it has been described, in part, on the Open Slate Wiki like this:

Super Chalk Board is intended to be the Open Slate Project’s principle application for instructional activity. It comprises a presentation capability enhanced by real-time input, a database back-end for passive organization of content, and, most importantly, the ability to transmit content live via a network to a group of subscribing clients. The presenter and subscribers can be in a single classroom, a group of classrooms, or, as in the case of homeschoolers, individual students wherever they happen to be working in a group.

Given the benefits of working in Squeak, it makes sense that Super Chalk Board be written in Squeak. There are no morphs that support the requirement, but the Indiana class includes a set of morphs with interesting network functionality.

Think of Super Chalk Board as three layers of clear acetate over a plain white background. The author creates the first layer, just above the background – the textbook, as it were. The instructor creates the second layer dynamically, in the same manner as writing on a chalk board, all of which is automatically downloaded to the class (and available later to anyone absent). The third, top-most layer is created by the student, taking notes. Like the second layer, the notes are saved automatically. A variety of play-back options allow for a flexible session playback for study and review. Note that the slate’s pen feature supports ink input that facilitates chalk boarding and note taking, unlike keyboard input.

The idea, then, is to have a variety of delivery methods, with Super Chalk Board being the most popular due to its live delivery mechanism. But even the best automation in the world will not overcome the biggest obstacle open-source content faces today. That is, credibility.

## **Attribution and trusted sources**

A college professor friend of mine claims he will flunk any student who uses Wikipedia as a reference. This is not an isolated case. Attribution is a cornerstone of academic writing. Academics loath open-source Wikipedia because there is no practical way to determine who wrote what.

Textbooks have authors, and the better ones include citations to back-up their statements. Even where a textbook author is unfamiliar, instructors trust publishers to have performed the required due diligence in verifying the author's credentials. In the past this worked reasonably well, because a publisher could not afford any loss of reputation, but with the consolidation of the publishing industry such self-monitoring can no longer be counted on.

Chalk Dust addresses the attribution issue by creating each work as a separate project, with authorship clearly identified. Furthermore, recognized subject matter experts are encouraged to publish reviews of these works.

## **Outside the Chalk Dust box**

The creative process can and should take place at several levels. For example, the head of the math faculty at a large high school could develop a lesson plan to be followed by other teachers at that school. Where curriculum development exists "above" the school level – say at the district level – classroom materials and self-study projects could be developed in the Super Chalk Board format and made available to schools for download. Homeschooling parents could develop and share material. These projects would exist outside the scope of Chalk Dust and its peer review system, but could be submitted for consideration.

## **Transformation**

Given the recent growth in the tablet market following the introduction of the iPad it remains to be seen whether or not the concept of self-made slates will be practical. Whatever the source, the slate must run an open-source OS and Squeak. This platform will make Chalk Dust a reality and transform the nature of textbooks and classroom activity. The costly, commercial textbook publishing industry will disappear, leaving in its place a community of creative scholars willing to share their knowledge.