Free High School Science Texts (FHSST)

Objectives

Free High School Science Texts (FHSST) is an initiative, started by a group of post-graduate physics students at the University of Cape Town, to develop and distribute free mathematics, physics and chemistry textbooks to grade 10 - 12 learners in South Africa.
Our primary objectives are to:

- Provide a free resource, that can be used alone or in conjunction with other education initiatives in South Africa, to all learners and teachers
- Provide a quality, accurate and interesting text that adheres to the South African school curriculum and the outcomes-based education system
- Provide a text that is easy to read and understand even for second-language English speakers
- Make a difference in South Africa through helping to educate young South Africans

The project is endorsed by the Faculty of Science at the University of Cape Town (UCT) and the Education Department at UCT is also involved. However, the project is an independent entity and we welcome input from **all** who are willing to contribute.

Motivation

Educational resources, especially books, are costly. A recent study published in *The South African Journal of Economics* found that for the Western Cape it is imperative to address the issue of lack of resources in education:

> ... investments to improve teacher quantity and quality are unlikely to offer a viable means of overcoming [these] shortcomings in education before shortages in complementary teaching materials are addressed, ...[1]

In light of this, as young South Africans trained in the sciences, we initiated a project in September 2002 to write a set of free high school science textbooks covering mathematics, physics and chemistry. The aim of the project is to produce quality texts and make them available to all South African learners and teachers royalty-free. It is also a decisive response to requests for contributions of educational material by other education initiatives, for example, the *Mindset Project*[2].

Project Team

Mark Horner initiated the project in 2002 and currently the project is headed by Mark and Spencer Wheaton. Both hold masters degrees in physics and are currently reading towards their doctorates in physics at UCT.

The writing of content for the books has been accomplished purely through the efforts of volunteers. Contributions have been received mostly from local sources but there have also been a number of international contributions and the project currently includes around 35 contributors. Project authors include 4 post-doctoral, 13 post-graduate and 5 undergraduate science students as well as people in industry and commerce. Guest editors whose field of research is education in science have been asked to provide the final edit of the books.

[1] S. van der Berg and R. Burger *The South African Journal of Economics. Die Suid-Afrikaanse Tydskrif vir Ekonomie.* Vol. 71:3 September 2003

[2] *http://www.mindset.co.za*

Non-author members include a volunteer graphic designer who has produced book covers. The project website is maintained by a volunteer web-designer and a computer science masters student at UCT is building the web-based database services for the project. A journalist has become involved in the project to document activities and help with public relations. For further information see the article about the project published in *The Science in Africa Online Magazine.*[3] This publicity has already led to the South African Museum expressing interest in the use of the books in their Mindspace[4] program (a program providing resources to disadvantaged learners and adults studying towards matric).

Project Overview

In order to meet the project's objective of delivering quality texts, there has been focus not only on the core content but also on the application of scientific skills. Comprehensive sets of worked examples have been included in the chapters to enable the application of concepts as they are taught and explained in the chapters.

The writing style of the books ensures that the content is accessible to second language English learners[5]. It is our goal first to publish the complete set of books in English and make revisions through reader feedback before translation into other languages.

To appeal to learners and encourage further study, short essays written by people with backgrounds in science who are now working in industry and business, are included. These essays aim to introduce learners to real world applications of the skills and knowledge they acquire by studying the sciences. In addition, exposure to different career choices is achieved through this medium.

Additional editing has been done by members of the Education Department at UCT under Prof. K. Rochford to ensure that the books adhere to the needs of teachers while meeting the requirements laid out in the outcomes based curriculum. This group includes experienced science teachers as well as young science graduates training to be teachers. The mix of youth and experience ensures a refreshing style and interesting up-to-date content as well as ensuring the appropriate reading level.

Expert guest editors, focussing on education in science, have been invited to provide a final stamp of approval and consistency check of the content.

To ensure that the printing and distribution of the books are free of any royalty fees, they will be released under the Gnu Free Documentation Licence[6] (FDL). This licence entitles anyone to print, copy or distribute the books without penalties from the copyright holders. This is much the same as the Gnu Public Licence used in open source software. The licence maintains the integrity of the authors while promoting free distribution.

Project Status

Content

The content gathering stage of the project is nearing completion. The majority of the physics book has been written while there are still chapters outstanding for chemistry and maths. **Contributions of content and editing for all three books are still needed!** Once this is done, the books will be passed on to the guest editors for final editing and consistency checks.

Timeline

Phase I (2004)

The first phase involves the gathering of content, editing, printing and pilot distribution of the books in the Western Cape during year **(2005)**. The goal is to ensure, with the help of the Schools

[3] *http://www.scienceinafrica.co.za/2003/november/book.htm*
[4] *http://www.museums.org.za/sam/edu/mind.htm*
[5] The readability of selected sections has been determined through Fry graphs and the Flesch formula nomogram.
[6] *http://www.gnu.org/licenses/fdl.html*

Development Unit at UCT, that the content meets all curriculum criteria and is properly tested in the school environment. In addition, national education initiatives will be notified of the project.

Once the books are complete, the content will also be released online in html format (webpages) and as digital documents which can be downloaded (pdf or postscript format) from the Internet.

Phase II (2005 - ongoing)

During Phase II, key learnings from the roll-out of Phase I will be incorporated. Feedback from teachers and learners will be addressed and, if necessary, a second edition of the books will be released. This phase will involve roll-out in Western Cape and other provinces as funding allows.

Funding

Funding for the project is imperative to enable the printing and distribution of the books. The project was recently selected by the Shuttleworth Foundation to attend their Innovation Bazaar (in September) where educational projects are put in contact with potential investors. We hope to raise some funds in this manner but further funding will be necessary to allow the national roll-out of the project. Further fund-raising activities will be planned as the project progresses.

Contact Details

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Curriculum Vitae

- **Mark Horner**
  Mark initiated the project in 2002 and has coordinated activities to date. These include liaising with the UCT Education Department, coordinating with the UCT Faculty of Science, writing content and recruiting authors. In terms of educational experience, Mark has 6 years of tutoring experience at both university and school level. In addition he was involved in creating a tutoring initiative (Pure Maths) to teach extra lessons in science and mathematics (1998-1999) to students at Fish Hoek High School and Rustenburg Girls' High School.

- **Spencer Wheaton**
  Spencer worked as a matric science teacher at Rosebank House Damelin College in Cape Town from 1999-2000 before returning to UCT to study full-time. Spencer's academic achievements have been recognised by UCT through a research fellowship, in addition to holding a National Research Foundation (NRF) prestigious scholarship. At university level he has been involved in physics tutoring for 7 years.