

Free High School Science Texts (FHSST)

Prepared by

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on behalf of the
FHSST authors¹

¹<http://www.nongnu.org/fhsst/people.html>

Project Objectives

Free High School Science Texts (FHSST) is an initiative to develop and distribute free mathematics, physics and chemistry textbooks to all grade 10 - 12 learners in South Africa.

The 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
- To provide a quality, accurate and interesting text that adheres to the South African school curriculum and the outcomes-based education system
- To provide a text that is easy to read and understand even for second-language English speakers
- To make a difference in South Africa through helping to educate young South Africans

The majority of content for all three books has been gathered and the project focus is moving towards printing preparation, distribution and fundraising activities.

The project is endorsed by the Faculty of Science at the University of Cape Town (UCT).

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. It is also a decisive response to requests for contributions of educational material by other education initiatives for example the *Mindset Project*².

Organisation Details

Name: Free High School Science Texts / FHSST (<http://www.nongnu.org/fhsst>)

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Organisation Status: An application for registration as a Voluntary Organisation is being submitted. Once this is complete, application for tax exemption status will begin.

¹S. 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>

Project Team

Project Coordinators

The project is headed by Mark Horner and Spencer Wheaton, both of whom hold masters degrees in physics and are currently reading towards their doctorates at UCT.

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 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.

Team Members

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. Project authors include 4 post-doctoral, 13 post-graduate and 5 undergraduate 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.

Non-author members include a graphic designer who has volunteered to produce book covers. The group's 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. This has resulted in an article about the project being published in *The Science in Africa Online Magazine*.³

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 application of each new concept is illustrated immediately in a worked example. These are broken down into a step-by-step problem solving approach. Learners often struggle to make the leap from concept to application and therefore worked examples provide important illustrations on which they can build their skills. This also helps teachers by offering alternative explanations and methods of problem solving.

The writing style of the books ensures that the content is accessible to second language English learners⁴.

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 young science graduates training to be teachers. The mix of youth and experience

³<http://www.sciencein africa.co.za/2003/november/book.htm>

⁴the readability of selected sections has been determined through Fry graphs and the Flesch formula nomogram

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 Licence⁵ (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 Plan

The main project outcomes are:

- A set of mathematics, physics and chemistry books that can be printed and distributed by anyone, royalty free
- A free resource for all other education initiatives to use in their programmes
- Wide use of the book in the Western Cape from 2005, nationwide exposure beginning in parallel
- National roll-out in 2006
- A channel for businesses and individuals to contribute to South African education

The project consists of two phases:

Phase I

The first phase involves the gathering of content, editing, printing and pilot distribution of the books in the Western Cape.

After content gathering and editing, samples will be printed in the final format including cover designs. Once the final books are complete the content will be released online in html format (webpages) and also as digital documents which can be downloaded (pdf or postscript format).

Concurrently printing details will be finalised. FHSST has been approached by a printer who can print large quantities lithographically as well as provide print-on-demand services which will be useful in future years.

Potential sponsors will be identified and approached. At this time, samples of the final books will be available to promote investor buy-in and confidence.

In order to stimulate awareness of the project amongst teachers in the Western Cape a seminar/seminars will be organised. Speakers from education initiatives will be invited, building a link between the books, education initiatives and teachers. The Western Cape Department of Education will be consulted at this stage. Other education initiatives will also be approached to use the books. Interest from the South African Museum has already been expressed for the use of the books in their Mindspace⁶ program.

It is planned that initial funding will be used for a large lithographic print run as this is the most cost-effective option for large quantities. The books are optimised to be printed in black and white to further reduce costs. The books will be distributed first to the schools taking part in the seminars. Once the initial lithographic reserves are exhausted (possibly only in 2006), the print-on-demand service can be used for small print batches i.e. as schools need books.

⁵<http://www.gnu.org/licenses/fdl.html>

⁶<http://www.museums.org.za/sam/edu/mind.htm>

Phase II

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 also involve roll-out on a national scale. Contact will be made with the various provincial education departments to identify schools to participate in the project. Once final numbers of learners and costing estimates are established, potential sponsors will be approached. In addition, national education initiatives will be notified of the project's roll-out.

As in the pilot phase, seminars for teachers will be held in major centres to promote the use of the books.

Long Term Sustainability

Long term sustainability relies on the successful adoption of the book by teachers and learners across the country as well as adequate funding to maintain the supply of the books.

During the first two years, feedback and assessment of the books from the users will be gathered, analysed and incorporated into revised editions of the books. The seminars will also help to promote awareness and use of the books. These activities will help to ensure broad usage of the books by teachers and learners alike.

Funding will enable revisions of the books to be made, printed and distributed. Sponsors may be given recognition for their contributions by their acknowledgement in the books and on the FHSST website.

Detailed Project Plan

Phase I			
Content Gathering and Editing:			
Complete cover designs	Jan 2004	-	May 2004
Complete first drafts of all books	Sep 2002	-	Jun 2004
Edit books according to outcomes -based methodology	Jan 2004	-	Aug 2004
Finalise guest editors	Jan 2004	-	Aug 2004
Get feedback from guest editors, finalise books	Aug 2004	-	Oct 2004
Create web-based content	Oct 2004	-	Nov 2004
Fundraising and Printing:			
Fundraising:			
Identify and contact potential sponsors	Mar 2004	-	ongoing
Printing:			
Identify printer			May 2004
Negotiate printing rates	Mar 2004	-	Oct 2004
Print samples			Jun 2004
Print covers			Oct 2004
Print books for identified schools in Western Cape	Oct 2004	-	Nov 2004

Promotion and Distribution:

Promotion:

Organise seminar for teachers in Western Cape	Apr 2004	-	Oct 2004
Make contact with newspapers/magazines/ radio stations to publicise project			Oct 2004
Contact Western Cape Education Department			Oct 2004
Identify and contact other large education initiatives	Mar 2004	-	Oct 2004
Run seminar for teachers and provide books for their classes			Nov 2004

Distribution:

Identify schools for distribution of books and information			Mar 2004
Identify contact person per school to organise book delivery			Oct 2004

Phase II

Phase I Feedback:

Contact teachers involved in pilot roll-out to determine any refinements to the books/process	Jun 2005	-	Jul 2005
Implement necessary steps to incorporate feedback	Jul 2005	-	Aug 2005

National Rollout:

Contact provincial education departments in other provinces	Jan 2005	-	Jul 2005
Identify schools	Jan 2005	-	Jul 2005
Identify contact people at schools	Jan 2005	-	Jul 2005
Organise and run seminars in major centres	Jul 2005	-	Aug 2005
Identify number of books needed	Jan 2005	-	Jul 2005
Identify local/national sponsors to cover printing and distribution costs	Mar 2005	-	ongoing
Identify sponsorship for print-on-demand in Western Cape			ongoing
Print and distribute books for 2006	Sep 2005	-	Dec 2005

Budget

Phase I			
Fundraising and Printing:			
Fundraising:			
Identify and contact potential sponsors	Print & distribute promotional material	R	255
Book Printing:			
	Print mathematics books (x 25 000)	R	362 500
	Print physics books (x 12 500)	R	181 250
	Print chemistry books (x 12 500)	R	181 250
Promotion and Distribution:			
Promotion:			
Print sample books for promotional use	Printing	R	19 850
Organise and run seminar for teachers in Western Cape	Print promotional material	R	240
	Venue and equipment hire	R	7 500
Contact media, Western Cape Education department and large education initiatives	Print & distribute promotional material	R	102
Distribution:			
Store books after print	Storage costs	R	900
Deliver books to schools	Delivery costs	R	90 000
Administration:			
	Telephone installation cost	R	301
	Telephone rental for half year	R	551
	Telephone calls/faxes for half year	R	6 480
15 % Contingency		R	127 677
Total for Phase I (2004):		R	978 855
Phase II			
Phase I Feedback:			
Conduct survey of schools using book	Printing and postage	R	1 410
National Rollout:			
Contact provincial education departments	Printing and postage	R	56
Organise and run teacher seminars nation-wide	Print promotional material	R	2640
	Venue and equipment hire	R	82 500
	Transport (car hire, air tickets)	R	119 900
Book Printing			
	Print maths books (x 262 500)	R	3 806 250
	Print physics books (x 131 250)	R	1 903 125
	Print chemistry books (x 131 250)	R	1 903 125
Administration			
	Administrative assistant (part-time)	R	50 000
	Telephone rental	R	1 101
	Telephone calls/faxes	R	12 960
	Internet services	R	27 360
15% Contingency		R	1 186 564
Total for Phase II (2005):		R	9 096 991