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## Hardware, software & connectivity for the SA classroom/laboratory in the 21<sup>st</sup> century

### Background:

There is no question – the way forward for creative and enterprising teachers and schools is to follow the digital route – as we face the challenges in our daily teaching of the SA Maths & Science Curriculums!

### Document contents:

For many people hardware and software is developing so quickly – that many are too nervous to take the necessary decisions and thus move forward – into the exciting possibilities available in the digital world. We will briefly overview the following topics – hoping that we can provide some guidelines for the way forward for you in the classroom digital age:

1. Classroom/laboratory teaching venue
2. Computers
3. Data projectors
4. Projection screens
5. Sound requirements
6. Software
7. Basic, introductory hardware and software package to get you going
8. Internet connectivity
9. Interactive White boards & Mimios
10. Useful Websites
11. Fundraising to finance additional/new hardware and software.



- **Classroom/laboratory teaching venue:**

The venue(s) for your daily teaching in every lesson is the first important factor to consider, as portability of hardware determines (to a certain extent) what type of equipment you should consider & acquire. If you teach in the same venue every lesson, a personal computer, data projector fixed to the ceiling and a wall-mounted screen may well be the route to take – provided your security is top class! If you move around every lesson, a computer Notebook, very portable data projector and a tripod screen may well be the route to follow. If the security in your lab is not great – this may also be the right way forward for you as well.

- **Computer requirements (R 6000 – R 9000 range are suitable):**

Basically, most modern computers are pretty good these days – otherwise they would not survive in this very competitive market.

We recommend that you consider a p.c. (provided the security is good in your teaching venue) or a computer Notebook – if security is not great or if portability is important. A Notebook is also very useful (even if you have a secure venue) since you can take it home as often as required and prepare lessons, notes, worksheets, tests, exams, circulars, rubrics, letters etc in the comfort of your home environment. A computer Netbook has too small a hard drive and RAM.



We recommend you select one of the better-known brands with a reasonable sized hard drive and suitable Ram – to cope with your present and future requirements. Certain of the Dell computers are offering and providing onsite service and if they can't sort out the problem at your school – they will return your computer within 24 hours – or provide you with a temporary replacement. This is certainly worth considering. We suspect that other brands will soon follow suit.

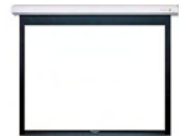
- **Data projectors (R 6000 – R 9000 range are suitable):**



Try to avoid the cheaper ones – they are usually not bright enough for the average classroom or laboratory. There are a number of suitable ones on the market – we suggest you stick to one of the better-known brands. Some are suitable for ceiling mounting, while others are not. In general, the smaller (& thus more portable) they are and the brighter the bulb, the higher the price. Do not select a projector that has a bulb with a brightness less than 2 500 lumens and remember the life span of most of these bulbs is about 3000 – 5000 hours and they are very expensive to replace. After using the data projector, allow the fan to continue to cool the projector after switching off the bulb – before disconnecting the projector. This will prolong the life of the bulb. If you do not move the projector at all – you can leave it on for the whole day and only switch off at the end of the school day – when you have finished teaching. For classroom projection – buy a projector with a projection range of 2 – 5 m – so that it can be positioned close to the front of the classroom.

A recent development is the introduction of LED bulbs into data projectors. The life expectancy of these bulbs is an amazing 30 000 hours and certainly looks like the way to go – provided the bulbs are bright enough for your requirements!

- **Projection screens (R 800 – R 1800 range are suitable)**



If you remain in the same venue for all your lessons, then we recommend a fixed wall-mounted screen – one that can be pulled down (manual ones are much cheaper than motorised ones) or rolled up when not in use. It is useful if the screen is not mounted in front of your board – then you can use both at the same time – to elaborate on the board that which is showing on the screen. The screen should be positioned as far away from the windows as possible. It may be necessary to have dark curtains or blinds covering the windows nearest the screen – depending upon your particular circumstances in your venue. If you have a suitable, large, white wall space in your classroom you could also project onto the wall. Sometimes this can be a better option – for your particular facilities.

Portable tripod screens – usually of similar price can also be of great use and value – as you move from one venue to another. These days they make ones that can be assembled and positioned very quickly at the start of your lesson or presentation.

Screens having a width of 1.4 – 1.8 m are suitable for class projection where the number of people viewing the projection number between 20 – 75 learners. This would also be suitable for use in a small hall – provided people were sitting reasonably close to the screen.

- **Classroom sound requirements (R 200 – R 600 range are suitable):**

Although some computers have their own loudspeakers, they are often not loud enough to be heard from the back of a classroom or small hall. Loud speakers can be purchased to connect directly to your computer and will provide very adequate sound facilities. The 2 speakers are usually connected together by wires and use a single connection plug to your computer. There is normally a volume control on one of the speakers.



- **Software requirements (R 1200 – R 4000 range per subject):**

Suitable & appropriate CD Rom discs for High Schools are available



(some on the SA OBE Curriculum). Most of the discs cost about R 400 – R 600 per disc and cover certain aspects of the Curriculum per Grade. Decide what you need to start with and gradually build up your library of CDs as and when finances permit.

CDs for you to consider are:

Maths & Science CDs – using a PowerPoint framework for content delivery of G 10 – 12 lessons on the complete SA OBE Curriculum. (R 400 each)

Cyber School CDs – using 1 – 2 minute UK Curriculum video clips to illustrate 100s of concepts in Science, Maths & Life Sciences. (From R 400 each)

Maskew Miller Longman ExanBank CDs – using a fairly large data base to draw up your tests, worksheets and exam papers – with Memos and mark schemes. SA Curriculum. (R510 each)

Learthings CDs – useful for teaching G 5 – 9 using UK clips with which to illustrate many concepts. (From R500 each)

Other software – mainly UK based Curriculum is also available – but it is quite expensive and often costs R 3000 – R 20 000 and does not necessarily cover the complete content for a subject or for a particular year.

- **Basic approximate costs for the introductory package to get you going in your own venue:**

It is highly recommended that you start off small and gradually build up to the ultimate teaching and learning package as you become more and more familiar with your equipment, software and the different methodology that is recommended. At a later stage you can acquire Mimios or Interactive White Boards. The basic package to get you started would cost:

Notebook computer	R 8 000
Data projector	R 8 000
Screen	R 1 500
Speakers	R 400
Maths & Science CDs	R 1 200
Cyber school Video CDs	R 800
Maskew ExamBank CDs	R 1 500
Total basic costing:	<u>R 21 400</u>



These costs could be substantially reduced by: Purchasing your own Notebook computer through the Education Department – where you will receive a subsidised R 11 000 Notebook computer (including Internet connectivity) for the figure of +/- R 60.00 per month – deducted from your monthly salary. You could also just start with the Maths & Science teaching CDs and then go on to purchase the other CDs – as finances permit.

- **Internet connectivity:**

There are quite a number of issues for you to consider here and you probably need to take professional advice on what is the best for your situation in your particular school. It is useful – although not absolutely essential – to have the facility to connect to the Internet during your lesson. You could connect to certain websites – to illustrate certain concepts as well as connect to Google Earth, You Tube etc.

Some schools have wonderful computer laboratories with servers etc. and you may well be able to hook up – with or without cables, to this facility.

Alternatively, you could connect to the Internet wirelessly via a '3G Dongle' or even using certain 3G cell phones to connect to the websites you would like to use.



It is strongly recommended that you get professional help and guidance as to what will be best for you and your situation in your classroom – taking into consideration what the school already has at its disposal and what your requirements are.

- **Interactive White Boards & Mimios: (R 6000 – R 50 000 range)**

It is generally felt – by many people, that these could well be seen as luxury items – especially for High Schools. Boards and Mimios come with a library of images, but the teacher basically needs to spend much time making their own appropriate images and many teachers do not have the time nor the skills to do this.



Mimios cost about R 6000 and merely adhere to an ordinary white board, while connected to your Notebook computer and a data projector and it enables you to use the board to draw and write certain images while teaching. It can be very useful and may be worth considering.

Interactive White Boards start at about R 15 000 for the cheaper boards and range up to the more expensive established brands at R 50 000 for the set up – including the Notebook computer and the data projector that are required to go with the Interactive White Board. While certain images in the accompanying library are very useful, the teacher will really be expected to make up many of their own images – if they are really going to get value for the money spent on these boards.



- **Useful websites:**

The following is a list of websites that could be used to obtain teaching materials, CDs, worksheets and other information:

Maths & Science Marketing - for fantastic SA Curriculum based CDs:

[www.mathsandscience.com](http://www.mathsandscience.com)

- Smartlabs – for excellent Cyber School CDs & exciting new laboratory equipment: [www.smartlabs.co.za](http://www.smartlabs.co.za)
- Walter Fendt – many fantastic physics & maths demos: [www.walter-fendt.de](http://www.walter-fendt.de)
- ADESSA – SA companies supplying CD Rom teaching discs for schools: [www.adessa.org.za](http://www.adessa.org.za)
- Crocodilia & crocodile clips & Yenka products for Maths, Physics & Chemistry demos: [www.crocodilia.com](http://www.crocodilia.com)
- Maskew Miller Longman – useful Exam Bank CDs: [www.mml.co.za](http://www.mml.co.za)
- Thutong DoE National website – lots of Science & Maths materials: <http://new.thutong.org.za>
- WCED: <http://wced.gov.za>

- DoE: <http://education.gov.za>
- How stuff works – useful Science stuff: [www.howstuffworks.com](http://www.howstuffworks.com)
- Dept of Science & Technology: <http://updated.dst.gov.za>
- Physics experiments: [www.physclips.unsw.au](http://www.physclips.unsw.au)
- Science in Africa: [www.scienceinafrica.co.za](http://www.scienceinafrica.co.za)
- Khanya – the IT arm of the W Cape Education dept.: [www.khanya.co.za](http://www.khanya.co.za)
- Absorb Physics: [www.absorblearning.com](http://www.absorblearning.com)
- SMART Board downloads (Free) [www2.smarttech.com](http://www2.smarttech.com)
- Google earth for identifying places, buildings etc: [www.earth.google.com](http://www.earth.google.com)

• **Fundraising for hardware and software:**

Although the cost of a basic package at R 21 400 seems like an incredible amount of money – any determined, creative, organised teacher – together with their learners should easily be able to raise this sum of money at school - without too much difficulty. Here are some ideas to help you along the way:



1. Contribution from each learner in the school - say R 5.00 ea.
2. Discos – in school hall
3. Civvies days – instead of school uniform
4. Cake/hot dog/hamburger/chips sales
5. Legal Raffles
6. Donations from business(es) or corporate(s)
7. Four or more parents who can afford contributions – to improve things for learners
8. Collection & recycling of items – paper, bottles, scrap metal, old clothes, cooldrink cans etc
9. Proceeds/sponsorship from tuck shop
10. Fashion show
11. Dancing competitions

Borrow the necessary basic equipment and demonstrate to the learners what you envisage – get them excited about what could be happening in their Science and Maths classroom – with their help!

Challenge the learners to help you come up with ways to raise the necessary funding required to get a computer (even second hand), a data projector and the necessary CDs in each of the Maths, Maths Literacy & Science classrooms.

Be assured - they will surprise you!

