RISING TO THE AFRICAN EDUCATION CHALLENGE

SUPPORT VIRTUAL REALITY IN AFRICA FOR AFRICA BY AFRICA
AN APPEAL TO DONOR AGENCIES & FOUNDATIONS

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VR

What: VR in African training & education

Why: Visually interactive
Allows learners to explore in safety
Overcomes language barriers
Overcomes literacy barriers
Show, don't tell

How: By taking advantage of the visual powers of the human brain and the principles of intuitive learning

If a picture paints a thousand words why do we still focus on text as a learning medium?

Who are we?

The Naledi3D Factory (Pty) Ltd. of Pretoria, South Africa, focuses on the development of visual learning content. We are a modern, innovative company(1) that develops computer based virtual reality (VR) content as a means of visualising objects, complex concepts or processes in a three dimensional, interactive environment. (*Our vision is to use the visually interactive nature of VR to communicate ideas and concepts; and to visualise Africa's rich heritage; to address the training needs of our diverse communities; to overcome literacy barriers and hence, help people bridge the skills and knowledge divide.)*

To realise this vision, we have developed strategic relationships with organisations such as **UNESCO**; **IICBA** (International Institute for Capacity Building in Africa - based in Ethiopia); **Infotiv Visual Technologies** of Sweden (who develop visualisations in the areas of healthcare and medical training); and more recently, **Worldlinks Southern Africa** (a Washington based global learning network that links teachers, through technology, with schools and multi-purpose centres) as well as the **Open Knowledge Network**.

UNESCO - Nakaseke Rural Hygiene Project - Uganda

Naledi *- in our Basotho culture, Naledi is a star - a star that shines over Africa....*

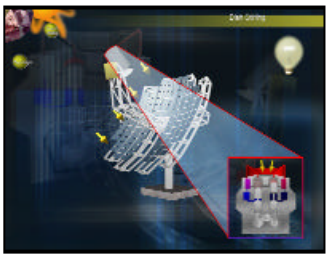
(1) **the Naledi3d Factory** - "*One of South Africa's most innovative companies*" (*Business Day - December 2003*)

What do we do?

PROUDLY SOUTH AFRICAN

Interactive visual simulations

- Education and training - our main focus;
- Industrial training & safety;
- Heritage & tourism;
- Visual representations of new technology concepts;
- Construction, architecture & town planning.



ESKOM - Solar Collector and Sand Filtration Water Filter

Some of our highlight VR projects to date include:
- Basic hygiene (Uganda);
- HIV / AIDS awareness for teachers (Ethiopia);
- Helping the youth in Alexandra Township (Johannesburg) to find, and retain employment;
- Land-use planning in Soweto;
- Alternative power sources for rural communities;
- Technical skills - with a first project in turning and milling.

What is VR?

VR, or "interactive visual simulation" can be defined as "a computer-generated environment where the user is able to view and also manipulate the contents of the environment".

As PC's become more powerful, VR is becoming a new, powerful, practical and effective communication medium in education and training. VR allows for intuitive, real-time interaction in visually appealing and stimulating 3D worlds.

This makes it the ideal tool both for education and the communication of concepts, where "a picture paints a thousand words...". VR is context as well as concept rich and enables the development of skills in a safe environment with no risk of real damage, loss or injury.

Why VR in Africa?

In Africa, poor literacy and limited resources pose a huge challenge to learning at school and in adult-based learning. Due to the visual nature of VR, it overcomes literacy barriers as the content is *shown - not told;* which has always been a problem in traditional, descriptive text-based education.

VR can be effective in areas as diverse as science, history, agriculture and health. The Naledi3d Factory has taken up the challenge and, with the support of UNESCO and others, has introduced VR as a way of helping to address the challenges faced by communities struggling to break out of poverty.

Join us today and help us to truly educate and empower the people of a proud and ancient continent

Initiatives in Uganda have led to trained VR developers and a VR committee, with representatives from the Department of Education, UNESCO, two Universities, SchoolNet, the National Curriculum Development Centre and several schools. The NCDC have now begun to develop VR models.

What we believe in

Naledi3D Factory was founded to make a difference - by applying VR as a visually interactive training tool to the communication of ideas and concepts; to visualise our rich African heritage and to address the training needs of our communities. The ability to transfer knowledge and skills to those with lower literacy skills makes VR very exciting in the African context.

By taking advantage of the visual nature of VR, appropriate and effective training and education can be provided without the need for strong literacy skills. This can lead to social upliftment, the alleviation of poverty and help lift economic growth. We believe that VR has a powerful role to play in the future development of Africa and we are committed to making this happen!

Educational Challenges in Africa

The Naledi3d Factory's belief that VR can have a major impact on education in Africa is founded on a new understanding of how people learn and the role of language and text in education:

Language: Much formal teaching in Africa is done in English or French, often a person's third or even fourth strongest language. The learner is disadvantaged from day one as all learning has to go through a translation process;

Literacy: Illiteracy is a serious learning barrier in developing areas of the world - in Africa, literacy averages around 56%.

Text: This is usually used as the primary medium for knowledge transfer, but is very inefficient. VR is not only visual, but also interactive in nature, and is much more compatible with how the brain actually functions and learns. VR can be used to give a global picture, using text as a secondary medium to add detail. VR is a more powerful way of transferring knowledge.

In view of the foregoing, we believe that VR can have more of an impact in the African learning context than in the more traditional First-world environment.

"VR in Education" workshop in Pretoria, with senior specialists from Ethiopia, Uganda and Nigeria (hosted by IICBA)

Learning how to get a job - Alexsan Kopano multipurpose centre, Alexandra Township, Johannesburg. November 2003

How does the brain learn?

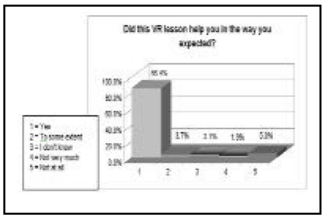
Recent research carried out for UNESCO (by the Naledi3d Factory) summarised the latest neurological research into how the human brain learns. This study shows conclusively that the human brain is a visual organ. A large part of the brain is dedicated to visual stimuli and the visual cortex has evolved over millions of years; whereas the text processing part of our brain's "working memory" is much more recent. We dream in pictures, we picture what we are told. Current 'show-and-tell' teaching methods don't take into account the strengths of our crucially important working memory and underutilises the so-called visio-spatial sketchpad. VR is inherently based on pseudo-3D imagery that exploits the most powerful parts of the brain!

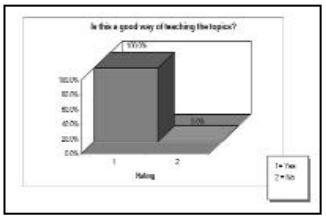
The study concludes that "…there is only one ICT application that is able to create environments combining all required aspects and that application is a fully interactive, simulated, virtual 3D environment, i.e. Virtual Reality". (These reports are available from our web site - www.naledi3d.com).

VR acceptance surveys in SA and Uganda

Clearly, as a learning tool, VR can overcome literacy barriers. VR is a visual tool where learners can be *SHOWN* how things work as opposed to being *TOLD*.

Surveys were undertaken in Ugandan and South African schools and multi-purpose centres. The responses from "children" of all ages strongly supports what was found by the above research. This field study of over 330 people confirms that VR is an ideal educational tool. The responses of both teachers and students show that the learning process can be greatly enhanced by the use of VR-based learning material. All teachers interviewed believed VR was a good teaching medium and they indicated that they could integrate VR into their lessons. Most students benefited from the visually interactive nature of the technology, leaving them more confident in respect of the subjects concerned.





VR evaluations in Ndejje Senior Secondary School and Buwama multipurpose centre - Uganda

These findings are remarkable given the relatively brief exposure to the VR-based learning content, and underscores the speed and ease of learning associated with VR.

What we have achieved so far

Over four years, we have brought First World, supposedly expensive and exclusive VR worlds into the everyday experience of people in Africa; while our focus is African development we have also undertaken visualization projects in Europe - including the Delft Museum of Technology; a flood control scheme on the Maas River and housing upgrades in Roermond.

Here are some of our proud achievements, which addresses unique development needs - from hygiene to sustainable energy; HIV/AIDS education and technical training. We are working to revolutionise the way that Africa learns.

UNESCO: Sanitation, basic hygiene and the prevention of disease, using Nakaseke (Uganda) and it's tele-centre as a pilot site - helping limit the spread of disease and save lives (this project also included a technology transfer element to Uganda).

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ESKOM: (SA electricity supplier) - A visual representation of a proposed Cape wind farm - used in an EIA process.

Housing development - Roermond

ESKOM - Cape Wind farm

South African Excellence Foundation & DTI; A visual representation of the SAEF SME Business Excellence Model - how to implement quality in business.

IICBA: (Addis Ababa) - A VR in Education workshop with senior representatives from Uganda, Ethiopia and Nigeria, which also included levers, molecules and buoyancy VR models.

ESKOM: A visualisation of 11 ESKOM power technologies ranging from the complex Dish Stirling and Aquaponics system to the simple water heater barrow and water filter (used at the 2002 World Earth Summit, Jhb).

ESKOM - Aquaponics

Business Excellence for the SAEF

City of Johannesburg: A visual representation of the upgrade to the Moroka Dam, Soweto (also used at the 2002 World Earth Summit).

Freedom Park: A SA prestige development in Pretoria including the Garden of Remembrance, memorial and museum to freedom through the ages.

Land-use planning - Soweto

Freedom Park - Pretoria

UNESCO: Overview of VR and other multimedia technologies in the learning process including an overview of how the brain learns.

ESKOM: Concentrated Solar Power (CSP) - showing the functionality and the main components of the CSP system which would typically be built and operated in a dry, desert environment.

Size comparison

National Laser Centre: A demonstrator of how lasers work - to raise awareness of laser technologies amongst the youth.

IICBA: (Addis Ababa) - A learning model on HIV/AIDS as it relates to teachers and kids in Ethiopia - covering themes as diverse as myths, medical, stigma and prevention; this tool can play a vital role in saving lives in Ethiopia.

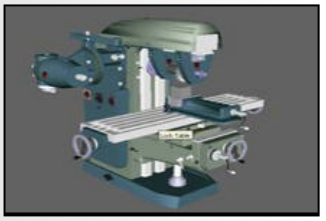
UNESCO: How to apply for, be successful and also to keep a job; piloted and used in the AlexSan-Kopano multipurpose centre, Alexandra, Johannesburg.

AIDS Awareness Education in Ethiopia

Training for Employment - Alexandra

SA Department of Labour: Training for lathe and milling machine operators (with Tshwane college / Wits University).

Turning machine in a workshop environment



Milling machine in 'inspect mode'

W.K. Kellogg Foundation: Beekeeping for emergent farmers (Zimbabwe) which includes the building and ideal location of hives, hive management, enemies, extracting honey as well as packaging.

A beekeeping farming environment

Step by step construction of a Kenyan Top Bar Hive

Why Local Content?

There is a need for learning content that is uniquely African. Local content can make a huge contribution to development as learners can more easily relate to the learning material. This speeds up the learning process and improves education quality. This is especially true of visual VR content. During our recent Evaluation of VR (see above) which evaluates the comparative advantages of applying interactive 3D tools to the African learning environment, interviewed teachers and pupils in both Uganda and South Africa decried the general lack of African content.

African learning is inundated with European and American teaching material (in both book and digital form), which can hinder the learning process - ontent is presented using analogies that are totally foreign to the learner's experiences. Content is also typically presented in English, which may be the learner's third or fourth strongest language.

Impact on the NEPAD priority areas

Our initiatives can have an impact on most of NEPAD's priority areas including Agriculture, Infrastructure, Health, Education and Skills Development, ICT's as well as Environment and Tourism.

Potential Impact on our communities

We now have feedback on our first work, Basic Hygiene in Nakaseke - with a population of 36 000. The model was installed as a pilot in the local MCT (Multipurpose Community Telecentre) three years ago.

MCT staff are using the content in twenty four primary schools and four secondary schools. Community and church leaders, as well as the local clinic refer to and use it. The "community" have fed back to UNESCO that there has been a drop in dysentery and other related disease in the community.

The MCT staff also use the VR model to entice locals into the Centre - *"It (the model) has been shown to community members and schoolchildren, with the special approach of having users run it on their own. This has also been one way of encouraging locals that were originally intimidated by the MCT to participate and use the equipment at the MCT."*

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This (so called "pilot") basic hygiene model is now being used in Kampala (schools, universities and community centres), as well as in community medical centres in Kenya and also in Zambia.

Some potential content themes

To show the scope for VR in African education, here are some content themes that we are currently working towards (and seeking support):

Health: ranging from nursing and medical skills to community health awareness, eg. Malaria and especially HIV/AIDS;

Technical and artisan training: for example, machine operation, brick-laying and electrical work, including related safety issues and labour-based construction techniques;

General education (GET, FET & ABET): Visual content can be used in many areas of the curriculum and at all levels; with science, history and geography being but examples;

Agriculture: the training of (emergent) farmers in a range of subject areas, from husbandry to maintenance of infrastructure;

Life skills: eg, financial awareness, health issues etc;

Heritage: a very important area that especially includes the re-creation and digitisation of *pre-colonial African heritage*, both for the youth and to enhance the tourism experience.

This list is not comprehensive - the sky is really the limit. By working together, we can address the specific needs of your community.

Implementation and roll-out issues

How to get content to end-users? We have relationships with a number of organisations including:

Multipurpose centres: Some of our recent work has been tested in the Alexsan Kopano Centre in Alexandra, Johannesburg, through which we have access to over 60 "GCIS" centres in South Africa (up to 240 are planned!).

We have a relationship with **World-Links** (Southern and West Africa), who link many community centres.

Schools: Through the various SchoolNet networks - who offer channels into schools; also the national Departments of Education.

The Open Knowledge Network: Which is developing links to many multipurpose centres, schools and others across the African continent; this network offers an exciting way to get locally developed content to many communities.

Bet Georgis - Lalibela - Ethiopia

HIV infection and stigma, Ethiopia

Powered by EON Studio

The Way Forward - Help us to make it happen!

Many of the projects outlined above would never have seen the light of day had it not been for the unwavering support of organisations such as UNESCO, IICBA and other governmental organisations, who have been able to seed this initiative.

Now is the time for foundations and other funding agencies to step up and help one of the greatest educational revolutions in African history grow. By working with us with the roll-out of VR in education, we can together make a huge difference to Africa's future.

We need to find ways to elevate VR content development in Africa in order to develop visual content on a larger scale and in a more holistic way. To be successful however, an initiative of this scale will require significant support.

We have identified three ways of working towards this goal:

Level 1
Learning content development - individual subject areas

We currently tend to work at this level; whereby individual VR models are built with individual partners. Most of the above examples were developed in this way - and over time, we are building quite an exciting library of content themes which are made freely available through channels such as described elsewhere on this page.

Level 2
Learning content development - thematic content areas

Whereby theme areas are addressed at more of a holistic level. Thus for example, a funded programme would be established to develop a comprehensive range of content in areas such as health, heritage, skills development etc. Thus for example, a range of learning content would be developed around the subject of agriculture; as opposed to bees or maize.

The resulting developed content, would again be made freely available through the above channels - and others.

Level 3
Regional content development freely distributed via local networks

Our final vision is to establish *co-ordinated* regional centres in several countries, *whereby* ***true local*** *content is developed and distributed regionally.*
We currently envisage centres being established in universities or other tertiary bodies. Identified candidate countries currently include Uganda (Makerere); Mozambique (Eduardo Mondlane); Ethiopia (Addis Ababa); Nigeria as well as Senegal.

A trans-continental initiative is envisaged, in which learning content and experiences are shared between centres and their users.

I f you feel that you can help support this exciting initiative, please contact Dave Lockwood:
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