Are Scientists, Engineers and Technologists born or can we nurture them?

Project Director – YESA Programme
Key Concepts

- Need for sustained skills development in key areas
- Forced to continue importing professionals
- Poor quality teaching in the areas of Science, Mathematics and Technology
- Education system promotes mediocrity through a sausage factory
- Young Engineers of South Africa (YESA)
  - aimed at generating a pipeline
  - stimulating interventions starting at preschool level through to grade 12
  - hands on challenges which promote the use of real-world tools, with a strong ICT foundation
  - encourages creativity and innovation leading to knowledge generation
  - group work, communication, research, application, construction and fun learning
- More career changing interventions
- Career guidance and entrepreneurial opportunities

THERE ARE NO FAILURES
Teaching for a society that no longer exists

There is a need to shift the focus of education.

Society is a moving target

Preparing Learners for Life

12 years of education
The Zeitgeist
Nature / Nurture debate

The intellectual and culture "flavor" of a time and place
Ridley 1999

Nature

Nurture

Late 1800's - UK
Darwinism took off
The role of genetically
determined capability was
considered very important.

1960's – USA "tabula rasa" (blank state) view of human intelligence
All people are capable of much more,
if given conducive environmental
conditions in which to reach their potential.

Western psychological world
is somewhere in between
The modern view
is “Interactionist”.

Constructionism
Constructivism
“In an increasingly complex world, sometimes old questions require new answers.”
The Flynn effect:
Are we getting smarter?

- Average IQ improving by 3 IQ Points per decade since WWII

- Causes
  - Diet
  - Schooling
  - Modern visual stimulus
  - Other
Intelligence varies with at least 21 factors

- Infant malnutrition (-ve)
- Birth weight
- Birth order
- Height
- Number of siblings (-ve)
- Number of years in school
- Social group of parental home
- Father’s profession
- Father’s economic status
- Degree of parental rigidity (-ve)
- Parental ambition
- Mother’s education
- Average TV viewing (-ve)
- Average book-reading
- Self-confidence according to attitude scale measurement
- Age (negative relationship, applies only in adulthood)
- Degree of authority in parental home (-ve)
- Criminality (-ve)
- Alcoholism (-ve)
- Mental disease (-ve)
- Emotional adaptation
Constructivism

- theory about how people learn
  - people construct their own understanding and knowledge of the world
  - we are active creators of our own knowledge
- In the classroom
  - encourage students to use active techniques (experiments, real-world problem solving) to create more knowledge
  - to reflect on and talk about what they are doing
  - Teacher has to understand pre-existing conceptions to guide the activity

- Objectives vs Outcomes
  - What are you going to teach
  - What can the learners do not that you have taught them
Constructionism, Seymour Papert

- Children learn best when they are in the active role of the designer and constructor
- Papert “It is the idea that happens especially felicitously in a context where the learner is consciously engaged in constructing a public entity”
- The creation process and the end product
‘If you think education is expensive, try ignorance!’

Dasgupta
Technological Ladder

- Digital Chasm syndrome
- Moving beyond the digital divide
- Rungs of the technological ladder

Replacement
Admin
Repairs
Training
Connectivity
Acquisition
Fund Raising

Tool for creativity & innovation
Knowledge Workers Learners
Research
Email and Internet
Word Processing
Computer Literacy
Real world learning

- Young Engineers of South Africa
  - 3-18
  - Hands on experiences
  - Strong emphasis on group work
  - Use of real world tools
  - Moving beyond word processing
  - Having fun
**Broader Picture**

**ICTs in Education – National Impact**

Knowledge Society, Global Competitiveness, SME coupled to key sectors of Automotive and Transport, Metals and Minerals, Chemical. Clothing and Textiles, Craft and Aerospace

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**Ultimate Goal**

Successful and innovative Scientists, Engineers and Technologists

<table>
<thead>
<tr>
<th>Curriculum Support</th>
<th>Scientists</th>
<th>Engineers</th>
<th>ICTs Specialists</th>
<th>Technologists and Innovators</th>
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<tbody>
<tr>
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- **Research opportunities**
- **Entrepreneurial Opportunities**
- **Career Guidance**

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Input from Industry
Broader Picture

Knowledge Engineering, Science, ICTs, Technologists and Innovators

Successful Scientists, Engineers and Technologists

Career Guidance, Research opportunities, Entrepreneurial Opportunities

Input from Industry

Skill Set

Knowledge Society, Global Competitiveness, SME coupled to key sectors of Automotive and Transport, Metals and Minerals, Chemical, Clothing and Textiles, Craft and Aerospace

Curriculum Support

Teacher Training and other support programmes

Community Networking – Mesh and Ulwazi

TEKKI TOT Programme – Preschool Intervention

Grade 0

Post Grad

Under Grad

FET

GET

Skill Set
Broader Picture

Knowledge Society, Global Competitiveness, SME coupled to key sectors of Automotive and Transport, Metals and Minerals, Chemical, Clothing and Textiles, Craft and Aerospace

Ultimate Goal
Successful and innovative Scientists, Engineers and Technologists

Input from Industry

Curriculum Support
Teacher Training and other support programmes

Post Grad

Under Grad

FET

GET

Grade 0

Entrepreneurial Opportunities
Career Guidance
Research opportunities

Research

Risk

Professionals

Technologists and Innovators
Skill Set

TEKKI TOT Programme – Preschool Intervention

Community Networking – Mesh and Ulwazi
Teacher Training and other support programmes

Existing Interventions

Think Quest
Young Engineers of South Africa

Programme

Skill Set

Knowledge and Skills

Successful and Innovative Scientists, Engineers and Technologists

Broader Picture

ICTs in Education – National Impact

Knowledge Society, Global Competitiveness, SME coupled to key sectors of Automotive and Transport, Metals and Minerals, Chemical, Clothing and Textiles, Craft and Aerospace

Other National Cross Curricular Interventions to be conceived and implemented

Input from Industry

Career Guidance

F1 in Schools

Space Clubs/Camps

CAME/CASE/CATE

Science Weeks

Science Expos

Research opportunities

Four Square Challenge

Greenpower

ICDL

EDN

Intel Teach to the Future

Think Quest

Four Square Challenge

Fab Kids

Kids Club

Entrepreneurial Opportunities

Space Clubs/Camps

Space Clubs/Camps

Space Clubs/Camps

Kids Club

Kids Club

F1 in Schools

New Interventions

Meraka Innovate Conference

Teacher Training and other support programmes

Community Networking – Mesh and Ulwazi

TEKKI TOT Programme – Preschool Intervention

Teacher Training and other support programmes

Existing Interventions

Hydrogen Fuel Cell Technology Challenge

New Interventions
Digital Inclusion

- Digital inclusion is not about computers, the internet or even technology.
- It is about
  - using technology as a channel to improve skills,
  - to enhance quality of life,
  - to drive education, and
  - to promote economic well-being
- It is about social inclusion, and because of this, the potential for technology to radically improve society and the way we live our lives should not be underestimated. (Pinder)
We need to start today for …

- South Africa to produce more people like…
  - Dr Barnard (Heart Surgeon)
  - Mark Shuttleworth (IT Entrepreneur)
  - Trevor Wadley (Electronic Engineering)
  - Phillip Tobias (Palaeontology)
  - George Ellis (Cosmology)
  - …
Thank – you!

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