16. Promoting the Public Understanding of Science and Technology: The South African Case

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Introduction

1994 saw the election of South Africa's first democratic government. This had immediate consequences for the development of social programmes in general and for science and technology policies in particular. The Public Understanding of Science, Engineering and Technology (PUSET) has become an important issue. Extensive national and international research has been carried out to develop up-to-date and globally inspired and competitive policies on science and technology PUSET.

The Department of Arts, Culture, Science and Technology (DACST) of the South African government is responsible for the formulation and overseeing of the implementation of science and technology policies, including those of PUSET. A specific 'Directorate for Science and Society' has been created within DACST that shows the commitment and importance given to PUSET in South Africa. Indeed, the South African government is well aware of '... the importance of science and technology to modern societies and the role of a technologically educated population in promoting economic and social development. The complex relationship between the economy, society, the environment and scientific knowledge makes a multidisciplinary approach to the development of society essential and calls for skilled communicators, able to address technological issues' (DACST, 2000b).

This chapter will first discuss DACST's White Paper on Science and Technology that is fundamental to all issues related to science and technology

in South Africa. From this White Paper, the need for PUSET and consequently for a Directorate for Science and Society became clear. The Directorate for Science and Society has developed a draft strategy for PUSET that will also be discussed in this chapter. Following this, a number of specific initiatives on PUSET in South Africa will be briefly described, and lastly the future focuses on how a new body, the Foundation for Education, Science and Technology, has been created by DACST to further the aims of PUSET will be outlined.

South Africa's Policy on Science and Technology

In 1996 the 'White Paper on Science and Technology: Preparing for the 21st Century' was published (DACST, 1996). This White Paper, forming the base of all further policy formulation and implementation, points out that 'innovation' is a crucial aspect when pursuing the well-being and prosperity of a country. Innovation must be based on a framework for social and economic policy that maximises possibilities for all parts of the system to interact for the benefit of individual stakeholders or groups of stakeholders, as well as for the advancement of national goals. The White Paper, therefore, provides a National System of Innovation (NSI) with science and technology at its core. This is based on the following considerations:

- Promoting competitiveness and employment creation
- Enhancing the quality of life
- Developing human resources
- Working towards environmental sustainability
- Promoting an information society
- The importance of knowledge creation
- The role of human sciences in innovation
- Finance, management and performance.

The National System of Innovation based on the above issues has six sets of functions that are outlined below according to their being 'Government' or 'Shared' functions (DACST, 1996):

Government Functions: Policy formulation and resources allocation at national level

Regulatory policy-making

Shared Functions:	Performance-level financing of innovation-related activities
	Performance of innovation-related activities
	Human resource development and capacity building
	Provision of infrastructure

The functions show that government not only considers policy formulation. It also considers that implementation of policy, appropriate resource allocation and the stimulation of innovative activities are crucial. Furthermore, government pays explicit attention to the development of human capital, capacity building and appropriate infrastructure. In all, the White Paper provides a clear and comprehensive framework for the promotion and development of science and technology for economic development, social innovation and an uplifting of all people of South Africa. Indeed, the White Paper states that: 'The stimulation of a national system of innovation will be central to the empowerment of all South Africans as they seek to achieve social, political, economic and environmental goals. The development of innovative ideas, products, institutional arrangements and processes will enable the country to address more effectively the needs and aspirations of its citizens. [...] A well managed and properly functioning national system of innovation will make it possible for all South Africans to enjoy the economic, socio-political and intellectual benefits of science and technology' (DACST, 1996).

Rationale and Strategy for PUSET

In the White Paper particular attention is given to PUSET. Government promotes the recognition, understanding, use and benefits of science and technology both through initiatives in the formal education sector and through special programmes. The White Paper argues that: 'Access to information is empowering, enabling people to monitor, lobby, learn, collaborate, campaign and react to proposed legislation ... The democratisation of society and elimination of poverty can only occur if people have equal access to the services and resources they need to perform their productive tasks' (DACST, 1996). The White Paper continues: 'For the national system of innovation to become effective and successful all South Africans should participate. This requires a society that understands and values science, engineering and technology and their critical role in ensuring national prosperity and sustainable development'.

The White Paper stresses the need for development of a public understanding

of science, engineering and technology and outlines a campaign that has two elements: promoting the power of science, engineering and technology (SET), and literacy in these fields. This is done through programmes that include:

- Increasing people's familiarity with the natural world;
- Promoting understanding of some key concepts and principles of science and technology;
- Demonstrating that science, engineering and technology are social tools;
- Fostering an ability to use science and technology knowledge in ways that enhance personal goals, as well as economic and community development.

These points show a clear recognition that PUSET is critical if South Africa is to continue to develop as a functioning democracy. To participate more fully in democratic processes, South Africa's peoples must understand, rather than fear, science and technology; and since poverty is recognised as an obstacle to effective democracy, all our people must use science and technology to contribute to its eradication.

The Directorate for Science and Society within DACST has published a document entitled *Towards a Strategy for Public Understanding of Science, Engineering and Technology* (DACST, 2000b). The document highlights the importance DACST and the South African government give to developing a society that is comfortable with science and technology, competent in its proper use and capable of contributing to its development. The document particularly identifies women and rural populations as requiring particular attention. It also advocates an appropriate recognition of local and traditional practices and their effective use, as well as the more prevalent use of 'mainstream' science.

The Strategy Document explains that the Science and Society Directorate will develop a PUSET model to implement and interact with the formal education system. From an awareness that South Africa does not rank highly in international comparisons on an understanding of science and technology, a need arose to develop a concerted effort to improve PUSET for the country. Indeed, the strategy is based on the recognition that there is a need to:

- Revisit the current approach of 'Taking SET to the people' and to develop it into an implementable strategy that recognises the inputs at all levels of society and incorporates them into the conceptualisation, design, implementation, monitoring, evaluation, funding and communication of PUSET programmes at the National Level;
- Create a PUSET model for South Africa that by 2005 will constitute the

realisation of Vision 2005 of the Directorate: Science and Society.

Aims of the draft strategy include:

- Generating a public interest in science, engineering and technology;
- Making society aware of the everyday use of science and technology;
- Encouraging the scientific community to become more transparent to society by communicating more appropriately with the public through media such as television, newspapers, radio and e-mail;
- Creating partnerships with scientific institutions, business, communities, NGOs, Institutes of Higher Education and other government departments;
- Improving scientific and technological education to enrich the lives of people without negatively affecting local culture;
- Stimulating the production of new resources that harmoniously combine mainstream scientific knowledge with traditional knowledge;
- Raising the scientific and technological literacy of women.

The strategy strives to integrate stakeholders in a public understanding of science, engineering and technology and make it a concern of national importance to which all can and must contribute. There is explicit reference to other government departments, business, schooling, the scientific community, the media and women. The strategy makes a clear move towards integrating the many role players that are active in PUSET and to develop a co-ordinated approach where resources, skills and capacity are fully used in a complementary and supportive rather than in a competitive manner.

A last document that is important to PUSET is the Report from the Foresight Project initiated by DACST (DACST, 1999). The National Research and Technology Foresight Project is one of a number of initiatives being undertaken by the Department of Arts, Culture, Science and Technology as part of its mission to review and reform South Africa's science and technology system. The outcomes of the Foresight Project, along with other policy initiatives, will contribute to new directions for science and technology in South Africa. The aim of the project is to help identify those sector-specific technologies and technology trends that will best improve the quality of life of all South Africans over the next 10–20 years. The project encompasses technologies that impact on social issues and wealth creation through product or process development. In particular the Foresight Project seeks to:

- Identify those technologies and possible market opportunities that are most likely to generate benefits for South Africa;

- Develop consensus on future priorities amongst the different stakeholders in sectors such as the industrial, socio-economic or service sectors;
- Co-ordinate research efforts between different players within selected sectors;
- Reach agreement on those actions that are needed in different sectors to take full advantage of existing and future technologies.

As important as these outcomes is the foresight process itself that will bring together government departments, industry, science councils, higher education, organised labour, professional organisations and other stakeholders who previously related to each other in a highly fragmented way. This is the start of a process that will see a long-term strategic approach to science and technology within South Africa, and greater focus on the role that technology has to play in the country's development.

In the Foresight Report (DACST, 1999) the development of human resources is identified as a crosscutting element in all the foresight areas that range from agriculture to information technology, mining and environmental issues. In this respect, a public understanding of science, engineering and technology is again identified as an important element of South Africa's plans for development of the competitive science and technology needed for the country to become an equal player in the global market.

PUSET Initiatives

DACST, and particularly the Directorate for Science and Society, has been instrumental in developing many initiatives related to PUSET. Some of these initiatives as well as some of those developed with partners are briefly outlined below:

Year of Science and Technology, 1998

South Africa proclaimed 1998 the Year of Science and Technology (YEAST). Each of the nine provinces held a week-long festival where they invited the general public, and specifically school children, to come to view and actively participate in a science and technology fair. Business, schools, universities and research institutes, both national and international, developed a 'road-show' that travelled to all provinces. More than 200,000 people were reached through YEAST. The initiative appeared to be a big success, particularly where good partnerships were created between business, government, research councils, education NGOs and formal institutes. YEAST also gave an enormous boost to PUSET.

National Science and Technology Girls' Camps

The first National Science and Technology Girls' Camp was held in 1998. Its objectives were to develop a better understanding of science and technology amongst the girls participating; to make them more aware of and able to deal with gender issues; and to alert them to the HIV/AIDS scourge. Through involving role models, businesses, and VIP and other visitors the status and accessibility of science and technology for the girls was enhanced. In 2000, three more girls' camps were held in which over 250 girls from all nine provinces participated.

National Science, Engineering and Technology Week

Building on the success of YEAST, a yearly week on science, engineering and technology is being held from 2000–2002. Each year, three provinces have been selected to host a 'Science, Engineering and Technology Week'. The public, particularly school pupils, have been invited to attend seminars, workshop displays and demonstrations designed by science councils, universities, business and other interested parties.

Women in SET Reference Group

Recently DACST initiated a Reference Group for Women in SET. The Reference Group sees its task as enhancing: a) the contributions from senior women scientists; b) career pathing for women; c) access for women to SET institutions; d) access and participation in school science and technology education; and e) use of science and technology as a tool for rural development and poverty eradication.

Science Journalism Awards

DACST recognises the important role played by the media in the public understanding of science, engineering and technology. To stimulate active and constructive media participation, DACST initiated Science Journalism Awards identifying seven categories. Some universities in South Africa have started to offer modules on Science Communication and Journalism.

Science Centres

Over a dozen science centres operate in South Africa. Typically they are based at a university, government education department or museum. Some centres target the public while others provide support for teachers and learners in their endeavour to understand more about science and technology. Some are interactive and others are more oriented towards displays. These science centres often have outreach programmes especially for rural schools.

Grahamstown Science Festival

The yearly Grahamstown Science Festival, SciFest, is another initiative that

explicitly aims at developing PUSET. Yearly, since before 1998, between 30,000 and 40,000 people visit SciFest where in a similar way to the Year of Science and Technology, national and international research groups, businesses, universities, schools and others display and involve the public in the latest and most topical science and technology developments.

Research into PUSET

The National Research Foundation (NRF) funds a number of university-based research projects into PUSET that are related to topics such as the implementation of the new curriculum, C2005; the use of indigenous knowledge in the school curriculum; and the development of scientific literacy, and rural science and technology learning.

Conferences on PUSET

DACST has hosted two conferences on PUSET where national and international researchers presented their research findings. Specific attention was given to the evaluation of YEAST and other PUSET activities and to mapping a way forward.

Solar Eclipse Project

In 2001 a 75 per cent solar eclipse could be observed in Southern Africa, and 2002 will see another. DACST developed materials and stimulated other initiatives for school children and the public that use the national media and other channels to make people more aware of the eclipse and its significance.

The new National Curriculum for Formal Schooling

The South African government has developed a new curriculum for Grades 1–9 (DoE, 2001) that sets out to contribute to the public understanding of science, engineering and technology. The new curriculum, called Curriculum 2005 (C2005), is based on outcomes-based education where clear end goals are formulated towards which all learning must contribute. The critical outcomes to which all education in South Africa is striving are to:

- Communicate effectively using visual, mathematical and language skills;
- Identify and solve problems using creative and critical thinking;
- Organise and manage activities responsibly and effectively;
- Work effectively with others in a team, group, organisation and community;
- Collect, analyse, organise and critically evaluate information;
- Use science and technology effectively and critically, showing responsibility towards the environment and the health of others;

- Understand that the world is a set of related systems.

These outcomes are achieved through learning in eight learning areas, namely language, mathematics, natural sciences, technology, social sciences, arts and culture, economics and life orientation. These critical outcomes clearly show a goal of learning that develops learners into citizens with an ability to understand and use science and technology in their lives and have an understanding of the world as a complex set of related environmental systems. This curriculum is a clear departure from traditional curricula that focus on the static reproduction of academic knowledge. The curriculum is ambitious and issues of teacher preparedness, development of appropriate learning resources, and learner and parent expectations are problematic. However, the government has recently simplified C2005, making it more user-friendly, and will support teachers and learners in a more effective way than it did in the first version of C2005. It is therefore likely to contribute to South Africans' understanding of science, engineering and technology.

In all, it can be seen that there are many initiatives in the area of PUSET in South Africa. Indeed, when seen in the broader African context, South Africa has a relatively well-developed infrastructure, technology-based industry and formal education system up to tertiary level. All these greatly assist in identifying a variety of stakeholders who are interested in PUSET and can contribute to it. A number of large businesses, research councils, universities and the media all are able and willing to play their part in the development of PUSET. However, at times perhaps the initiatives are somewhat disparate and fragmented. It is with this realisation in mind that DACST has taken a new initiative, setting up a Foundation for Engineering, Science and Technology (FEST).

The Future: Integrating PUSET through FEST

The Foundation for Engineering, Science and Technology was recently set up to ensure a better co-operation, mutual awareness and beneficial cross-fertilisation of ideas and initiatives to improve the public understanding of science, engineering and technology. The rationale for FEST is that DACST felt a need to better co-ordinate activities for the public understanding of science, engineering and technology, as well as to have a facilitating body to concentrate on implementation of policies for PUSET. DACST develops policy, while FEST will become a body which facilitates the disbursing of funds, identification of stakeholder groups, and co-ordination of proposals and other implementation issues. It is envisaged that FEST, through the representation of all major stakeholder groups in society, will enhance the

contribution of society to PUSET. The public understanding of science, engineering and technology is seen as requiring a facilitating body to ensure that the policies that have been generated over the past few years will be implemented widely and that this process becomes an integral part of the public domain. As such, it is seen as essential that FEST effectively performs a bridging function between DACST and South African society. Through systematic planning, networking, evaluation, tendering, generating and disbursement of funds, PUSET will then become an integral part of development for and by society.