

## Research Agenda

### 1. Introduction

The White Paper on e-Education (2004) directs the implementation of e-education in South African schools. The introduction of information communication technology (ICT) in education represents an important part of government's strategy to improve the quality of teaching and learning in the South African school and FET college sectors. It is also in line with the national AsgiSA and Jipsa strategies to -

- contribute towards employability of learners;
- education and skills development in schools, communities and higher education; and
- provide wider opportunities for learners wishing to pursue careers in industry.

### 2. Need for research

The White Paper acknowledges that continuous research is needed to learn and understand how to improve teaching, learning, management and administration practices. Government must bring together managers, teachers, researchers and the ICT industry in an action-oriented research and development forum, to evaluate and develop leading-edge applications for management, teaching, learning and administration.

There is thus a need for a high-quality, long-term national agenda for the collection, analysis and dissemination of information on the use and effectiveness of technology in education. Furthermore, the national planning and phasing of research activities are important to ensure that research results feed into the ongoing implementation of the roll-out of e-education.

### 3. Purpose of the research

The purpose of the research is to develop a research agenda for ICT in education in order to:

- stimulate, identify and map research practices;
- identify, categorise and prioritise government's research needs; and
- engage the research community in a coordinated way.

Setting priorities provides a vision of where research can contribute to South Africa's development in the critical areas of skills, information and knowledge development, and will help to align research efforts from various sectors. National research priorities will enable the coordination and impact of research by building a critical mass of information and knowledge in relevant areas and by promoting collaboration between government, the research community and industry.

The Department of Education needs certain information in order to guide the implementation of e-education policies. This will be the priority of the research agenda for the Department. However, the Department acknowledges that research in the field can and should be much wider than its basic requirements, and conducted at various levels. The suggested framework does not exclude issues that are not mentioned, and is by no means comprehensive or exclusive.

### 4. Participation of Research Agencies

The research agenda needs to be owned and implemented by the Department of Education. However, there are elements of research which require external agents to conduct and/or support the various studies. As such, research requires partnerships involving a range of research agencies. These agencies include:

- National or provincial Department of Education research units or individual officials;
- Higher education institutions;
- NGOs; Parastatals (Statistics South Africa, the Council for Scientific and Industrial Research (CSIR), and the Human Sciences Research Council (HSRC); and
- Research consultancies (both large international and small local agencies).

## **5. Leadership in the research agenda**

As previously stated, the research agenda needs to be owned and implemented by the Department of Education. The research agenda will, however, put into place mechanisms to guide research initiatives that can inform and evaluate e-education roll-out and sustainability. This will entail a steering committee/advisory body with representation from stakeholders in government and the ICT and research domains. The purpose of the body will be to monitor and manage information dissemination, decision-making as well as to identify and align research activities.

The role of a steering committee/advisory body will be to:

- develop and communicate e-education research areas;
- map research initiatives in areas of interest, indicating the highest priority needs of the educational community;
- establish appropriate procedures for commissioning and supporting quality research;
- strengthen relationships and communication between researchers, policymakers, practitioners and funding bodies;
- provide a forum for discussions with researchers, practitioners and policy makers regarding future developments;
- foster interdisciplinary collaboration, and cross-sector and multi-organisational approaches to research;
- negotiate research agendas with stakeholders and provincial education departments;
- where possible, limit the impact of research on school activities by scheduling of multiple research projects and limiting 'respondent fatigue';
- create a process for making inputs into research proposals, and findings for the purpose of peer review;
- arrange workshops, conferences and other events on ICT research;
- develop opportunities for the dissemination of research findings so that they are more easily accessible; and
- facilitate research collaboration between prospective partners.

## **6. Research areas**

Research will provide critical input in a number of different ways:

- Research should support decision-making in the roll-out of e-education. The Department of Education is implementing a programme that aims to provide progressive access to ICT in all South African schools. An initiative of this scope can be implemented only in phases over a period of several years. Research results from pilot projects and from different phases of implementation will enable a more effective and efficient roll-out. Research will also produce knowledge that could lead to improvements in the design of the roll-out strategy as a whole or in sub-projects within the wider initiative.
- Research in classrooms has the potential to provide valuable insights into how learners and educators interact with and use ICT.
- Research may support the overall aims of the White Paper on e-Education through assisting in the identification of practices that obtain positive results against learning objectives.
- Research as monitoring and evaluation is critical for quality assuring and assessing progress in the roll-out and ongoing implementation of the programme as a whole.
- Research that explores the links between school-based ICT experience and learning achievement may illuminate how ICT influences curriculum outcomes.
- Research into how the implementation and integration of ICT in school management, teaching and learning affects the system will provide insight into change management issues.
- Researchers' understanding of how their work relates to the bigger picture, to the needs of different stakeholders and to work underway elsewhere in the research and policy community will be deepened.

## 7. Overview of research areas

The following table offers a brief overview of the key themes/areas of research in ICT in education. Various research questions can be derived from many of these themes (see Annexure B for a sample list of research questions), and any aspect can be researched from a highly theoretical point of view, and/or from a more practical, implementation perspective. Annexure A includes wider issues for research which will be of interest to the higher education community and other research institutions, but the table below indicates only areas of research critical to the Department of Education.

Area	Dimensions of ICT to be researched
Systemic	<ul style="list-style-type: none"> <li>▪ Comparison of different education systems and the impact of the integration of ICT on systemic change/performance</li> <li>▪ Creating baselines against which to measure progress in the achievement of ICT gains across the system.</li> <li>▪ Statistical survey data collection and sustainability</li> <li>▪ Integration of systems               <ul style="list-style-type: none"> <li>○ EMIS</li> <li>○ Physical Planning, etc.</li> </ul> </li> <li>▪ Change management               <ul style="list-style-type: none"> <li>○ What changes ICT brings to education</li> <li>○ How ICT can support change and the process should be managed</li> <li>○ Impact of structures that makes economic sense (e.g. clusters) on change management</li> <li>○ Roles and responsibilities of different people in a changing environment</li> </ul> </li> </ul>

Area	Dimensions of ICT to be researched
Policy research	<ul style="list-style-type: none"> <li>▪ Policy indicators</li> <li>▪ Policy analysis, gap analysis and interaction with other policies</li> <li>▪ Gathering data important for policy</li> <li>▪ Recycling/disposal policies</li> </ul>
Financial/economical	<ul style="list-style-type: none"> <li>▪ Total cost of ownership and implications for implementation</li> <li>▪ Funding models and strategies</li> </ul>
Sustainability	<ul style="list-style-type: none"> <li>▪ Affordability models</li> <li>▪ Financial modelling of sustainability</li> <li>▪ Replicability – key projects that are working</li> <li>▪ Evidence on how community can sustain the ICT environment</li> <li>▪ Technical, financial, operational and human resource issues</li> <li>▪ Environmental sustainability</li> <li>▪ Self-sufficiency vs interdependence</li> </ul>
Connectivity	<ul style="list-style-type: none"> <li>▪ Different models/levels of connectivity</li> <li>▪ National and international impact/best practices/possibilities/lessons learnt/benchmarking</li> <li>▪ Issues relating to broadband provision, including impacts of provision and barriers to uptake</li> </ul>
Infrastructure	<ul style="list-style-type: none"> <li>▪ What does ICT bring besides traditional tools?</li> <li>▪ ICT infrastructure models in schools</li> <li>▪ Spatial and environmental aspects</li> <li>▪ Schools of the future – what would e-schools look like?</li> <li>▪ National and international best practice</li> </ul>

Area	Dimensions of ICT to be researched
Technologies	<ul style="list-style-type: none"> <li>▪ New and emerging technologies – innovative practices</li> <li>▪ Use of alternative technologies <ul style="list-style-type: none"> <li>○ at practical levels</li> <li>○ best practices for teaching and learning/management</li> </ul> </li> <li>▪ Open source and proprietary use in schools</li> <li>▪ How can a teacher create a technology solution for effective teaching and learning?</li> <li>▪ Impact/best practices/possibilities/lessons learnt</li> <li>▪ How do we harness technologies to improve teachings and learning?</li> </ul>
Pedagogical practices and support	<ul style="list-style-type: none"> <li>▪ Empirical evidence <ul style="list-style-type: none"> <li>○ Learner gains and achievement</li> <li>○ Teaching gains</li> <li>○ Curriculum integration</li> </ul> </li> <li>▪ The link between curriculum and the use of ICT in a developing context</li> <li>▪ Culture <ul style="list-style-type: none"> <li>○ How does the culture of a school/teaching and learning change because of the introduction of ICT?</li> <li>○ Change of learning practices - Social change and knowledge paradigm shifts</li> </ul> </li> <li>▪ Existing and potential relationship between ICT and learning processes</li> <li>▪ Different pedagogies and their effectiveness</li> <li>▪ Usefulness of ICT in the teaching and learning process</li> <li>▪ When does learning and teaching improve?</li> <li>▪ Contextual and cultural factors producing variation in ICT use within schools</li> <li>▪ Managing the <b>teaching</b> and <b>learning</b> process – how to manage a classroom with <b>technology</b> <ul style="list-style-type: none"> <li>○ optimal conditions for the effective introduction of ICT in education</li> <li>○ How to <b>introduce</b> the use of technology</li> <li>○ NCS integration and support</li> </ul> </li> <li>▪ E-assessment - Assessment with/through the use of ICT</li> <li>▪ Best practices <ul style="list-style-type: none"> <li>○ Unique learning situations in SA, e.g. big classrooms, limited access</li> <li>○ Shortage of trained teachers in certain subjects, e.g. Mathematical Literacy</li> <li>○ Loss of teachers through HIV/AIDS</li> </ul> </li> <li>▪ Relationship between technological and pedagogical innovation</li> <li>▪ Dimensions of ICT use in the context of individual subjects and learning areas</li> </ul>

Area	Dimensions of ICT to be researched
Social	<ul style="list-style-type: none"> <li>▪ Roles of parents and others in the teaching and learning process</li> </ul>
Institutional development and management	<ul style="list-style-type: none"> <li>▪ School readiness/e-learning/quality indicators</li> <li>▪ Access management and operational processes, e.g. the effective use of public spaces.</li> <li>▪ Management of infrastructure, security and different technologies</li> <li>▪ Financial management involved with the introduction of ICT</li> <li>▪ Implementation strategies/How to develop and spread effective ICT practice in the school/organisation</li> <li>▪ Best practises and quality indicators for good leadership</li> <li>▪ Relationship management through ICT (relationship with community, parents, service providers, other schools)</li> <li>▪ Achievement of efficiency, productivity, workload, administration and management with the use of ICT</li> </ul>
Professional development	<ul style="list-style-type: none"> <li>▪ Roles/needs/development issues of the curriculum specialists/provincial managers/EMIS in supporting teachers</li> <li>▪ Set skills/competencies needed</li> <li>▪ Professional development skills/competencies needed</li> </ul>
Content	<ul style="list-style-type: none"> <li>▪ The use different kinds of software and the relation to the curriculum <ul style="list-style-type: none"> <li>○ Relevance</li> <li>○ Construction</li> <li>○ Development</li> </ul> </li> <li>▪ Quality of content (What; Who; When, Why) – development of quality indicators</li> <li>▪ The use of open content</li> <li>▪ Development and supply of content to schools, including access, storage, retrieval, promotion, selection and usage.</li> </ul>

These domains are not distinct in reality, but can be separated to show that different sets of questions can be asked at each level, and addressed using appropriate methodologies.

## 8. Operational issues

### 8.1 Steering committee

A steering committee will be established as outlined in par. 2. The steering committee will develop a plan of action with time frames and priorities.

### 8.2 Higher education focus area

The Department will communicate and liaise with higher education institutions to make ICT in education a research focus area for them.

### 8.3 Research indaba

A research indaba will be organised to bring together -

- government departments such as the Departments of Education, Science and Technology, and Communications;
- research agencies/bodies such as the National Research Foundation, Council for Scientific and Industrial Research, Human Sciences Research Council, Meraka Institute;
- NGOs such as JET, SAIDE and Mindset;
- funding bodies such as the World Bank, USAID; and
- higher education institutions.

The purpose of the indaba will be to -

- introduce the research Agenda to the research community;
- strengthen relationships and communication between researchers, policymakers, practitioners and funding bodies;
- establish a forum for discussions with researchers, practitioners and policy makers regarding future developments; and

- foster interdisciplinary collaboration, cross sector and multi organisational approaches to research.

#### 8.4 Database of ICT in education research in South Africa

The Department of Education will develop a database of ICT in Education research in South Africa and communicate the research findings to the wider educational sector via the Thutong educational portal.

#### ANNEXURE A

The following table gives an overview of extended research areas outside the Department of Education's framework. Answers to these issues will nevertheless be of critical importance to the Department. All research outputs have the potential to feed into policy formulation and implementation.

Area	Issues
<b>Systemic</b>	<ul style="list-style-type: none"> <li>▪ Change management               <ul style="list-style-type: none"> <li>○ Unintended consequences that ICT brings</li> <li>○ How do ICT change the relationship in schooling and with management</li> <li>○ Social aspects of change management – beyond the education system, broader community/society</li> </ul> </li> <li>▪ Globalised society; ICT have an impact – assumptions need to be researched</li> </ul>
<b>Policy research</b>	<ul style="list-style-type: none"> <li>▪ How do you turn research results into policies</li> <li>▪ Inter-policy work – how do ICT policies relate to other policies?</li> <li>▪ Policy implementation/design gaps that lead to implementation gaps</li> <li>▪ What kind of competitive intelligence do we need to build to sustain/inform policy?</li> <li>▪ How is policy being created? – Action research – test impact of policy before implementation</li> </ul>
<b>Sustainability</b>	<ul style="list-style-type: none"> <li>▪ Acceptance, championship of the intervention in the community itself – more than merely financially</li> </ul>
<b>Management</b>	<ul style="list-style-type: none"> <li>▪ School readiness indicators</li> </ul>
<b>Technologies</b>	<ul style="list-style-type: none"> <li>▪ Teaching's influence on the creation of new technology/ use.</li> <li>▪ Environmental impact of the introductions of ICT into education               <ul style="list-style-type: none"> <li>○ Impact of short-term issues</li> </ul> </li> <li>▪ Kind of choices we make – effect on the environment</li> </ul>
<b>Connectivity</b>	<ul style="list-style-type: none"> <li>▪ Expectations on the management/learning and teaching introduced by connectivity – effect on the process</li> </ul>
<b>Social</b>	<ul style="list-style-type: none"> <li>▪ Social change and knowledge paradigm shifts</li> <li>▪ Teacher and learner satisfaction, performance, motivation, creativity and enjoyment</li> <li>▪ What effect does the home environment have on the change in the classroom – massive variation in access at home</li> <li>▪ How does ICT impact on broader life</li> <li>▪ Social exclusion of ICT – e.g. access to technologies</li> <li>▪ Social implications of the introduction of ICT into communities – do not need to teach them how to find applications.</li> <li>▪ How does technology impact on broader social context – impact on education, how do we harness it, what impact it has on teaching and learning</li> <li>▪ Do we really live in a global society?</li> </ul>

Area	Issues
Pedagogical practices and support	<p><i>Empirical evidence</i></p> <ul style="list-style-type: none"> <li>▪ Learner gains</li> <li>▪ Learner achievement</li> <li>▪ Teaching gains</li> <li>▪ Curriculum integration</li> <li>▪ The link between curriculum and the use of ICT in a developing context</li> <li>▪ Culture: <ul style="list-style-type: none"> <li>○ Are we perpetuating the old or not? <ul style="list-style-type: none"> <li>▪ Access</li> <li>▪ Growth</li> <li>▪ Eradicate poverty</li> <li>▪ Enhance teaching and learning</li> </ul> </li> </ul> </li> <li>▪ Managing the <b>teaching and learning</b> process – how to manage a classroom with <b>technology</b> <ul style="list-style-type: none"> <li>○ What are the implications of people not having access to technology?</li> <li>○ Impact of language on the teaching and learning/use of ICT</li> <li>○ Manage the outcome of the use of ICT (why you are using ICT) – enhancing the whole experience</li> </ul> </li> <li>▪ Learning objects, reusable objects – leadership on the impact/ power roles</li> <li>▪ What does ICT bring more than traditional tools</li> <li>▪ Understanding what ICT can contribute to pedagogical processes</li> <li>▪ Forms of representation that learners are engaged in – what does ICT give us in enhancing the learning process?</li> <li>▪ Learning styles when introducing content/ICT</li> </ul> <p><i>Best practices</i></p> <ul style="list-style-type: none"> <li>▪ Use technology to get (manage) information – adjust classroom practices – add value to the learning</li> <li>▪ Social issues</li> </ul> <p><i>Learners</i></p> <ul style="list-style-type: none"> <li>▪ Learners' perceptions/gains</li> <li>▪ How reading is taking place on a screen/comprehension?</li> <li>▪ How do learners learn with technology?</li> </ul>

Professional development	<ul style="list-style-type: none"> <li>▪ How well is the integration of ICT being modelled by teacher training institutions?</li> <li>▪ Teachers as a community – how ICT can be harness to encourage mutualism in teachers?</li> <li>▪ Role of virtual communities of practice</li> <li>▪ Teacher believe system – what they are – ICT change the believe system of teachers – teachers becoming different kinds of people – epistemological/ontological</li> </ul>
Content	<ul style="list-style-type: none"> <li>▪ Learning styles when introducing content/ICT</li> <li>▪ What is content?</li> <li>▪ What are the risks factors of putting technology solution before the e-content?</li> </ul>

## **ANNEXURE B**

### **Sample questions derived from a workshop about the national research agenda for e-education held on 1 September 2006**

1. What do ICTs bring to the learning and teaching process that other technologies don't?
2. How does ICT enhance the learning process?
3. How can ICT build the early literacy needs of learners?
4. How do teachers' belief systems about themselves, about teaching and about technology affect how they work with ICT?
5. Why do we assume that ICT is of any value at all?
6. What is best practise in the use of technology internationally and in South Africa?
7. How do different technologies facilitate different behaviours and different kinds of learning?
8. How does technology change power dynamics in the education system?
9. How does technology alter deep-level (power) structures? (Can it support power structures?)
10. What is the impact of ICT in schools on the digital divide? (What is the divide?)
11. To what extent does the implementation of ICT require institutional change management?
12. How does the use of ICT impact on the culture of teaching? (resistance)
13. How should the professional development (initial, continuing, etc.) of teachers accommodate including ICT in the learning process?
14. How do learners perceive the introduction of learning technologies into the learning environment?
15. What are the optimal conditions for enabling ICT to have an impact?
16. What are the basic conditions for enabling ICT to have an impact?
17. What is the role of education district officials and district level management? How important is this group for buy-in to ICT?
18. How do the politics of access to ICT show up inefficiencies, competition and disruption to the intentions of implementation?
19. How can change management be designed to include the community and parents?
20. How can ICT be customised to benefit different learner groups with different learning styles/needs?
21. What are the ethical issues in relation to the teacher-learner relationship? How can educators be prepared for this?
22. Can teacher training take into account the need for teachers to be learners in an ICT environment?
23. What is the need for curriculum development?
24. What unintended consequences of the implementation of ICT may there be, and how can change management take account of or respond to these?
25. How can learning use ICT, without being merely a computer literacy and knowledge transfer initiative, but rather focusing on knowledge generation?
26. What is appropriate content, how is this measured and who develops the content?
27. Could ICT make learners vulnerable to social control or infringe their right to privacy?
28. How can the different media and different kinds of information and knowledge and skills needed to manage these different forms be included in the curriculum?
29. Is ICT a tool to redress imbalances?
30. What are the expectations of ICT in respect to improving school leavers' opportunities for study or employment?
31. How can systems/relationships (e.g. e-mentors) be put in place in schools to encourage the use of ICT?
32. How can ICT be harnessed so that teachers can share knowledge and assist one another?
33. What is the link between ICT at school and home computer access?
34. What ICT can be used besides that traditionally used in a computer laboratory?
35. How can we ensure the effective use of a computer laboratory?
36. What will the schools and classrooms of the future look like?
37. Will home schooling and ICT produce any changes in the school population?
38. What are the key strategic choices to be made between proprietary and open-source software?

39. How can we ensure that the research agenda is not dominated by a focus on technology?
40. How to overcome bandwidth problems is perhaps not the correct question – supply?
41. How can communities be encouraged to resolve problems and design their own ICT solutions?
42. What can be learned from other technology successes? (Retro-research)
43. Can ICT be used to augment/replace the teacher in context of teacher shortages?
44. What models can be used to support ICT roll-out, e.g. clustering and sharing bandwidth?
45. What are the best models of infrastructure and connectivity?
46. How should the laboratory timetable be designed to maximise access?
47. What is the importance of linking e-content to technology?
48. What are the risk factors associated with particular procurement strategies?
49. How is equipment to be disposed of or cascaded?
50. What are the learning and knowledge implications of learning objects?
51. What are the implications of using various software and hardware cycles?
52. What ICT can we afford?
53. What will be required to get the programme to run on a systemic basis? In other words, what will the critical mass be for take-up of ICT in the curriculum?
54. How will we be able to identify which new technologies are likely to impact – positively or negatively - on our efforts to integrate ICT in the curriculum? (Road-mapping exercise)
55. How will technology cycles – hardware and software – influence the investment choices made for implementation?
56. How will the DoE use the concept of ‘technology readiness’ to identify schools where preparatory activities are necessary to maximise the take-up of ICT?
57. What are the international lessons regarding curriculum implementation in the different school phases – GET, FET and FET colleges?
58. What would be the most useful indicators to assist policy and implementation decision making?
59. What will be the best way of assessing and monitoring policy coherence and complementarities between the various government agencies involved, e.g. the Departments of Education, Communications and Public Works, and the Universal Service and Access Agency of South Africa?
60. What model of costing – e.g. total cost of ownership – will be used for the development of cost models to assist investment decisions?
61. What is the best way to ensure that research addresses implementation issues and also predictive needs?
62. To what extent will the implementation of ICT in South African schools contribute to the impact of globalisation?
63. What are the key issues to be addressed in obtaining sustainability of the computer laboratories in schools and within school communities?
64. What alternative models are there – on a temporary basis – to providing ICT access while laboratories are being built? (e.g. Internet cafes, ‘digital doorways’)
65. In what ways will communities react – negatively and positively - to the establishment of IT laboratories?
66. How will pilot projects for the programme be used to enhance the replicability of implementation?
67. Is it worth utilising international experience in designing the local implementation plan? Which countries’ experiences will be deemed most useful?
68. What other research has been undertaken in the field of ICT in South Africa that can be used to inform this project?
69. Can a directory of SA research be developed?
70. How can the implementation plan base itself on the ideal combination of technological and financial sustainability?
71. To what extent can the implementation of this project drive changes to the design of the whole education system?
72. How can the implementation model that is finally chosen provide for technical self-sufficiency? At what level of management will this technical self-sufficiency be required?

73. Can the project support the introduction of a South African journal which is dedicated to ICT in education in this region?
74. What level of subsidies will be required for the funding of the development of the portal?
75. Once schools that have obtained sustainable computer laboratories have been identified, the key question to ask will be what gives these schools the edge.
76. How can a PhD programme support the research needs of the DoE programme?
77. How has the teacher education curriculum responded to/should the teacher education curriculum respond to the intended programme?
78. What kinds of skills and attitudes should graduates in teacher education be expected to graduate with? What is the capacity of higher education institutions to meet this need?
79. What is the best qualification with which to address the need for ICT skills?
80. How can the ability to teach CAT and IT be supported?
81. What should the teacher development framework for ICT skills be?
82. What kind of research agenda will higher education buy into?
83. How can the needs of the research programme be communicated to the broader research community?