HUMAN SCIENCES RESEARCH COUNCIL

ROLE OF PARENTS IN THEIR CHILDREN'S SCIENCE, ENGINEERING AND TECHNOLOGY CAREER CHOICES

Vijay Reddy with Busi Alant,
Santhana Gengiah, Andile Mji & Thabiso Nyabanyaba

Research conducted for the Department of Science and Technology

May 2006

CONTENTS PAGE

Appendices

EXECUTIVE SUMMARY

Mathematics and science are key areas of knowledge and competence for the development of an individual and the social and economic development of South Africa in a globalizing world. Government has emphasized the centrality of mathematics and science as part of the human development strategy for South Africa. However, South Africa faces a challenge to improve the performance of school science and mathematics.

There have been many initiatives in South Africa to ensure an increased participation and performance in the areas of mathematics and science. These initiatives have focused mainly on schools, teachers, and learners. We have not considered how parents could be a leverage point to ensure greater participation and performance in the areas of mathematics and science. There is a silence in the South African educational literature about the involvement of parents in the education of their children.

The Department of Science and Technology commissioned this study to establish the extent to which parents: (i) contribute to children's participation and performance in mathematics and science education and (ii) influence their children in choosing SET careers. The findings from the study would be used to inform the development of strategic interventions that will maximize parental involvement in their children's mathematics and science education.

The Human Sciences Research Council conducted the study. The research had three components: (i) Literature review relating to parents role in education and scoping the existence of intervention programmes to promote parental involvement in South Africa; (ii) Eliciting the views of parents, learners and teachers about parental roles in mathematics and science participation, performance and subject choices and (iii) A workshop with key stakeholders to present preliminary findings and determine policy directives to ensure greater parental participation in their children's science and mathematics education.

This study, then, is very important in foregrounding the voice of parents in the education of their children. The study could provide a backdrop of what happens within homes to encourage learners to pursue science and technology at school and as a career. It could also indicate how parents are involved in their children's learning of science related subjects and how this involvement could be enhanced and supported.

The findings from the study are:

1. It is more appropriate to talk about the notion of 'parenthood' rather than 'parents'. There are many people outside the school that are involved in the learners lives – these are not only biological parents, but include grandparents, siblings, neighbours and other members of the community.
2. There is a silence in the South African educational literature about the involvement of parents in the education of their children. Much of the South African educational literature has focused on the role of the school, the teacher and the principal.
3. The international literature on the role of parents documents the middle class activities which stimulate cognitive and social development. A large proportion of the South African population would be classified as 'working class' (both in terms of income and educational level). The question is, how do we intervene in preventing this social reproduction where poor people continue to be poor and affluent families continue to enhance and maintain their middle class advantage.
4. Whatever the education level or socio-economic status, all parents believe in the importance and role of education to ensure a better life for their children. (*'Imfundo isinkwa sakusasa' (education is tomorrows food)*. Parents want their children to have an education in mathematics because they believe that this would allow them to access many opportunities they were denied. However, the involvement of working and middle class parents in the lives of their children is different. Working class parents spend long times away from home either because of traveling or long working days. They cannot get directly involved in their children's education but get involved by trying to ensure that the education takes place. Middle class parents can provide a home background and social interactions that is better able to facilitate and support learning in the school.
5. Parents are more involved at the grade 3 level and their involvement decreases at the grade 9 and 12 levels. Parents ask about school, showing interest and motivate learners about school and provide books and stationary. There is less direct involvement with schoolwork. The pattern of involvement in homework and school projects and assignments changes from grade 3 to 9 to 12 – understandably parents

get more involved at the early years and as the learner moves to higher grades the instruction is more formal and parents feel less able to participate in the schoolwork. In addition to parents, siblings and friends also assist in enhancing the schooling experiences.

6. In general, parents are involved with what happens in school and this involvement may be more in an indirect rather than a direct manner. Mothers play a bigger role in the educational experiences of children
7. The most popular career choices of the grade 9 and 12 learners who were surveyed are: health related professions, scientist/ engineer or a business career. The surprising response was from first year tertiary learners, who are registered for science and engineering degrees, but indicated they would follow non-science related careers when they completed their studies.
8. Grade 9 learners obtained information about careers from family members, media and the school and grade 12 learners obtained information mostly from school, media, brochures from tertiary institutions and family members. The most important influence for the career choice, at all levels, is the mother or a female guardian.
9. There are intervention projects that offer support to parents: The regulatory framework (South African Schools Act) allows for the involvement of parents in the school and there is involvement through the structures of the School Governing Body. The intentions of the School Governing Body and the Outcomes Based Education are more suited to middle class homes.
10. Many of the intervention projects which promote and assist parental involvement in education relate to providing information about school governance and parents rights. They is a body of information related to parents rights and responsibilities and how they can get involved in schools, but this information is not disseminated to most parents. The key challenge is to ensure wide dissemination of the information.
11. Parents do not have information on how they can get involved in facilitating their children's cognitive development and development of analytical skills. The Family

Literacy Project, through the adult literacy courses incorporates activities on the ways that parents can interact with their children to promote cognitive development.

RESPONSES TO THE TERMS OF REFERENCE

2.1. *Define parental involvement (or lack of it) in their children's math and science education, including the appropriate time to start this involvement in order to nurture children's interest in mathematics and science.*

- The term 'parenthood' (many people who take on the role of a parent or caregiver to children) which refers to the broader community who interact with the child should be used when discussing parents.
- The voices and role of parents are silent with respect to the educational experiences of children. It is important to re-emphasise and re-assert this role in the discussions and discourses about education.
- All parents believe in the importance and role of education. The scenarios for education and parental involvement are different for the different social class groups. Children from the poorer communities have a double disadvantage in that their homes do not provide the necessary resources to access the school curriculum and at the same time the school is unable to provide the quality inputs to ensure that the opportunity to come out of the poverty trap.
- Parents are more involved in issues of school governance but play a lesser role in learning in classrooms, especially mathematics and science learning.
- Parents are more involved in asking about schooling, showing interest and motivating learners about school and providing books and stationary. There is less involvement with the direct help of schoolwork.
- The pattern of involvement in homework and school projects and assignments changes from grade 3 to 9 to 12 – understandably parents get more involved at the early years and as the learner moves to higher grades the instruction is more formal and parents would be less able to participate in the schoolwork.
- In general, parents, especially mothers, are involved with what happens in school.
- Parents recognise the need for their children's' education and recognise the importance of mathematics/ SET.

- The strategy for involvement with parents might be to support parents with activities to promote cognitive growth and development in the early years. These foundational skills are important to access subsequent levels of schooling.

2.2. *Establish the impact of parental attitudes towards math and science on learners' participation and performance in mathematics and science subjects, and to establish the impact of parental involvement in learners' choices of science, engineering and technology careers.*

- Parents recognise the importance of mathematics and science and encourage their children to take mathematics.
- Parents recognise that they do not have the requisite knowledge to assist directly with the knowledge required for good performance in mathematics and science. For parents with low income they offer encouragement to their children and try to get assistance from older siblings or learners in the community. For middle class parents, if needed they seek extra tuition to assist in mathematics performance.
- Two thirds of learners surveyed indicated that they made their own choices about taking mathematics and science as subjects, but they were encouraged by parents.
- Teachers play a role in the choice of mathematics and science subjects, but learners indicated that they would rather make their own choices.
- Learners surveyed indicated that family members, media and school were their main sources of information about career choices.
- The most important influence to most learners is the mother or female guardian.
- Parents in low income households encouraged their children to continue studies in the FET colleges, so that they could learn a skill and then there would be ensured employment.

2.3. *Establish the level of math and science content knowledge (including IKS) required by parents to motivate and influence children to participate, perform and choose careers in science, engineering and technology.*

- Irrespective of their 'formal' knowledge base parents recognise the importance of mathematics and science. For Black people the explicit exclusion from mathematics

during the apartheid years, has made them see this subject as important for access and thus they encourage their children to take mathematics.

- Middle class parents, in social interactions with their children, link school activities to activities around the home and everyday life. For example they play games with numbers, watch nature programmes. In poorer families, parents with low levels of education do not have the time and are unable to make the links.
- Parents, especially low income parents, see the domain of school science and everyday practices as separate from each other. Similarly with traditional practices –parents do not see any scientific basis for the practices and it as separate from school science. IKS is an important area of valuing traditional knowledge. However for parents to make the links between indigenous knowledge, like traditional medicines, and school science they would have to know both domains.

2.4. Scope the existence, in South Africa, of intervention programmes that promote parental involvement in mathematics and science education.

- The regulatory framework allows for the involvement of parents in the school (SASA) and although imperfect there is some involvement through the structures of the School Governing Body.
- The underpinning philosophy of the outcomes based education is the parent-learner-school involvement. This philosophy is based on the assumption that parents would have a formal education and therefore be able to participate in their children's education.
- The intentions of the School Governing Body and the Outcomes Based Education are more suited to middle class homes.
- There are intervention projects which promote and assist parental involvement in education and these intervention projects mostly relate largely to providing information about school governance and parents rights.
- There is information related to parents rights and responsibilities and involvement in school governance, but this information is not disseminated to most parents. The key challenge is to ensure wider dissemination of the information.

- The websites of the trade unions provides a good illustration of how the existing mechanisms can be used to disseminate information to parents.
- There does not seem to be information about how parents can get involved with improving classroom knowledge – especially in mathematics and science.
- Projects like the Family Literacy Projects offer adult literacy courses, a component of which is about how parents can interact with their children to promote their cognitive development.

2.5. STRATEGIES TO INCREASE PARENTAL INVOLVEMENT

1. We must re-emphasise and re-assert the role of parents and the community (parenthood) in the educational life of the children. We must re-insert the agenda of parents involvement into our discourses and discussions about the education of children.
2. The reason that the DST (and other stakeholders) embarks on such studies (how to ensure greater parental involvement) is to improve the state of mathematics and science and thus achieve better educational outcomes. Improved educational outcomes are dependent on support from the home and a quality education in school. Therefore we have to look at strategies that refer to both in- school and at the home.

In school

There are three areas that can be strengthened within the schooling system and this would be the responsibility of the Department of Education:

(i) improving the quality of pedagogical inputs,
(ii) increase information to schools about career choices and opportunities and
(iii) strengthen the mechanisms for communication between the home and the school.

(i) improving the quality of pedagogical inputs,

Parents depend on the school to provide the *quality inputs for the education* of the children, because they do not have the knowledge (especially in higher grades), time,

resources (money to access supplementary tuition). The school is the key institution to provide pedagogical inputs and it is essential that they provide a quality education.

Access to a quality education is dependent on the social status and that is linked to race. Children from urban areas and with financial resources build up social and cultural capital at home and have better access to an education that will give them better opportunities in life. Children within poorer environments bring little social and cultural capital from the home to be able to access school and the school curriculum. Literature indicates that a child's education is the sum of the inputs from the home and the school. Parents are interested and supportive of their children's education. Parents depend on the school to provide the quality educational inputs. But schools which are located in areas where most poor people live, are sites where quality learning is not offered. The learners who most depend on and expect a quality input from the school are not receiving it and the poverty trap and social reproduction continues.

(ii) increase information to schools about career choices and opportunities

Schools offer both pedagogical inputs and *career guidance*. One of the subjects in the school curriculum is *Life Orientation*. Within this 10 credit course, there are inputs about career guidance. In addition to receiving information about careers from the school, middle class parents can provide information from a range of other sources to learners. Families with low paying jobs, do not have such access to information depend on the school to provide such information. In the old (NATED) curriculum, schools offered the subject, Career Guidance, for learners in then ex House of Assembly (for White learners) and ex House of Delegates (for Indian learners). In addition schools had a guidance counselor to provide information to learners. In the present curriculum there is no guidance counselor in schools and there is less information about careers for learners. Again, for learners from poor environments, there is very limited information. Parents do not know enough about the curriculum options, about bursaries and about career opportunities.

(iii) strengthen the mechanisms for communication between the home and the school.

We need to find mechanisms that can strengthen the communication between the home and the school. The present structure of the school governing body and the mechanism of parent meetings does not facilitate the involvement of most parents in the activities of the school. It is difficult for teachers to communicate with parents through written communication because there is a high level of illiteracy among many parents and they are disadvantaged by this mechanism.

Out of school

In looking at out of school strategies to increase parental involvement (this is where there is a role for Department of Science and Technology) with their children's education the following are recommended:

i. Strengthen the initiatives who are currently working with parents on how they could get involved in their children's education. The information developed by these initiatives should be collated and disseminated to a bigger group.

ii. Create a database of information that already exists for parents on how to improve their interaction with children to facilitate their cognitive development and develop mechanisms to ensure effective communication of this information to a bigger group.

iii. A starting point is to work with parents of young children. A programme should be developed on how to assist parents to stimulate cognitive development and analytical skills.

Dissemination of present information to parents

We are using the definition of parenthood to include the broader community and the important strategy would be science communication. If we want to intervene to promote greater involvement of parents we should not do so by providing structured programmes which require people to attend a course or meeting (like a teacher upgrading intervention). Rather the programmes would have to interface smoothly with daily lives of parents. Therefore we need to consider media like the radio (e.g. plays about taking tablets), TV, newspaper, adult literacy courses and brochures for the dissemination of

information. There are lessons to be learnt from the dissemination of information around health issues.

Areas where present information can be used for broader dissemination to parents are:

- Information of rights as parents in the education of the child
- Information about school and curriculum issues
- Information about setting up learning environments in the home that are more conducive to learning.
- Mathematics and science information
- Information about careers

There are organizations involved in disseminating information about the rights of parents in the education of the child, the role of the School Governing Bodies, the school and the new curriculum. This information is patchy and not available in an accessible form to all parents. A role for DST could be the co-ordination and pooling of all this information and ensuring that there are mechanisms for better dissemination (e.g. by ensuring translation into different languages, by using different media to disseminate this information). The key is to ensure wider dissemination.

Investment in the early years of children's lives

Various studies indicate that investment in a child's education and health in the early years provides the greatest returns in the area of human, social and economic growth of the individual and the society. Support could be offered to parents about how they can set up activities in the home to facilitate cognitive growth and strengthen analytical skills. Parents are less intimidated about getting involved in their children's education in the early years and therefore a set of programmes targeting these years would be useful. In developing these strategies it is important that the different government departments: Department of Science and Technology, Department of Social Development and the Office of the Child in the Presidency work together.

Involvement in mathematics and science

There is less information for how parents can be involved in assisting with their children's mathematics and science education. The DST could promote initiatives in the following areas:

- The media should be used to re-image mathematics and science so that these subjects are seen as accessible to all and learners can achieve success in these areas. The popular media is accessible to both parents and children. For example, popular TV programmes should incorporate a message of mathematics accessibility and attractiveness– i.e. as 'vox populi'. One could have Angela's character in the TV programme Generations learning and enjoying mathematics and science and the adults around her engaging with and helping her with mathematics and science. Maths must be seen as a 'cool to do' subject and through the 'soapie' parents could be offered non-threathening prompts of how they could support their children's learning.
- A National Strategy for Mathematics and Science Literacy and Awareness must include a dimension which highlights the involvement of parents. The broad aim of such a strategy will be to improve the science knowledge and skills of the general public. A more mathematically and scientifically literate public could facilitate greater involvement of parents in the school mathematics and science.
- Use different media to disseminate messages about mathematics and science. For example the "Chappies gum" wrapper is fun and asks general knowledge questions. This idea could be used with science information displayed on popular brands of food. For example there would be simple science information on a cereal box or the wrapping of basic foodstuff (like mealie meal). This easy and non-threatening way of presenting information will ensure that we become a community of knowledge users and transmitters.
- In order for parents to encourage their children to value the traditional practices and see the link with the school science, parents themselves would have to be educated about the value of these traditional practices and the links with the formal science curriculum. This would mean developing public programmes which explicitly makes those links.

Improving science communication

- The popular media will be an important mechanism for the transmission of science knowledge. The DST should enter into a partnership with the South African Media (Television and Print) for a project to enhance parental involvement.
- The DST could facilitate campaigns to encourage parents to get more involved in their children's education. For example there could be a campaign to get parents more involved in children's homework. This could be structured around a weeklong set of activities that highlights the ways parents can get involved in homework.. SAASTA could be commissioned to drive such a campaign.
- In addition to the homework campaign, the DST's Science Week could explicitly include one day which highlights the role of parents in children's mathematics and science.
- For science communication the medium of the radio is more effective than the newspaper. Make use of the radio (in all indigenous languages) to run programmes for parents on how they can get involved in their children's education. For example the radio programmes could provide information to parents on the activities they could do to with their children to stimulate their cognitive growth development.
- Use newspapers like "Teacher" to promote popular science writing. This could also serve the purpose of communicating the latest information about careers to teachers who could then pass this on to learners.
- Use different communications mechanisms to pass on information about how parents could greater assist their children. Examples are the radio, Government Communication Information Services, municipal newsletters. All newsletters with a large distribution network could be targetted to pass on information about careers.
- Promote radio and TV journalism. DST should prepare a package to take to the science desk at SABC and on how they can assist with developing programmes for children. Analysis of TV programmes indicates that there are good programmes in the ECD area, but fewer educational programmes which are linked to the school curriculum.

ACRONYMS

CYFSD	Child, Youth, Family and Social Development
DET	Department of Education and Training
DoE	Department of Education
DoL	Department of Labour
DST	Department of Science and Technology
EC	Eastern Cape
ECHSA	Eastern Cape Schooling Association
ERP	Education Rights Project
Eskom	Electricity Supply Commission
Ex-HoA	Ex House of Assembly (White learners)
Ex-HoD	Ex House of Delegates (Indian learners)
FET	Further Education and Training
GET	General Education and Training
GHS	General Household Survey
GP	Gauteng Province
HESA	Higher Education of South Africa
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
HSRC	Human Sciences Research Council
IKS	Indigenous Knowledge Systems
KZN	Kwa-Zulu Natal
LFS	Labour Force Survey
SAASTA	South African Agency for Science Technology Advancement
SABC	South African Broadcasting Corporation
SASA	South African Schools Act
SES	Socio-Economic Status
SET	Science, Engineering and Technology
SGB	School Governing Body
SPSS	Statistical Package for Social Sciences
Stats SA	Statistics South Africa
TIMSS	Trends in International Mathematics and Science Study

CHAPTER ONE

ROLE OF PARENTS IN THEIR CHILDREN'S SCIENCE, ENGINEERING, AND TECHNOLOGY CAREER CHOICES

Science and Technology are considered to be central to creating wealth and improving the quality of life in contemporary society (DST, 2002).

1. Context and background

Mathematics and science are key areas of knowledge and competence for the development of an individual and the social and economic development of South Africa in a globalizing world. Since 1994 the new democratic government has emphasized the centrality of mathematics and science as part of the human development strategy for South Africa (Mbeki 2001, 2005). Government also recognizes that the African population was most disadvantaged and needed a programme of redress to ensure better participation and performance in mathematics and science. Commitment to this has been outlined in various government gazettes and policy documents (DoE 1996, DST 2002).

South Africa has started the 21st century with a shortage of skilled personnel in almost all science and technology related fields. Skilled personnel in the workplace and entrants to tertiary institutions are dependent on the supply of suitably qualified science graduates from the school system. However there is a shortage of suitably qualified science graduates from the schooling system.

All learners in the school system take science and mathematics/numeracy up to the end of grade 9. South Africa has a high Gross Enrolment Rate in the General Education and Training (GET) phase. While the participation rates are acceptable, there is a concern about performance in these key areas. Evidence for this concern comes from the results of large-scale assessment studies. The grade 3 national assessment study of 2001, the grade 8 TIMSS 2003 results (released in 2004) and the grade 6 national assessment study of 2004 (released in 2005) all show that the average mathematics score is less than 30%.

In the Further Education and Training (FET) Phase, students choose[1] to study mathematics, physical science, biology and/or computer studies. About 60% of all learners who sit for the matriculation examination take mathematics. About 60% of these learners pass the examination. However, the concern is that of the 60% who take mathematics, participation in higher-grade mathematics is very low with between 15-20% of all mathematics learners offering the subject on the higher grade and pass rates being low. The number of mathematics higher grade passes indicates the number of learners who could participate in further science and technical studies and this was 26 383 in 2005 compared with 24 143 in 2004 (Reddy, 2005).

A major challenge facing South Africa is to improve the quality of school education so that the returns from education is higher and that the number of learners who leave the schooling system with a quality pass is increased leading to a larger pool of people who can proceed to scientific and technical careers.

There are a number of dynamics that affect learners' choice and success in science related subjects. Some of the in-school factors relate to the availability of suitably qualified science teachers, and hence of schools offering mathematics and science subjects and schools having adequate resources such as libraries and laboratories. In addition to school factors, there is also the role of parents in the support, encouragement and involvement in learning and choices made during the learning process. Parents have a critical role because they lay the foundations and value systems that their children follow.

There have been many initiatives in South Africa to ensure that we have increased participation and performance in the areas of mathematics and science. These initiatives have focused mainly on schools, teachers, and students. We have not considered how parents could be a leverage point to ensure greater participation and performance in the areas of mathematics and science.

At present, parents are involved in education in different ways. Some examples are: (1) the South African Schools Act makes provision for the involvement of parents in the School Governing Body: (2) the National Curriculum Statements (with an Outcomes Based Education curriculum) is underpinned by parent-school partnership for learners to

[1] This was so at the time of conducting the study. From 2006 in grade 10 all learners have to take mathematics – either as the subject mathematics or mathematical literacy.

achieve the specified outcomes and (3) to a small extent home-schooling. There has, however, been very little research done in South Africa on the role of parents in their children's mathematics and science education or on the choice of careers.

This study, then, is very important in foregrounding the voice of parents in the education of their children. The study could provide information of what happens within homes to encourage learners to pursue science and technology at school and as a career. It could also indicate how parents are involved in their children's learning of science related subjects.

2. Research Objectives and Terms of Reference

This study seeks to establish the extent to which parents:

- contribute to children's participation and performance in mathematics and science education and
- influence their children in choosing SET careers.

The findings from the above would help inform the development of strategic interventions that will maximize parental involvement in their children's mathematics and science education.

The specific terms of reference of the present study are to:

- Define parental involvement (or lack of it) in their children's mathematics and science education, including the appropriate time to start this involvement in order to nurture children's interest in mathematics and science.
- Establish the impact of parental attitudes towards mathematics and science on learners' participation and performance in mathematics and science subjects, and to establish the impact of parental involvement in learners' choice of science, engineering and technology careers.
- Establish the level of mathematics and science content knowledge required by parents to motivate and influence children to participate, perform and choose careers in science, engineering and technology.
- Scope the existence in South Africa, of intervention programmes that promote parental involvement in mathematics and science education.

- Recommend a strategic intervention that will maximize parental involvement in their children's mathematics and science education.

3. Research Approach and Activities

This research has three components

1. Literature review and scoping the existence of intervention programmes to promote parental involvement in South Africa.
2. Eliciting the views of parents, learners and teachers about parental roles in participation, performance and subject choices.
3. A workshop with key stakeholders to present preliminary findings and determine policy directives to ensure greater parental participation in their children's science and mathematics education.

The research activities for the study are:

Component	Activities	Deliverables
Setting up the study and understanding the terrain	Compiling a comprehensive literature review Survey of existing intervention programmes	A chapter of relevant literature
Instrument Design Discussion with DST about the instruments	Design instruments (Open ended questions for focus interviews & Items for the Questionnaire) Consulting other researchers about the instruments	Focus group Interview schedule for parents Focus group Interview schedule for grade 3 learners Questionnaire schedule for Gr 9 and 12 learners Questionnaire schedule for first year tertiary students. Interview schedule for parents.
Selecting the sample	Determine list of schools in Eastern Cape, KwaZuluNatal and Gauteng in different conditions and try to gain access. Connect with tertiary institutions for access to first year Science and Engineering learners. Make contact with parent/ adult groups to conduct the focus group interviews.	List of sites where data will be collected.
Data Collection	Instrument administration in KZN Instrument administration in EC Instrument Administration in GP	Data ready for analysis List of institutions (entities) that provide intervention programmes
Data Analysis	Data capture, cleaning and analysis Intervention programmes entities are profiled	Initial sense of: Parents' reported involvement Learners' impressions of parental involvement Profile of intervention programmes.
Draft report	Compilation of draft report with key themes and possible strategies Organize a Policy Related Workshop with stake holders to present initial findings and discuss issues related to policy development.	Draft report Workshop generated policy recommendations.
Final report	Outline recommendations relating to the specific terms of reference about parental involvement and influence on their children's choice of SET careers.	Final report to DST

CHAPTER TWO
CONTEXTUAL LANDSCAPE
PARENTS AND THEIR CHILDRENS' EDUCATION

1. Introduction

The home background of a child is an important resource to access school education and the school curriculum. The early years of the child, at home, is the start of the social, emotional and cognitive development of the child. Parents and the home are the first educators of a child. Research from the psychological domain indicates that the social, emotional and cognitive development up to the age of 5 or 6 in many ways determines the life trajectory of the individual afterwards. South Africa contains a highly diverse population of people. The country's history and past social practices have resulted in there being marked differences between population groups, with the African group most disadvantaged, in terms of social class, earning capacity, occupations, employment rates, education and skill levels and access to resources. These social and economic differences results in differing home background which impacts of the social, cognitive and emotional development of children.

In this study it is important and necessary to provide a contextual landscape which would allow us to make sense of the empirical information. In this landscape we will (i) review the international literature (the South African literature is very sparse) with respect to parental involvement in children's education and in particular in their mathematics and science learning; (ii) review the literature with regard to career influences and review the South African school curriculum provision with respect to career education; (iii) paint a picture of the South African adult population with respect to socio-economic status, educational and occupational levels and (iv) discuss the policy framework with respect to Indigenous Knowledge Systems in South Africa.

2. International Literature on the Role of Parents in Children's Participation and Performance in Education

There may be a paucity of South African literature on the role of parents in their children's education but in the developed countries there is an abundance of literature and research studies on this topic. The international authors agree that there are a myriad of factors that influence children's education and career choices. Some of these include teachers' influences, the school career counselor, peers/friends, the media, and experiences in school and personality type. However, in the majority of international research studies the influence of parents and home environment are factors that feature most prominently.

According to Catsambis (1998) there are a variety of ways in which researchers conceptualize 'parental involvement'. In a study, conducted in Baltimore (United States), Catsambis (1998), highlighted that Parental Involvement has a multidimensional nature. Parental involvement can be conceived of as, parents' participation in school activities or parental aspirations for their children or involvement with children's' learning at home.[2] Catsambis (1998) defines Parental Involvement as the complex interrelationships between family, school and community that give rise to six different types of parental involvement.

1. Parents establishing a positive learning environment at home.
2. Parent-school communications about school programs and student progress.
3. Parent participation and volunteering at school.
4. Parent and school communications regarding learning activities at home.
5. Parent involvement in school decision-making and governance.
6. Parents' collaboration with community organizations that increase students learning opportunities.

Also, parents can show involvement (indirect manner) by exposing their children to cognitively stimulating activities and materials, such as books, current events, and educational outings. According to Grolnick and Slowiaczek (1994) exposing the child to

[2] Here we define aspirations as something that one hopes to achieve for the future.

cognitively stimulating activities will ultimately enable the child to develop skills, which will be useful for school later. In this study a useful definition of parental involvement is the direct and indirect behavior of parents in all aspects of their children's education and learning. Direct parental involvement refers to the involvement of parents in school activities, school decision-making, communicating with the school about the child's progress, helping with homework. Indirect Parental Involvement refers to exposing the child to cognitively stimulating activities that have educational value, creating an environment for learning in the home (access to books, magazines, newspapers, the internet).

2.1. Parent level of education and educational involvement

The parent's level of education is perhaps the most documented socio-economic factor that influences children's education achievement, (Lankard 2002, Taylor et al 2004, Milbourne and Haury 1999, Dwyer 1992). The higher the parents level of education is, the more likely they are to have secured for themselves an occupation and hence increased their earning capacity and provide their children with material resources. However, there are studies that show that parental level of education goes much beyond just the ability to provide children with material effects. A parent's level of education can serve as a motivating factor for the child to remain in the education system and to want to increase the length of their educational years. So a parent's educational level can set a benchmark and is something to emulate.

On the other hand, some studies have shown that parental education level is something that children can try and better. For example, Lyons (2004) conducted a study with Australian high school students using a combination of interviews as well as a survey. The study attempted to understand the socio-cultural influences that impact on high achieving students in their choice of physical science as a subject. One of the socio-cultural influences that came through in this study was the life experience of parents, which served as a motivating factor for children to pursue and persist in science-related courses like Physical Science. The students explained that often they had been witness to their parents lamenting on regrets and misgivings of educational experiences gone by. According to Lyons (2004) parents held regrets on not having taken advantage on educational opportunities, some on the lack of useful qualifications, interruption of

education/careers (for family reasons). Many of the students in Lyons study took this as a cue to maximise on their educational opportunities.

Another study that illustrates that low levels of parental education can lead some children to be more determined to further themselves is that of Brooks (2003). In a qualitative longitudinal study of four young peoples higher education choices Brooks (2003) elicited that participants from working class families, whose parents have lower levels of education as compared to their middle class counterparts, are given the clear message from parents to 'not become like them' (pp288). Children in working class families wanted 'something different' for themselves and this serves a driving force for these children to pursue higher education and to be more successful than their parents.

It can be surmised from these studies that although high parental levels of education can be extremely advantageous to a child; those parents who have low levels of education have not condemned their children to a poorer quality of life, but rather they have the ability to motivate their children and encourage them even more on the importance of education. Motivating their children to do well in school and providing encouragement becomes vital for some parents as children progress through their educational careers.

2.2 Parental occupation.

Parents' professional careers can have significant impact on the career choices of their children. Various studies (Bender 2004, Lankard 2002, Taylor et al 2004) illustrate how parents' choice of occupations can filter to children, acting as either sources of information about what careers exist out there, the earning capacity of these careers, and job satisfaction. The study by Brooks (2004) found that those parents from the middle social classes find ways of ensuring the reproduction of their class advantage and thus promote certain careers as opposed to others. What is interesting is that parents of these middle class students learn about other careers from their place of work. They learn from their social networks (colleagues, peers, friends) which are the universities that enjoy high status, which are the high earning jobs etc. The majority of parents want the best for their children and therefore they would promote these to their children. Parents from the middle social classes, who want to perpetuate their class status encourage their children to enter professional careers, and these parents have the financial backing when encouraging their children.

There is also literature to suggest that children from middle class families want to be like their parents. They enjoy the status, level of income, earning capacity, luxuries etc. that their parents have. Yet, according to a study by Jawitz (2000) although middle class children are witness to the benefits that their parents enjoy and may want that, they may still lack the motivation to undertake the years of hard work that goes into securing a high social status for one's self. A South African based study, conducted by Jawitz et al (2000), undertook an investigation into how young South African women who are high achievers in school mathematics and physical science decide what to study at university, and this study paid special attention to motives for choosing or not choosing engineering among the young women. All the women in the study identified parents as important in their decision making about career choice. One of these students had in fact been deterred from choosing engineering as a career choice when she witnessed the amount of work that her engineer father would bring home. So, even though parental occupation can serve as models for children to aspire but there must be other factors that play a role in young people's career aspirations as this case illustrates that not all parents who are successful scientists have children who want to emulate them.

2.3. Parents involvement during school life

Catsambis (1998) explains that parents' level of involvement in their child's education varies across the lifespan of the child. Throughout the course of the child's education parental level of education can either wax or wane. A longitudinal study analysed by Catsambis (1998), provided insight into parental involvement in the educational achievement of high school seniors in Baltimore in the United States. Catsambis (1998) explains that in the earlier years of a child's schooling career parents find it easier to become involved in the supervision of school activities such as homework and school projects etc. This is perhaps easier for parents because they are able to contend with the level of the work that they have to engage in. However, as the level of the child's education increases (secondary school), parents might find that they have children whose education is beyond their own and according to Dwyer (1992) this could cause some parents to feel intimidated and overwhelmed by their lack of education.

Once these negative thoughts come into play, parents might feel that the school and the teacher are better equipped to oversee the education of their children and 'turn over' the

responsibility to the school. However, Catsambis (1998) findings in the longitudinal study, brought forth the point that irrespective of parental level of education (she discusses it in terms of Socio-Economic Status), the consistent encouragement, motivation, moral support, high levels of expectations were positive influences in the educational achievement of learners. So where parents find they are deficient in one quality (parental education in this case) there are other mechanisms through which they can positively influence their children. Parental socio-economic status influences a child's educational achievement in that parents who enjoy a high socioeconomic status would be able to provide their children with more resources by way of finance, books, information, the correct infrastructure for successful studying, support, role models to emulate etc. Parents who belong to the middle class have several of these resources for their children to exploit. On the other hand, parents from the working class or less affluent parents face a variety of challenges and difficulties in promoting their child's academic achievement. When demonstrating the influence or role of parents in education researchers generally look at the indicators of socioeconomic status that help explain the position that parents find themselves in. These indicators are: parental level of education and parent occupation. In addition to SES, researchers have also looked at parents' interactions with their children, their behaviour with regards to the importance of school and certain professions and the socialization of their children and how this influences career choice. What follows in this review is an account of what international studies have found useful when examining indicators of parent SES (education, occupation, social class etc) and how parental interactions influence the academic achievement and career decisions of children.

3. Literature on career influences and career education

The documented role of parents in the education and career choices of their children illustrates that parents play a complex and highly influential part in the life and educational path of their children. There are many parental factors acting together creating the basis for what a 'good education' means and what is required for a child to perform well academically, hence entering into a career and finding social and economic security. The needs of children will change across their lifespan and the role of the parent

also changes to adapt to the changing needs of their children. In order to understand how parents become involved in their children's education and career choices, as well as parents attitudes toward mathematics and science, and how this changes over time this study focuses on learners at 4 different stages of their academic careers: Grade 3 (8year olds), Grade 9 (14-15 years olds) and Grade 12 (17-18 year olds) and first year tertiary students.

There are a number of theories that attempt to explain the cognitive, emotional and social needs of children at the various stages of their lives. According to (Arulmani and Arulmani, 2004, Cox 2004) Human Development theory is one such theory which can be defined as the development of individuals over the entire lifespan, that is, from conception to death. Human development can be thought of as occurring in stages, where each stage in a human being's life is marked by a growth in cognitive ability and social maturity.

3.1. The Middle Years (6-8 years)

This period of Human Development (6-8 years) is characterized by considerable progress in cognitive and emotional skills. According to Cox (2004), Paplia and Olds (1992) children of this age spend the majority of their time in school and should be attempting tasks of reading, writing and learning arithmetic. Parental influence and interaction at this stage of a child's development leaves an enduring and indelible impact on the educational performance and career aspirations of the child (Bleeker and Jacobs 2004).

Parental impact on education – performance and participation

According to Paplia and Olds (1992:266) a study conducted in the United States by the US Department of Education found that those children who were high performers had parents who:

- Read, talk to and listen to their children. They tell their children stories, play games, discuss events on the news and television programmes and share hobbies;
- These parents provided a place to study and to keep books and supplies;
- They make and set rules for times of meals, sleep and homework and making sure that they are aware of school deadlines/activities that children have;
- They monitor and control television watching time and know what their children do after school;

- Show interest in school, by not just helping with homework, but also asking about what happened at school, discussing academic challenges, failures and successes.

In a study which was a follow up to a longitudinal study Bleeker and Jacobs (2004) conducted a large scale survey measuring parents' perceptions and expectations of their children to succeed in mathematics and science in school in 1984 and followed the sample of students and parents over 12 years until 1996. At two year intervals they measured adolescents' self-perceptions about mathematics and science. One of the most important findings that came out of this study was the enduring link between parents' early expectations about their children and activities with their children and later career choices. As hypothesised by the researchers parents early confidence in their child's ability to do well in mathematics and science, positively influenced the likelihood of the child choosing mathematics and science in school and wanting to enter into a profession that was science-orientated. Parental show of confidence in their children is a powerful force in developing self-esteem, self-confidence and self–efficacy providing the child with added motivation.

Children from different cultures have different views on career choices. In a qualitative study of Japanese and American first grade students occupational aspirations, Wang et al (2003) found that these two groups of children's thinking about careers and their occupational choices to be on opposite ends. The study used essays written by both American and Japanese students on the topic of 'What I want to be when I grow up?' These essays where then analysed themes and categories were identified. It was found that Japanese students were extremely concerned about the welfare of others and about pleasing others especially their parents. American children, on the other hand, give self-related reasons for their career aspirations. They identify careers that they 'want' and 'like to do'. Wang et al (2003) conclude from this that they cultural value systems present in American and Japanese cultures play a significant role in how young people think about 'what they would like to be when they grow'. With South Africa being a multicultural nation it is important to take into account the role that one's culture plays in influencing career aspirations.

3.2. *The Adolescent years (14-15 years)*

This stage of human development is often characterized by a search for identity, (Arulmani and Arulmani , 2004 ; Cox 2004, Paplia and Olds, 1996). In this stage of development the cognitive and social maturity of the individual is at an advanced stage and unlike the middle childhood phase, adolescents are able to rationalize, they are capable of hypothetical reasoning and can plan for their future. With this widening of cognitive abilities and an increase in social networks, we find that adolescents have key figures in their lives, who influence them in different ways. These can be role-models in the media, school or peers, parents, older siblings or someone in the community. With regard to the home, we find that even though adolescents are less likely to approach parents for help with homework, there are other home-influences that affect how well they do in school and the career aspirations that they acquire (Paplia and Olds, 1996).

Arulmani and Arulmani (2004) describe career choice at this stage as the *exploratory stage*. Here adolescents begin to explore what options are available to them and this is an important stage where they acquire information. It is important then that parents and school create opportunities for thorough and systematic career exploration. Some activities that parents/school can engage in is:

- Encouraging children to speak to career counsellors.
- Promoting self discovery
- Organising work experience programmes

As children grow older (late adolescence) they become more orientated to reality and start thinking realistically about there future. It is a debateable issue whether or not parental encouragement or parental socio-economic status is the strongest influence on academic achievement at this point. Aside from the parental encouragement and emotional support that adolescents receive there is also a strong link between parent financial support and academic achievement.

The effect of parental style has been shown to be as important at this stage as it was in middle childhood. According to the study by Dornbusch (1987), where more than 7000 high school students were surveyed on how they perceived their parents' attitudes and behaviors against their school performance, it was found that parents who adopted an Authorative style of parenting had children who performed well academically. It was

found that these parents were described by children as doing such activities as: going for parent-teacher meetings at least once in a while, talking about politics, welcoming teenagers to engage in family decision making, students received praise whereas poor grades bring offers of help and encouragement to try harder. Generally these students lived with both parents.

3.3. Career Counselling in South Africa

The delivery of career guidance in South Africa has been under criticism. It is being criticised for adopting westernised theories, career tests, and aptitude tests and for not taking into account the unique social, political and historical context that exists in our South African society. There is also a critical shortage of skilled counselling professionals in South Africa. Efforts in career counselling have thus far not been transformative.

Traditionally, in career counselling tests are adopted using Western and European frameworks and theories. According to Stead and Watson (1998) such career theories have been generally accepted in South Africa. Much of the application of these theories has focused on white South Africans (Maree and Beck, 2004) and little or no attention has been paid to testing the underlying assumptions of Western theories in the South African context.

In South Africa, career counsellors have been dependant on Western 'assessment'' methods. Traditional career counselling has favoured a 'positivist' /objective perspective. In order to obtain an objective image of an individual, sophisticated psychometric tests, paper and pencil tests and computer programs were utilised. This 'image' was then matched with the specific character traits suited to a specific career. If the individuals' personality, values and interests match the specific character traits suited for a career then the assumption was that the individual would find that career stable, productive and satisfying.

According to Maree and Beck (2004) the shortcomings of the traditional approach to career counselling has become quite apparent in post apartheid South Africa.

- Current career counselling models and methods have until recently been available only to white Afrikaans and English speaking learners. These theories are not suitable/ functional for all cultures, genders and socio-economic groups.

- Career Counsellors rely on the results of psychometric tests. Psychometric tests are problematic because, (i) few of these tests are designed for South Africa's multicultural society/population, (ii) the majority of American and European tests are not necessarily valid and reliable for the diversity of South African cultures, (iii) the learner is a passive recipient of the career counselling whereas the career counsellor is seen as the expert whose recommendations should be accepted unconditionally; (iv) this allows the client/learner to not take responsibility for the career decisions that are made; (v) test results could contribute to the student being labelled and (vi) career counselling is not available to the vast majority of South African.

Many researchers suggest that career counselling need to move away from the traditional approach to an approach that recognises the individual's social and historical background. Also, the individual needs to be an active member of the career counselling process. We need to better understand what the career behaviour of students is and what they are thinking. According to Maree and Beck (2004) the new approach to career counselling should embrace/encapsulate the following characteristics, (i) an open attitude toward different races, cultures, religions, moral convictions and sexual orientation, (ii) hold the value that diversity among the races is important and enriching (iii) a mixture of methods used in career counselling (not just psychometric tests) (iv) the counsellor has to renounce the role of expert and allow for the client/learner to develop, create and implement their own decisions, thus also empowering the individual to take responsibility for important life decisions.

4. The South African adult population: socio-economic status, educational and occupational levels

One of the objectives of the present study is to foreground the voices of parents. We also focus on learners who are at different stages of their academic careers (grade 3, 9, 12 and first year tertiary students). Thus for the purposes of this study we have focused on that portion of the adult population who are 25 years and older. It is this population who are more likely to have children who are negotiating their way through the education system.

4.1. The South African adult population

To get an understanding of the demographic profile of the adult population (25 years and older) we use secondary sources of data, such as the 2004 General Household Survey (GHS) and the 2004 Labour Force Survey (LFS) (Statistics South Africa, 2004; Statistics South Africa, 2005) Table 1 provides a description of those adults 25 years and older who participated in the General Household Survey in 2004 (Stats SA). The table shows the distribution of this sample of people by race and gender.

Table 1: The South African population (>25 years old) by age group, population group and sex. [(N)1000]

Age group	African			Coloured			Indian			White			Total		
	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F
25-29	3366	1661	1705	352	165	187	109	49	60	370	183	187	4199	2059	2140
30-34	2740	1337	1403	346	158	188	123	72	51	450	232	217	3662	1801	1860
35-39	2009	933	1075	286	142	144	82	45	37	354	183	171	2734	1304	1430
40-44	1826	839	986	266	117	149	81	38	42	312	154	158	2485	1149	1336
45-49	1548	715	833	211	92	119	75	35	41	317	171	146	2151	1012	1139
50-54	1257	550	707	179	85	94	58	28	30	223	109	114	1718	772	946
55-59	972	419	552	136	63	73	48	25	23	233	113	121	1390	620	769
60-64	848	331	517	93	41	52	41	18	23	226	114	112	1210	504	706
65+	1635	577	1058	152	59	93	62	33	29	392	201	190	2242	871	1371

Source: Statistics SA Household Survey. T= Total, M= Male, F=Female

The number of adults in the 25-29 and 30-34 age group is higher than the other age groups. After the 30-34 age category the number of adults start to decline and increases again when we reach the above 65 age group. The causes for this could be (i) the effects of sampling households could have resulted in only younger people being available for participation in the study, (ii) we could be looking at the effects of migratory laborers. GHS did not take into account and (iii) HIV/AIDS which is documented as the main source of death among South African adults could impact on population sizes.

4.2. Socio-economic status of the adult population

The socio-economic status of parents is an important factor, in that it is an indicator of the resources that are available in a household. These resources then provide the child with the social and cultural capital needed to access the school curriculum. Generally, socio-economic status is described in terms of parents' level of education and parental occupation. For an understanding of the socio-economic status of adults in South Africa we will describe the population according to:

- The distribution of skills in the labor market
- Highest level of education
- Illiteracy rates
- Poverty
- Income levels

South Africa has a unique history of racism and discriminatory policies. According to Moleke (2005), the huge social inequalities that plague the South African society and the poverty stricken plight of many Africans are the effects of the apartheid era. The sectors where racial inequalities are best illustrated is the labor market/job sector. According to the 2002 Labour Force Survey (Stats SA, 2002) Africans constitute over two-thirds of the labour force. Table 2 (Moleke, 2005) shows the distribution of skilled, semi-skilled and unskilled workers in certain sections of the labour market.

Table 2: Distribution of workers in occupational groups by race: 2001-2004

	African	Coloured	Indian	White
Top management				
2004	11.8%	3.7%	5.6%	78.9%
2003	10.0%	3.4%	5.0%	81.5%
2002	8.0%	13.0%	4.0%	75.0%
2001	6.2%	2.7%	3.8%	87.5%
Senior management				
2004	13%	5.4%	7.2%	74.4%
2003	10.8%	5.3%	6.3%	77.9%
2002	10%	5%	5%	80%
2001	8.7%	4.9%	4.9%	81.6%
Professionals and middle management				
2004	38.8%	6.5%	5.9%	48.9%
2002	40.0%	6.0%	4.0%	50.0%
2001	32.8%	5.5%	5.8%	56.1%
Skilled technical and management				
2004	29.8%	11.9%	8.9%	49.5%
2003	35.8%	14.5%	7.0%	43.1%
2002	38.0%	13.0%	8.0%	41.0%
2001	34.4%	14.6%	7.5%	43.6%
Semi-skilled				
2003	61.9%	15.9%	5.3%	16.9%
2002	62.0%	15.0%	5.0%	18.0%
2001	58.9%	17.7%	5.6%	17.8%

Source: Employment equity reports: 2001, 2002, 2003 & 2004

4.3. Level of education

A factor that contributes to the skill levels in the labour market is education. The historical marginalization of the African group in the education system partly explains why Africans are unable to obtain high skilled occupations.

Table 3 shows the distribution of education among those aged 20 years and older, who participated in Census 2001. Once again we find that there are glaring disparities between race groups.

Table 3: Highest level of education among those aged 20 and older by race, 2001

	No schooling	Some primary	Completed Primary	Some Secondary	Completed Secondary	Higher Education
African	22.3	18.5	6.9	30.4	16.8	5.2
Coloured	8.3	18.4	9.8	40.1	18.5	4.9
Indian	5.3	7.7	4.2	33	34.9	14.9
White	1.4	1.2	0.8	25.9	40.9	29.8
Total	**17.9**	**16**	**6.4**	**30.8**	**20.4**	**8.4**

Source: Statistics South Africa, Census 2001

For the African group, 40% of the population had 'no schooling' or 'some primary' and for the White group 2.6 % had 'no schooling' or 'some primary'. At the other end of the educational spectrum, for the African group, 22% had 'completed secondary' or 'higher education' and 70% of the White group had 'completed secondary' or 'high education'. Of the illiterate, 57% are females and 36% are male.

In the international literature, Parent/guardian level of education is viewed as one of the important factors influencing educational aspirations of children. While it still remains unclear to what extent South African children are influenced by their parents level of education, we can assume that the low levels of education among parents impacts on the social and cultural capital that students bring to the classroom.

4.4. Poverty levels in South Africa

According to the Development Report (2005) it is difficult to arrive at a concise definition of what poverty is. Poverty is a multidimensional phenomenon; aside from the

monetary aspects of this phenomenon one can also view poverty as a 'lack of resources' (viz. sanitation, education, and housing) or a lack of opportunities. To describe the South African poverty levels we will look at monetary and public resources available to people. According to the Millenium Development Report (2005) in 2000, 11% of South African people were living on less than US $1 a day, and 34% were living on less than US $2 a day.

4.7. The impact of HIV/ AIDS on family structure in South Africa

The HIV/AIDS pandemic that has ravaged millions of South African families and has seen high mortality rates in adults leaving many children orphaned and an increasing number of households being child headed households. The Nelson Mandela /Human Sciences Research Council study on HIV/AIDS found that 13% of children had lost one or both of their parents. The social and economic impact of HIV/AIDS on households forces families to reorganize themselves by either reducing their numbers or taking in other family members – generally children.

According to Marcus (2002), Freeman et al (2004) the burden of childcare (after the death of a parent from AIDS) falls mostly on grandparents. These grandparents (mostly grandmothers) were themselves heavily dependent on their children for financial support.

Also, according to Marcus (2002) the death of a female parent correlates statistically significantly with a reduction in the number of hours children spent at school. Furthermore, when household members (especially a parent) become ill there is a significant decline in the earning capacity of that household because HIV/AIDS removes the income earners of that household and the financial burden of biomedical and traditional medicine absorbs a considerable amount of cost.

According to Freeman et al (2004) the HIV/AIDS pandemic will leave millions of children with out their parents and primary care-givers. In South Africa alone there were estimations that in 2002 approximately 800 000 children, under 18, had lost a mother and that by 2015, 3 million children would be maternal orphans and 4.7 million paternal orphans. Often the remaining parent in a family is too old to take of the children and in some extreme cases an older sibling takes care of younger sibling. These cases of child-headed households are becoming ever more prevalent in South African society.

5. *The South African Department of Education and parents*

The South African Department of Education indicates that it is committed to enhancing education and the qualities of schools in South Africa and encouraging the involvement of parents in the education of their children. Both the South African Schools Act of 1996 and the National Education Policy Act of 1996 place an emphasis on involving parents in the education of their children. The South African Schools Act deals with the norms and minimum standards for school funding and acknowledges at the fore that South Africa's past history has resulted in injustices and inequality. To address these injustices and inequalities SASA encourages schools to enhance their resources by using the SGB to raise 'additional resources' that will supplement what the state gives to them. South African parents from the middle classes and those who are less poor would be able to contribute finances towards their children's school and as a result those schools will have the proper resources, facilities, learning materials and equipment. On the other hand working class parents and those parents who are less affluent will only be able to contribute a small percentage or maybe none of their earnings to their child's education or school. This will result in some schools continuing to be poor and those children continuing to receive a low quality of education, which will help perpetuate the cycle of poor families. The question to be asked now is, how do we intervene in preventing this social reproduction where poor people continue to be poor and affluent families continue to enhance and maintain their middle class advantage. For example, those parents who have low levels of education would find it a daunting task to engage with their children in completing homework tasks or helping with school projects. Parents from the working class may not be able to afford their children the time to engage in these activities, as their occupations make this an extremely difficult task. For example, consider miners, or parents whose occupations take them out of the home for long hours. These parents face challenges of a physically draining job and may have little energy at the end of the day to get involved in their children's education. Providing a basic living for their children maybe their top priority and the responsibility of education is 'handed over' to teachers and the school.

As illustrated in the international literature parents in skilled professions serve as role models and people their children can emulate. However, children of working class

parents do not want to find themselves in the same life circumstances as their parents but whom do they have as role models? Here is where teachers, school and the media need to play a role in providing role models for children. The best examples of role models would be people who have made great academic achievements even though they faced obstacles that may have appeared to be insurmountable. South Africa is rich with people who can demonstrate this for children.

6. South African literature on parents and careers

The international literature highlighted the role of parents as social support structures for their children, where the provision and encouragement of parents was a very influential and powerful force in motivating children to achieve well academically. There is evidence to show that parental and familial support has had excellent effects on South Africans from disadvantaged backgrounds. A doctoral study by Reddy (2000) on academic success in an unequal society, found that the participants (who had received a doctoral degree) identified family support as integral to their success. This qualitative study elicited the unique and personal stories of 10 black South African doctoral graduates to understand how their academic careers unfolded and what their experiences were like en route to obtaining their doctoral degrees. "A critical ingredient in explaining the academic success was the family. The family provided resources for schooling and shaped the educational aspirations of the participants. The influence of the family and the school institutions are related in explaining academic success. The Indian and Coloured school systems offered a better quality education than the African school system and those participants had a better chance of a quality education. For Africans, the chances of gaining a quality education were increased if the parents were professionals and were able to supplement the inputs from schools and if families had the material resources to send their children to a boarding school. If the educational institution was good and provided quality education the academic support given by the family does not seem to have been as critical as when the educational institution provided poor inputs. The family was especially important in the lives of the single mothers. Families assumed childcare responsibilities and this provided an opportunity for the women to continue along their academic pathways" (Reddy, 2000: 327).

The family and extended family is a rich source of social capital and this view is also endorsed by Amoateng et al (2004), who explains that people have social networks that comprise of immediate and extended families as well as friends, peers and colleagues. This network of people is sometimes referred to as 'social capital'. It is an intangible resource in communities that help people to cope with stresses and develop their potential. Parents do have social capital in that they can get information from colleagues at work, employers, friends, other family members etc. Therefore there are networks of people that parents can approach to further their knowledge on education matters. Lyons (2004) suggests that social capital within the family is an excellent factor that motivates children to do well in school. Here social capital refers to the quality of parent/child relationships. When parents communicate their attitudes about science, and advocate for or encourage an interest in science it shows that science is valued.

A study in South Africa on the occupational aspirations of Black South African high school learners have been found to be concentrated mostly in social services and education fields and least in technical fields. According to Stead and Watson (1993) research on Xhosa-speaking Grade 10 and 12 students revealed that most of their occupational aspirations were for the helping professions and few are for the science-orientated professions such as engineering, technical trades and computer science. Hence research is needed to find out what social processes are taking place and whether these views persist in 2006. We need to find out what could be influencing Black learners to choose more caring professions rather than scientific professions. We need to acknowledge that career aspirations and attitudes are closely tied to the social practices in which they are forged.

5. The policy framework with respect to Indigenous Knowledge Systems in South Africa.

All communities are rich repositories of information and knowledge and have ways of making sense of the world. During the apartheid era local knowledge was dismissed as inferior. The new government sought mechanisms to acknowledge and value local knowledge and the Department of Science and Technology has produced the policy document on Indigenous Knowledge Systems (IKS).

IKS is generally used synonymously with traditional and local knowledge to differentiate the knowledge developed by and within distinctive indigenous communities from the international system generated through universities, government research centres and private industry.

6. Concluding comments

Parents have an important role to play in the education of their children. They provide the foundations at home and thus the social and cultural capital to access the school curriculum. South African society has a very high income distribution with high levels of poverty and these families cannot provide the home background inputs to access the school curriculum. The kinds of inputs, activities and social and cultural capital that middle class families provide allows those children easier access to the school curriculum.

CHAPTER THREE
RESEARCH METHODOLOGY

Foregrounding the voices of parents

1. Research Approach

This research foregrounds the voices of parents. We collected data from parents on what they indicate is their role and involvement in their children's science and technology participation and performance. In addition we collected information from the learners on how they perceive the involvement of parents.

To get a sense of parents involvement we considered the following:

1. Definition of parent: Parents in this study are defined as adult persons who either currently have children at school, whose children have gone through the schooling system or those who get involved with children and their education. In this study, the aim is to be as inclusive as possible in recognition of the fact that not all children may be living with their biological parents. This means that parents in this study could be a mother, a father, an aunt, an elder sister, or brother, a grandmother or grandfather or any other adult who acts as a guardian.
2. Given that the voices of parents on the issues of attitudes of children's career choices in science are silent, this research will foreground the voices of parents (or caregivers).
3. South Africa has high economic stratification and the roles of parents may be different for different class groups. Therefore, this research will take into account the fact that the role of parents in the education of their children will be different for the different classes of South African society.
4. South Africa has distinct rural and urban populations and this will have to be considered in understanding the question asked in this research.
5. We will conduct the research in three provinces: Kwa-ZuluNatal, Eastern Cape and Gauteng because these three cases represent different socio-economic conditions in the country and therefore different realities.

6. Career choices and involvement in science careers are gendered. Therefore the research will explicitly consider the role of male and female parents in the education of girls and boys.
7. The underlying assumption in the research is that students make subject choices. However in many cases this is decided upon at the school, based on what the school subject offerings are and the prior performance of the learners. The research will probe these issues as well.
8. We will consider choices in the schooling system and gain an understanding of subject choices and attitudes at grade 3, 9 and 12 level.

3. Sampling

The HSRC proposed a sampling design whereby three provinces in the country would be selected: Gauteng, Kwa-Zulu Natal and the Eastern Cape. The rationale for choosing these provinces is that they would be illuminative of the South African society and would provide access to both rural and urban participants.

Participants for the study included, from each of the three provinces, a sample of adults who are parents and who are 25 years and older. In addition the views of learners who are at the grade 3, 9 and 12 learners as well as first year tertiary science and engineering were elicited. See appendix A for the list of sites and numbers where the data was collected.

Sampling of parents

A major challenge of the study was to obtain a sample of parents from different socio-economic backgrounds and to access adults who will be available for a focus group discussion. It was proposed that the parents would be accessed through organizational affiliations, such that, parents/adults would be approached at a mutually agreed upon time at their place of work for a focus group discussion. About one hundred parents were to be interviewed from each province

Sampling of grade 9 and 12 learners

When sampling for grade 9 and 12 learners, an effort was made to access learners from different socio-economic school types in each of the 3 provinces. We sought to target 150 grade 9 learners from each province (N=450), 150 grade 12 learners from each province

(N=450). On completion of the data collection, we had elicited data from 952 grade 9 learners and 610 grade 12 learners.

Sampling of Tertiary Students

When sampling tertiary students we attempted to get the views of students who had taken a decision to study science-related subjects. These included Engineering students, students in a science bridging course, and Bachelor of Science students. We proposed that we would sample 50 tertiary students from each province. One hundred and sixty (160) tertiary students completed the questionnaire.

Sampling of grade 3 learners

Ten grade 3 learners from three schools in each province were interviewed in focus group interview sessions about the role of their parents in their education.

4. Instruments

Five data collection instruments were used to collect data for the study. The full set of instruments is available in Appendix B.

1. *Parents' interview schedule*: This consisted of a set of open-ended questions to elicit parents experiences of how they get involved in their children's participation, performance and careers in SET.
2. *Grade 3 learner interview schedule*: This instrument consisted of a set of questions that tried to elicit how parents get involved in their children's school work.
3. *Grade 9 learner questionnaire:* asked learners how their parents are involved in school work and their involvement in SET career choices.
4. *Grade 12 learner questionnaire:* asked learners how their parents are involved in school work and their involvement in SET career choices.
5. *First year SET tertiary students questionnaire:* asked learners how their parents were involved in their school work and how they influenced the current career choices of these learners

5. Analysis

The data from the questionnaires were entered onto an SPSS data base. The grade 12, 9 and tertiary student questionnaires were analyzed using frequency counts and cross tabulations.

In the focus group discussions, extensive field notes were taken and these were analyzed to assess the extent to which parents have become involved in their children's education and career decision making.

6. Stakeholder workshop

The draft report was prepared and these findings were presented to a Stakeholder group meeting. Initial strategies were presented to the Stakeholder group and these strategies were debated. Appendix C provides a list of participants at the stakeholder workshop.

CHAPTER FOUR

PARENTS' INVOLVEMENT IN CHILDREN'S MATHEMATICS AND SCIENCE EDUCATION

'Imfundo isinkwa sakusasa' (Education is tomorrows food)

1. Introduction

In the literature we found a silence in relation to the voices of parents about their involvement and views on education. In this study we decided to foreground the voices of parents and therefore we interviewed parents.

We collected data in 3 provinces: KwaZuluNatal, Eastern Cape and Gauteng – in total we interviewed 234 parents. We recognized that with South Africa being a highly stratified country there would be differences in the educational level of parents and the socio-economic levels of parents. We set up focus group interviews with groups of parents representing the different categories. Most of the people that we interviewed were women – this was not intentional.

In this chapter we start off by providing two vignettes: these can be seen as a composite story of parents and their involvement in education in two different socio-economic settings. In addition we will provide an analysis, in relation to the questions in the Terms of Reference, of the interviews with parents:

(i) involvement in children's education;

(ii) views and involvement in mathematics and science;

(iii) views on the new curriculum (OBE) for school;

(iv) views on FET colleges;

(v) aspirations for their children after completing schooling;

(vi) linking mathematics and science with everyday practices/ traditional practices.

The chapter will end of stories of the researcher in their role as 'parents'.

2. Two vignettes of parental involvement

Vignette 1: Parent from the rural Hlabisa district

Hlabisa is about 250km to the North of Durban. It is best described as a 'poor rural area'. The soil is sandy and brown, the vegetation sparse, there are small houses and huts, and there are no industries in the area. The daily lives of children involves walking long distance to school, returning from school and helping with chores like gathering firewood and water, helping around the house. There is no electricity in the houses. If there is homework it needs to be completed before the candles are lit.

Children in this area may live with grandparents. Those parents that are at home may be unemployed and most parents have a low educational level. Parents who are professionals like teachers etc, live closer to the town of Mtubatuba. Parents send their children to the school and depend on the school to provide a good education. Parents are interested in the children's education, value it and are supportive to their children's education. However as the child goes to higher levels of schooling, because of the specialized nature of knowledge they are unable to assist with the child's learning. At the moment parents are confused with all the changes that have occurred in the education system and most speak in negative terms about OBE – largely because they do not know what it is and see OBE as the problem in education.

Parents say that they depend on the school for an education of their children. But they say that in school there are no resources and there are no quality mathematics and science teachers. Parents have an almost resigned air in accepting that their children will not be getting a quality education. They say the whole issue is about education and development – and the area needs to develop first before there can be quality education. Most parents indicated that they would like their child to study whatever would make them happy.

The question then is, given that the home cannot provide the educational inputs for a quality education and they depend on the school and the school is not providing these inputs, what then are the chances for the learner to come out of the poverty trap.

Vignette 2: Parent from a middle class urban home

The child from the middle class home lives in a suburb, with all the services of running water, electricity and a series of social and educational inputs at hand. The home is generally with a nuclear family and both parents could be working (maybe one or both in a professional job). In the child's early years, the home provides many social inputs – toys, family discussing what happens in the world, watching Nature programmes together. Family is supportive of school. If both parents are working when the child comes home there is generally a grandparent or maid to take care of the child. Parent may assist the child with school work in the early years of schooling, but as the child moves to higher grades with specialized knowledge the parents are less able to provide assistance.

Parents try to send the children to 'good' schools – and these are generally high fee paying schools. In these schools teachers are generally qualified and the educational inputs from the school are generally good. Learners are given a range of inputs which would facilitate their learning, perform well in examinations, passing through the schooling system and then getting access to better opportunities in their lives afterwards.

If the parent feels that the child needs extra inputs with regard to their mathematics and science knowledge, then the child is sent for extra tuition – parents pay.

Parents indicated that they would be quite happy with whatever careers their children chose.

These two vignettes illuminate the differences and similarities in the lives of children and parents in different socio-economic conditions. The educational outcomes of children are dependent on the inputs from the home and the school. In the case of children from middle class backgrounds, children come from homes with the requisite cultural and social capital to meet the requirements of the curriculum in schools. The schools they access generally provide a quality education. In the case of children from poorer communities they do not come in with the social and cultural capital needed to meet the requirements of the curriculum. Generally poorer communities depend on the school to provide quality educational inputs to ensure the learner is given a better chance to meet the curriculum goals. However the education provided in most rural, poor communities is

problematic and the learner is faced with further inequalities. And so for poorer communities the vicious cycle continues.

3. Parents involvement in children's education

Parents recognized education as integral to surviving in today's world. Parents felt that the past discriminatory policies had robbed them of a good education and view educating their children as a way to create a better life for them and a better society. All parents were keen that the children get educated and for poorer parents saw education as giving children an opportunity NOT to have a life like theirs.

> We are living examples that our kids should not follow. We are classified as nobodies because we are not educated. We want our kids to be known as doctors and teachers of tomorrow. [Woman from agricultural co-operative]

Parents ensure that children are attending school, check on homework, check on report cards, make visits to school to check progress. Parents in prison in their conversation over the telephone encouraged their children to go to school. Group of prisoners who take educational courses in prison, recognize the importance of education and because they have had good mathematics instruction they see mathematics as a subject which is accessible and now try to encourage and motivate their children to take mathematics as a subject.

The parenting role is still divided according to patriarchal activities where the women are expected to do the motherly chores with their children (bathing the children in the morning, washing their uniforms, accompanying their children to and from school) and fathers assist with the payment of school fees. While the women play the more dominant role in the education of their children, the fathers indicated that they do help by looking for materials for craftwork and they may take on the role of disciplinarian. If fathers are more educated than mothers they may assist with homework.

Parents would like to assist to a greater extent with homework but cannot do so because they do not have the requisite knowledge. Parents who did not have the knowledge to assist their children with homework, sought assistance from older siblings, neighbours, and children whom they knew were in higher grades and who could help. In addition parents bought study guides for their children.

Parents assisted more directly with schoolwork in the early years. Some parents reported innovative ways in which they try to help their younger children with mathematics, for example, using bottle caps, tins and slices of bread to explain problems.

Some parents engage in cognitively stimulating tasks such as watching educational programmes and reading novels together. Middle class parents indicated they play educational games such as scrabble, word games, reading together or talking about the books that children have read – they helped with homework and with projects and spoke with teacher about academic progress. They can also provide extra tuition for their children. Parents who themselves are in science related work environments do examples with their children, expose them to computer games, watch scientific movies like Sharkboy and LavaGirl. In a middle class professional family, the mother indicated that she integrates 'teaching' within the activities they do together – for example if she is cooking she would discuss with the child what is happening around them like how a fridge works etc. The daughter and father spend time watching TV and Nature programmes and chatting about it – a scenario with social and cultural capital that prepares one for schooling.

Parents contribute by participating in the SGB. They expressed the concern that kids watch too much TV and they can only monitor that they are doing homework when they are at home, but they return late from work so they cannot monitor what learners do.

Giving their children an education is seen as an investment by parents as they hope that their children will look after them in future. It has been known that in poor communities, a child's education is regarded as equivalent to a retirement policy, where children are expected to take care of their parents in later life.

4. Parents views and involvement in mathematics and science

Some parents acknowledged the centrality of mathematics, science and technology careers for competitiveness in a technologically-driven world and indicated their awareness of government's prioritization of these competencies. In general parents' valued science and mathematics subjects – it was almost at an intuitive level and the experience of being excluded from it in the past, that they felt that mathematics was an important subject.

They understood that mathematics and science provided more opportunities and good career prospects for their children, such as, engineering, medicine, and accounting. In addition to career opportunities it was necessary for the critical thinking that it develops in their children [*ukucwaninga*].

Parents wanted to help their children but did not have the knowledge and skills to do so, especially at the higher levels. Parents want re-imaging of mathematics and science so that it becomes accessible.

Some parents also expressed a view that greater participation in the subject would help the black community to be more positive and not see themselves as an inferior race to other races in the country. So they are **pushing** their children to do both subjects, to overcome the disadvantage of the past imbalances in our society, but this could perhaps deny their children the opportunity to flourish in other areas.

5. Views on the new curriculum (OBE) for school.

Most parents were not familiar with OBE and asked the interviewers *Yini leyo-ke?* (What is that?)

When the OBE system was explained to the parents they were in favor of this method of teaching. Some of the positive comments that parents had about OBE included: (i) it encourages independent and analytical thinking; (ii) Children are not 'spoon fed' rather they will acquire skills that will be appropriate for when they leave school; (iii) Children are encouraged to work in teams/groups, which is considered a good skill to have when one needs employment. Grandmothers knew of OBE and said 'it caused thinking.'

Parents who could comment on OBE were themselves educators. They were supportive of this new curriculum but acknowledged that for it to be successfully implemented; the school must be well resourced. However, parents who were involved in education admitted that the implementation of that was undertaken with little support to teachers. Some even indicated that what they see being implemented is not what had been originally conceived.

Some of the negative comments that parents had included: (i) A general dissatisfaction with the report cards. It was felt that comments, about the child's progress, on the report

card was bland and general and (ii) Teachers are ill-equipped to carry out this method of teaching. Parents' views about OBE is what is largely reported in the media.

6. Views on FET colleges and children attending FET colleges

A group of women who live in close proximity to an FET college indicated that they would like their children to go to the FET colleges so that with educational opportunities they get at the school they can easily access employment opportunities. FET colleges are also seen in a favorable light for their affordability, the valuable technical skills they provide, a shorter time is spent in FET colleges as opposed to universities. Parents felt that there is still a stigma attached to attending FET colleges. Parents also felt that government had not done enough to educate the public about FET colleges.

7. Aspirations for their children after finishing school

In general, parents would like to see their children make a success out their lives and to do better than they have done. Whereas parents concede that children have to come to their own decision about a career choice, they would like to see their children entering high skilled careers such as: accounting, engineering and medicine – jobs that pay well. But parents indicate that they do try to mediate in the context where television portrays the success attached to acquiring money as more important than developing a more rounded person.

Parents acknowledge that children sometimes have career aspirations that are not entirely rational, but feel that their role is to provide good support, encouragement and direction.

Many of the parents pointed out that they have no direct influence on what career paths their children choose. Some parents indicated that the teachers at school were much more influential in this regard

Parents gather from the media that there are many business related opportunities and feel that their children will not find it difficult to find employment provided that they get good directions from the school and the parent themselves.

8. Linking math and science with everyday practices/ traditional practices

Middle class parents try to link the science and mathematics to everyday life by involving their children in activities around the house and explaining what is happening. One of the Engineering students who is a parent commented that his children help/watch him when fixes household appliances or when he is doing mechanical work on his car. Also, parents relate activities such as cooking (ratios in recipes). Parents related stories of how they use everyday activities to link to mathematics, including competitions based on car registration numbers and the parents at the SciBona Science centre used this opportunity to show their children the workings of science.

When we interviewed a group of women on the baking skills program and asked if they talked with their children about using Baking Powder in the cakes to rise and link this to science at school. They said no – that was school science and this was baking. We probed further to ask if they talked with their children about traditional medicines etc and school and they said no – this was traditional medicine/ home remedies and that was science. It seems that in order to make the connections between school science and everyday science or traditional science you have to know both the domains.

9. Stories of researchers in this study as a parent/caregiver

Researcher 1

I am not a parent, but an aunt to 4 children – ages 2, 6, 12 and 14. I am involved in education and therefore take a great deal of interest the children's education. From their early days I have been given a space in their lives and my activities with them consists of mainly 'doing' things with them – I have taken them for walks in nature reserves, taken them to watch birds, good educational movies, bought them books and educational toys, taken them to science centres and museums. In fact the conversation between us is "I will not buy you another car or toy, but I will pay for an educational experience." Being a one time teacher, I am always trying to teach them something – talking about the news or why something happens (sometimes I think they get bored with me and would rather have inconsequential talk). Since my own background is in mathematics and science I spend time doing homework with them. I noticed that my niece was not doing well in mathematics – I bought a mathematics textbook with many examples. I spend at least two

afternoons a week revising homework – I make her work through many examples and then check these examples. I talk about the science and technology that is studied at school and I try to find connections between the different sections she is studying and also link to other aspects of life. For example they may be studying the colour wheel in science and in Art and Culture – she would not link these two parts up and when I point it out she is totally surprised.

I assist with mathematics projects. The new school curriculum has the underpinning philosophy of a partnership between the school and home in order to support the child's learning. There was one very interesting project that was given as a mathematics project: learners had to do a survey of attitudes to HIV/AIDS. This meant designing a survey instrument, typing the survey questions, making 30 copies of the survey, finding 30 people to answer the questions, analyzing the data and representing the information in graphical form. She worked through this for a weekend and I supported and constantly checked her work (and talked about the survey I was conducting with 9000 learners). I thought it was a wonderful project but kept thinking about how a child in a rural area who did not have the same access to resources (computer, photocopying etc) and someone who know a bit of mathematics to support the activity would cope.

Researcher 2

While research and common sense tells us that parental involvement in children's education is of great benefit to the child' progress, reality often makes this very tricky to implement. Like all parents, I have always sought to get involved in my children's education; including taking part in activities at school and supporting my children's school activities at home. The account being given here highlights some of the difficulties of parents who are often away from home in what is a typical migrant worker situation that pervades much of Southern Africa. However, as with all perspectives the personal and contextual elements that influence the parent's behaviour are very intricately linked. Therefore, while my situation as a migrant worker in an extremely demanding career, home does account for a lot of my involvement with my children's education, my own personal characteristics do play an important role too.

As a father of two boys, both of them now at school, and a committed educator in a career that often sees me carrying a lot of work home, the balance would have been difficult in any case. But that home and work are more than 400 km apart, it is even more difficult to get involved. Because of being too far away I often err on the side of gentleness rather than firmness. Moments with kids tend to be holiday and fun time. My 'educational' interactions with my children are more often on school projects than on regular homework. As a result, when I do try to do some homework with them, I find that I am so far behind that I often have to start very far behind. Of course, I am too tired from the long journey or too tense from the approaching journey to provide quality support to my children's educational activities. Things work slightly better with open-ended school projects than with routine schoolwork. With the latter we (either of my sons and I) both lose patience long before we have made headway after arguments about how 'it' is done, with my wife smiling very wisely down on me as if to say: 'I told you so!' The one advantage of working away from them is that we have so little time together that they often insist that I take them to work. As a result, I find that they do not hold my work in the same awe I held my father's. Hopefully, this will allow us to talk more openly about careers, when the time comes, than would be the case otherwise.

Over and above my situation as a migrant worker, I have found that important elements in my involvement with my children's work are their characters. The second of the two boys, having just started school, is not easily convinced that 'teacher's' instruction can be interpreted in any other way besides the one in which he heard it. When he does not cope he becomes very frustrated and it takes a great deal to convince him that it can be done in other ways, or even that the box of cornflakes that 'teacher' said they must bring can just as easily be replaced by that of detergent. The first-born is a much more easy-going, fun-loving person and many teachers have found him very difficult to manage. This is where I really miss the stability brought about by working closer to home. Every year, I find that the older child's work falls behind because of the attitude of the teacher – that the boy is naughty - and I am unable to intervene until I earn leave days and am able to meet the teacher. Needless to say that my wife is too overwhelmed with running the family on her own and is often unable to create the time necessary to intervene either. And in general, teachers create attitudes about children from meeting their parents and the ability of some

parents to serve in school committees is generally not unrelated to their children's academic progress.

Researcher 3

I am a Science and Technology Education lecturer in the School of Science, Mathematics and Technology Education at the University of KwaZulu-Natal. In the last 3 to 4 years, I have been involved in community development projects that specially target teacher and learner support and development in the areas of Mathematics, Science and Technology Education.

With regard to learner development, my focus has been on showcasing the work done by learners who show exceptional talent in science and technology education. The aim is to provide support for, as well as empower on a sustainable basis, learners from disadvantaged areas to come up with innovative projects showing entrepreneurial insights, and which they demonstrate using the relevant technology. In this regard, scientific and technological excellence that affirms and acknowledges young learners' experiences is promoted in historically less privileged communities. I have in particular worked with learners from the Hammarsdale area in the Mpumalanga township outside Durban.

My initial association with the group was via Sbusiso Nene, who then introduced me to several of his peer acquaintances who had a similar inclination for the design and construction of working models of various types. Within this loose, but growing formation of "technologically promising young people"(TPYP), my own role gradually became that of a sister, warder, confidant, facilitator, participant observer and action researcher. Thus drawn into the action network of these learners, I began to facilitate their participation, not only in various expos at both provincial and national level (Sappi, Eskom and FFS Expositions for Young Scientists), but also at exhibitions, for example at the Natural Science Museum in Durban. Throughout all these activities, I shared in their anticipation and preparation for the events and in the ways the group experienced them. In fact, the title of my research project, "***We cross night***: making sense of potentially gifted young people's experiences of science and technology learning as defined by their

lived experiences of school and home", derives from the expression the boys use amongst themselves to refer to their preparation for an exhibition.

I met Sbusiso Nene in late 2003 through his mother, Doris, who, at the time, was working in the Faculty of Education (of the then University of Durban-Westville) as a cleaner. She had come to my office to raise funds for her son's participation in the national ESKOM exposition in Pretoria. He had won a gold medal in the local KZN expo, but didn't have the necessary funds to be able to make the trip to Pretoria. Doris enthusiastically shared her son's technological interest with me. Not being entirely convinced that the money was going to be used for the cause she said it was, I inquired if it would be possible for me to pay them a visit to see at first hand the models made by her son.

Upon walking into the four roomed house in Hammarsdale, it was clearly evident how the ESKOM Expo had invaded, not only this young boy's life, but indeed that of his entire family. His bedroom, which he shared with some of his siblings, was adorned with components of both finished and unfinished projects, as well as newspapers clippings and articles that covered a trip he had made to Grenoble in France in July 2001 in recognition of his achievements in the 2000 ESKOM Expo. The cramped lounge was full of certificates and medals he had won in past expos. Sbusiso Nene (23 years old) is now registered at Coastal College for FET in Umbilo for his NCOR. He plans to study electrical engineering in the second term of 2006. His fees at the College are covered by my research grant.

9. Summary points

Whatever the education level or socio-economic status of parents they believe in the importance and role of education to ensure a better life for their children. ('Imfundo isinkwa sakusasa' (Education is tomorrows food). Parents see education as something that could facilitate upward mobility.

Parents are interested in the education of their children and wanted them to succeed in their educational endeavors. They try to assist by motivating them, providing funds for school fees, buying books, checking report cards, attending some of the school meetings. The role of working class and middle class parents is different. Working class parents spend long times away from home either traveling to and from work in public transport

or long working days. Therefore they cannot get involved directly with their children's education but get involved by trying to provide so that the education can take place. Middle class parents can provide a home background that is better able to facilitate and support learning in the school.

In the earlier years of the child's life, the middle class home provides more activities that stimulate cognitive growth and development the skills acquired in these early years better facilitates access to the school curriculum.

Parents want their children to have an education in mathematics and science because they believe that this would allow them to access many opportunities that they were denied. However parents cannot assist their children with the mathematics and science learning and look to the school to provide the quality inputs and knowledge to access these disciplines.

Working class parents recognize the importance of the FET colleges to provide skills which would allow them to readily and easily access work opportunities and thus an income for the family. While we (researchers, policymakers etc) want to facilitate the growth of scientific and technical knowledge for long term gains, the need of the family is to ensure immediate employment and income to the family.

CHAPTER FIVE
STUDENTS PERCEPTIONS OF PARENTAL INVOLVEMENT IN THEIR EDUCATION

To determine students perceptions of parental involvement in their education, we administered questionnaires to students at the grade 9, 12 and first year tertiary level. In addition to administering questionnaires we interviewed grade 3 students to determine their perceptions of parental involvement. This chapter reports on the findings from the surveys and interviews. The list of places where the questionnaire was administered and the interviews conducted is provided in Appendix B.

We need to understand the involvement of parents in their children's' education in a more nuanced way. In this chapter, we describe the parental involvement in the following categories:

- students that participated in the study;
- parents of the students;
- direct involvement (payment of school fees, attendance of meetings; involvement in homework, communicating with school, providing extra tuition) of parents in school;
- indirect involvement (creating an environment for learning, aspirations and expectations, link math and science to everyday life) of parents in school;
- involvement of parents in mathematics and science;
- career choices of students;
- assistance students would like from parents and
- provide a summary of the findings.

2. The Students that Participated in the Study

This section provides information about the students who participated in the study. We did not follow a systematic random sampling approach but tried to choose schools that reflected the different South African realities. The descriptions allow one to indicate the extent one could 'generalise' the findings to the South African population.

1.1. Characteristics of the grade 3, 9, 12 participants

In sampling students to participate in the study we chose schools to reflect the demographic and socio-economic profile in South Africa. Table 1 indicates the characteristics of the students at the grade 3, 9, 12 and tertiary level that participated in this study.

Table 1: Characteristics of the grade 3, 9, 12 participants

	Grade 3	Grade 9	Grade 12	Tertiary
Number of students participating	124	950	610	157
% of students from each province	24% KZN 43% EC 32% GP	39%KZN 39% EC 22% GP	39% KZN 39% EC 22% GP	39% KZN 23% EC 38% GP
No. of schools/institutions from which data was collected	12 schools	28 schools	44 schools	4 Eng and science faculties
Gender of participants	50% female 50% male	57% Female 42% Male	63% Female 37% Male	48% Female 50% Male
Racial profile of participants		72%African 10%Indian 12% White 4% Coloured.	76%African 10%Indian 10% White 3% Coloured	84% African, 5% Indian 6% white 3% Coloured

This profile indicates that the findings would be illuminative of the South African population.

1.2. Home language

Participants in the study were asked to indicate their home language. The home language of the majority of the grade 9 and 12 students and tertiary students from each of the provinces is provided in Table 2.

Table 2: Home language of the students

	Eastern Cape	KwaZuluNatal	Gauteng	TOTAL
Afrikaans				
Grade 9	7.5	-	2.5	3.5
Grade 12	10.4	2.2	2.6	5.1
Tertiary*		-	-	1.9
English				
Grade 9	11.8	43.1	15.7	25
Grade 12	12.9	41.3	12.2	21
Tertiary	-	-	-	18
isiZulu				
Grade 9	9.1	51.5	29.4	30
Grade12	9	51.4	25	27.4
Tertiary	-	-	-	22
Sesotho				
Grade 9	27.8	2.7	30	17.4
Grade 12	11.9	1	31	16
Tertiary	-	-	-	15
Setswana				
Grade 9	2.1	0.5	17.6	4.6
Grade 12	0.5	0	5.2	2.1
Tertiary	-	-	-	3.1
isiXhosa				
Grade 9	38.8	1.3	1	16
Grade 12	52	1.1	6.6	20
Tertiary	-	-	-	26

* We did not have provincial figures for tertiary students

The overall figures are fairly reflective of the South African demographics. KwaZuluNatal has a higher percentage of students whose home language is English, indicating a slight bias to more affluent households in KwaZuluNatal.

1.3. Higher or standard grade participation

This study relates to participation, performance and career choices related to mathematics and science. We wanted to know about the grade level at which students studied the subject – higher grade participation in mathematics will facilitate entry to higher education institutions and science and technology careers. Table 3 provides an indication of the grade level that grade 12 and tertiary students who studied mathematics, physical science, biology and English.

Table 3: Mathematics HG and SG participation

	HG (%)	SG (%)	Do not take / no response
Mathematics			
Grade 12	33	61	6
Tertiary	51	44	6
Physical Science			
Grade 12	41	38	21
Tertiary	58	33	5
Biology			
Grade 12	42	38	20
Tertiary	61	23	16
English			
Grade 12	93	5.4	1
Tertiary	85	7.5	8

At the grade 12 level, we selected students for the sample from those who were enrolled for mathematics and science and at the at the tertiary level we had selected science and engineering students – therefore these figures are not a reflection of the cohorts of grade. At the grade 12 level, one third of the students are studying mathematics at the higher grade. A surprise statistic though is that only half the tertiary students (in science and engineering faculties), who are studying either science or engineering had studied mathematics at the higher grade in grade 12. One would have assumed that they would have needed to have passed mathematics on the higher grade for access to the tertiary institutions.

The provincial breakdown at the grade 12 level is indicated in Table 4.

Table 4: Mathematics HG and SG participation by province

	Gauteng			Eastern Cape			Kwa-Zulu Natal		
	HG%	SG%	Miss%	HG%	SG%	Miss%	HG%	SG%	Miss%
Math	33	63	4	26	61	13	40	59	1
Phy Sc	44	51	5	28	34	38	53	27	18
Biology	39	49	12	32	35	33	58	27	16
English	95	4	1	96	2	2	88	11	0.6

At the provincial level, 40% of the students from KwaZuluNatal; 33% of the students from Gauteng and 26% from the Eastern Cape took mathematics at the higher grade.

3. Description of Parents

2.1. Head of household

In order to gain some information about the makeup of the household, students were asked to indicate who the head of their household is.

Table 5: Head of the Household, by province

	Grade 9				Grade 12			
	GP	EC	KZN	Total	GP	EC	KZN	Total
Parents/ Mother/ Father	4.5 44 27	2.9 40 39	22.1 34 30	11 33 39	14.4 42 25	4.0 41 34	15.6 38 35	11 31 40
Grand Mother	15	9.1	5.7	9	6.1	5.5	2.2	4.8
Grand Father	1.5	1.9	1.3	1.6	3.5	3.0	2.2	3.0
Aunt	4.0	5.6	2.7	4.1	2.6	6.0	2.8	3.8
Uncle	1.0	-	0.5	1.5	1.0	1.0	2.2	1.3
Brother/sister	2.5	0.8	1.6	1.2	2.0	2.0	0.6	1.5

Just over 80% of grade 9, 12 and tertiary students indicated that the head of the household was one or both the parents and the other 20% indicating that this would be a grandparent, aunt or uncle or a sibling. About one third of the participants indicated that the mother was the head of the household and around 5% indicated that the grandmother was the head of the household. This response would imply that at least 40% of households are female headed. These figures seem to be in line with the national population as reflected in the General Household Survey data and the Census data. According to Stats SA (2001), 57% of households are headed by males while 43% are headed by females

Grade 3 students who were interviewed indicated that in most cases the household was headed by the mother or grandmother – this was especially so in the Eastern Cape where parents had gone to either to Cape Town or Durban to find a job. Students who attended ex-DET schools indicated that they lived in extended families – mother, siblings, grandmother, grandfather, cousins, uncle or aunt. Students who attended ex-Model C schools reported that the people living at home were generally mother, father and siblings – that is a nuclear family set up.

2.2. *Educational level of the parents*

Home background provides an insight into students' social and economic capital. Students from homes with extensive educational resources generally have more advantages and perform better in school than students from less advantaged backgrounds. One of the variables is parental education. Parents are important educators in the lives of the children and may be an important educational resource in the home. Students were asked to indicate the highest level of education attained by their parents. The highest educational level of the parents is indicated in Table 6.

Table 6: Educational level of parents

	FATHER	MOTHER
No Education		
Grade 9	3	4
Grade 12	4	5
Tertiary	3	7
Some Primary		
Grade 9	7	8
Grade 12	8	9
Tertiary	7	6
Completed Primary		
Grade 9	3	4
Grade 12	4	5
Tertiary	4	3
Some Secondary		
Grade 9	12	18
Grade 12	15	22
Tertiary	10	14
Completed Matric		
Grade 9	19	22
Grade 12	15	21
Tertiary	19	25
Completed Studies After Matric		
Grade 9	29	26
Grade 12	28	27
Tertiary	29	30
Don't Know/no response		
Grade 9	26	17
Grade 12	13	7
Tertiary	18	14

Students generally have difficulty answering the question about parents' education level and there is a high 'no response' rate. The general profile about the parents level of education is that around 4% had no education, around 10% had some primary education, about 30% of fathers and 40% of mothers had secondary education (20% of fathers and

20% of mothers had completed matric) and around 30% of both mothers and fathers had completed some studies after matric. These figures seem to be different from the national population as elicited by the 1996 Census. "The census revealed a total of 9 059 571 heads of household, of whom about three-fifths (62%) were men. In terms of educational qualifications, close on a quarter (24%) of heads had no formal education, 17% had not completed primary schooling, a further 38% had not completed secondary schooling, 12% had attained matric and the remaining 8% had a qualification higher than matric". (Stats SA, 2001).

2.3. Parents employment

Students had to indicate whether the parents/ guardian were in employment at the moment. The response is indicated in Table 7.

Table 7: Parents employment, by percentage

	FATHER				MOTHER			
	GP	EC	KZN	Total	GP	EC	KZN	Total
Yes								
Grade 9	55	60	72.2	64%	59.3	51.3	56	55%
Grade 12	56	52	69	58%	53	48.3	53.1	52%
Tertiary*				45%				51%
No								
Grade 9	19	22.5	19	20%	22	33.4	33.2	31%
Grade 12	20.1	22.5	16.2	20%	40.4	29	40.2	37%
Tertiary				25%				25%
No response								
Grade 9	9	17.7	8.7	14.6%	19.2	15.2	11	13.9%
Grade 12	24	25.5	15.1	22%	6.6	23	6.7	12%

* it is more meaningful to report on statistics for the whole group.

About 55% of the fathers and 50% of the mothers are working. It would seem that close to half the parents may not be working. The patterns are different for the students from different social classes – as indicated by the proxy of school type. About 90% of grade 9 students from ex-HoA schools and 53% of Grade 9 students from DET schools indicated that their fathers were working. About 82 % of students from ex HoA schools and 42% of students from DET schools indicated that their mothers were working. About 90% of grade 12 students from ex-HoA schools and 45% from DET schools indicated that their fathers were working. About 75 % of students from ex HoA schools and 53% of students

from DET schools indicated that their mothers were working. Grade 3 students also indicated that one or both the parents were working and type of work varies.

Of the students who indicated that their parents were working, the response of the type of jobs that parents are involved in range from low earning jobs (e.g. domestic worker) to professionals to high earning jobs. Students in Mdantsane Township in Eastern Cape reported that their parents left home very early and had to take two or three taxis to get to their place of work (mostly near East London) and similarly two or three taxis to get back home. This meant that parents spent long times away from the home and impacts on the type of involvement they could have with their children's school activities.

About half the grade 9 parents and 40% of grade 12 parents who are working discuss their work with the family. Most of the discussion is around the activities of the work and about half of the parents indicated that they like their jobs. The impression that students have of parents job is that work is positive – and that applies to all types of jobs – whether domestic work or labourer or teacher or lawyer. At the tertiary level there was a 65% 'no response' for fathers and 58% 'no response' for mothers to this question – again those that responded indicated that the parents talked about the activities of their work.

4. Parental Involvement in School

Parents could be involved both directly and indirectly in aspects of their children's education and learning. This section will describe the direct and indirect involvement of parents.

Activities related to direct involvement are:

(i) payment of school and university fees,
(ii) discussion about what happens in school,
(iii) parents visiting the school,
(iv) involvement in homework and projects,
(v) extra tuition and visits to science centres,
(vi) buys books and stationary,
(vii) checks report card,
(viii) discusses the news items and books and
(ix) discusses possible career paths.

Activities related to indirect involvement are:

(i) links school and everyday practices,

(ii) home environment for learning and

(iii) discusses the importance of education.

3.1. Direct involvement

(i) Payment of school and university fees

Students attending different school types pay different fees. About two thirds of grade 9 students and half of grade 12 students pay less than R200 a year in school fees; 0.4% grade 9 students and 19% grade 12 students pay between R200- R500 a year; 11.2 % of grade 9 and 7% grade 12 students pay between R500 - R1000 a year and around a quarter of students pay greater than R10 000 a year. This range of school fees indicates that we had sampled students from different socio-economic groupings. Appendix D provides detailed information about the school and university fees.

Three quarters of the grade 9 and 12 students and 80% of tertiary students indicated that their parents paid their school fees. 8% of grade 9 and 12 students and 4% of tertiary students indicated that the fees were paid by grandparents, 4% was paid by aunt/uncle, 2.5% was paid by brother/sister, 1% of students were on bursaries and 0.5% of students paid their school fees themselves.

Students indicated different payments for their university fees. University fees ranged from an amount less than R5000 to over R30 000 (these would include residential fees). About 30% of students indicated that they paid less than R5000 a year, around 16% paid fees in each of the ranges of R5000-R10 000, R10 000- R15 000 and R15 000 – R20 000. 41% of students indicated that a parent(s) pay for university fees, 23% indicated financial assistance schemes as the source of finance and 21% indicated a bursary/scholarship as the source of finance.

(ii) Discussions about what happens in school

Between 50-60% of students from the different grade levels discuss what happens at school with their parents: around 10% discuss with parents, 40% with mother and 5% with father. In addition to discussing their work with parents, students also discuss their

work with other family members: between 15-20% discuss what happens at school with their siblings (with more students discussing what happens with sisters than with brothers). At the grade 3 level students, from poorer homes where parents are working, would have discussions with older siblings or grandmother or neighbours. This data suggests that the mother/ sister/ grandmother (i.e. females in the home) play the greater role in interaction with students about what happens in schools.

(iii) Parents visiting school

Between 60-70% of the students indicated that their parents had visited the school at some time. The frequency of visits varied and the nature of visits in the different school types also varied. The frequency of the visits of students from different school types is provided in Table 8.

Table 8: Frequency of visits (in percentage) by parents to school

	Grade 9				Grade 12			
	Ex HoA	Ex DET	Ex HoD	Total	Ex HoA	Ex DET	Ex HoD	Total
Never	9	27	20	22	10	21	11	17
Once a year	11	18	44	18	20	16	22	17
Twice a year	14	7	8	9	15	10	20	12
3 times a year	11	5	4	7	10	9	13	9
4 times a year	29	21	16	23	31	27	17	27
Don't Know	26	17	6	19	13	14	15	14

Just below half the grade 9 and grade 12 students indicated that their parents/guardians attended a School Governing body meeting during the year. 63% of parents of tertiary students attended the school governing body meeting (it could be that these students went to higher fee paying schools and therefore there would have been a greater involvement in studies).

At the end of grade 9 students had to make curriculum choices for their grade 10 classes. 58% of the grade 9 students indicated that the school had invited their parents/ guardians to a meeting to discuss the new curriculum (FET-OBE curriculum which was introduced in 2006). 42% of students indicated that parents had attended these meetings – i.e. three quarters of the parents who were invited to the parents meeting did attend. The pattern of school invitation and attendance to these meetings was different in the ex HoA and DET schools. 86% of students in ex HoA schools indicated that their parents had been invited

to a meeting to discuss the curriculum choices and 60% of students indicated that their parents had attended these meeting. Half the students in DET schools indicated that their parents had been invited to a meeting to discuss the curriculum choices and 38 % of parents had attended these meeting.

At the end of grade 12 students would have to make career choices for the following year. We asked students whether the school had invited parents to a meeting to provide information about career choices post school. Just over 40% of grade 12 and tertiary students indicated that the school had invited parents to such a meeting and around 35% of students indicated that their parents had attended. The responses both students from both the ex HoA and DET groups were similar.

About 10% of grade 9 and 12 students indicated that either their mother or father 'often' spoke to the teacher about progress in school and about 20% indicated that they 'sometimes' spoke to teachers. A higher percentage of tertiary students indicated that their parents spoke to teachers. The patterns for the mother of grade 9 students from both the ex HoA and DET schools was similar.

*(iv) **Parental involvement in homework***

We asked students about whether parents asked about homework and if they helped with homework. The responses indicated that about twice the percentage of mothers than fathers asked about homework – this was around 40% of mothers who 'often' asked and 20% of fathers that 'often' asked. There is a consistency in this pattern for the grade 9, 12 and tertiary respondents in the study.

While 40% of mothers and 20% of fathers 'often' asked about homework, the percentage of parents that helped with homework decreased appreciably. Just less than 20% of parents helped with homework at the grade 9 level and this drops to around 9% at the grade 12 level. This is understandable given that at the higher grade levels the knowledge is more formal.

The pattern of responses for mothers of grade 9 students in the different school types is different. 68% of students in ex HoA schools and 27% of students in DET schools asked about homework. However, 21% of students in ex HoA schools and 15 % of students in ex DET schools indicated that mothers helped with homework.

As with involvement in homework, about 20% of grade 9 parents and 10% of grade 12 parents 'often' and 40% of grade 9 parents and 20% of grade 12 parents 'sometimes' help with the school projects. Mothers assisted more often than fathers. The pattern of assistance is different for students in different school types: 32% of grade 9 students in ex HoA schools and 16% of grade 9 students in DET schools indicated that their mothers 'often' helped with school projects.

(v) Attending extra classes and visits to science centres

There are many extra school activities offered which can enhance learning. If students have the finances they can access these activities. We asked students about whether they attended extra classes in mathematics and whether they visited science centres.

13% of grade 9 students, 28% of grade 12 students and 28% of tertiary students indicated that their mothers 'often' sent them for extra classes. Understandably about twice the numbers of grade 12 students than grade 9 students went for extra classes in math. At the grade 9 level, 16% of students from ex HoA schools and 13% of students from DET schools indicated that their mothers sent them for extra classes.

The number of students who visited science centre at all levels (grade 9, 12 and tertiary) was low at around 6%. There was a similar pattern for students from ex HoA and DET schools.

(vi) Buys books and other stationary

Around 65% of grade 9, 12 and tertiary level students indicated that their mothers 'often' bought books and other stationary. The corresponding figure for fathers was around 40%. 90% of grade 9 students from the ex HoA schools and 52% of students from DET schools indicated that their mothers bought the books and stationary.

(vii) Checks report card

Around 70% of mothers and 45% of fathers of students from each of the grades checked the report cards. At the grade 9 level, 92% of students from ex HoA schools and 62% of students from DET schools indicated that their mothers checked their report cards.

(viii) Discussion of news and books

About a quarter of students at the different levels indicated that parents 'often' and one third indicated that parents 'sometimes' discussed items in the news with them. About

15% of students indicated that their parents 'often' discussed books with them. The analysis shows higher rates of students who reported that their mothers discuss news and books, with around 63% of students discussing with mothers compared with around 45% who discuss with fathers. More females than male students were actually discussing the news with both parents. Around 65% of female students were discussing the news with their mothers, while on the other hand, around 45% of students were discussing the news with their fathers. A higher percentage of grade 9 students from ex- HoA schools than DET schools indicated that their mothers discussed the news with them.

(ix) Discussion of career paths

About half the grade 12 students indicated that their mothers 'often' discussed possible career paths with them and a quarter of indicated that this happened 'sometimes'. About one third of fathers discussed this 'often' and 15% 'sometimes'.

3.2. Indirect involvement

(i). Link school and everyday practices

Parents very seldom link what happens in school to everyday practices or links school activities to traditional practices. Around 15% of students at the different grade levels indicated that this is done 'often' and around 30% of grade 9 students say it is done 'sometimes' and this drops to around 20% at the grade 12 and tertiary levels. The patterns are similar at both ex HoA and DET schools. Interestingly, the analysis shows that mothers tend to link everyday and traditional practices more than fathers. About 52% for grade 9 and 47% for grade 12 mothers were reported to be linking everyday and traditional practices compared to 40% of grade 9 and 32% of grade 12 students reported to have their fathers linking the everyday and traditional practice. About 30% of students indicated that they have had discussions with parents about traditional medicines.

(ii). Home environment for learning

Most students indicated that the home environment was conducive to learning: over 85% of grade 9 and 12 students indicated that there were books, magazines and newspapers in the home. One third of students indicated that they had a computer at home and around 60% of students indicated they had a quiet place to study.

(iii). Talks about importance of education

Around 55% of students indicated that parents talked to them 'often' and 20% 'sometimes' about the importance of education. Mothers provided more of this encouragement. Grade 3 students indicated that their parents asked them about their work. There is a difference in the involvement for different class groups.

Middle class parents discussed nature programmes on TV or took their children to science excursions or to museums. In working class/ poorer homes there was discussion about school (asking how school was) but there weren't other inputs to complement what was happening in school.

5. Parental Involvement in Mathematics And Science

4.1. Direct involvement

Assistance with mathematics and science homework

Students were asked about whether their parents assisted them with mathematics and science homework. One quarter of grade 9 students, half of grade 12 students and one third of tertiary students indicated that they did their homework on their own. About 30% of grade 9 students, 14% of grade 12 and tertiary students indicated that one of the parents (with equal numbers of mother and fathers) assisted them with their homework. 30% of grade 9 students and 19% of grade 12 students indicated that siblings (about same number of boys and girls) assisted with the homework. 18% of tertiary students asked friends to assist with their homework.

4.2. Indirect involvement

Parents perceptions of the importance of mathematics and science

Students were asked to rate their perceptions of their parents rating of mathematics and science. For a full description of parents perceptions see Appendix E.

The perceptions of parents views towards science are positive. However one must recognize that these could be socially desirable answers. An analysis of responses of grade 9, 12 and tertiary level students indicate that:

- Parents consider mathematics and science an important subject.

- Parents encouraged students to take math and science (at the grade 12 and tertiary level these are students who are already studying mathematics and science).
- Parents encouraged students to get good marks in math and science.
- Parents would like students to select courses in mathematics and science at the post school level.
- Students from the ex HoA schools indicated that parents had a 'strongly positive' attitude and students from DET schools a 'positive' attitude to math and science.

5. Career and Curriculum Choices

5.1. Parental Involvement in Math and Science Curriculum Choices

Grade 9 and 12 students had to reflect on the involvement of different individuals on their choice of mathematics and science as school subjects for the grade 10-12 period. Grade 9 students had to indicate who will assist them with the choice and grade 12 students had to indicate how the choices are made. For the full response set refer to Appendix E.

Analysis of student responses indicates that two thirds of students made their own choices about mathematics and science, but they were assisted by parents. Less than 10% of the students indicated that they took the subjects that their friends were taking. 30% of students indicated that teachers decided on the subjects they should take and 56% of students indicated that they would have like teachers to allow them to make their own choices (this may be a reference to the choice of higher and standard grade).

Tertiary level students were asked about the involvement of parents/ guardians in the choice of a degree. There was a 'no response' from about 15% of the students on this set of questions. For full set of responses please refer to Appendix E.

About half the students indicated that parents encouraged them to choose this degree and about two-thirds of parents had discussions with them about their career choices. About 40% of parents found out about university degrees and about half the parents told their children about different universities. About 70% of tertiary students indicated that their parents showed confidence in academic abilities. 84% of the group of tertiary students is African so it is not meaningful to disaggregate statistics.

5.2. Career aspirations

Grade 9 students will go into grade 10 in 2006 and all students have to take either mathematics or mathematical literacy. When the questionnaire was administered in October 2005, it seemed that many students did not know about the curriculum choices that the school would be offering the following year. It also seems that many students and parents desired mathematics rather than mathematical literacy. Three quarters of grade 9 students indicated that their parents would like them to study mathematics rather than mathematical literacy at the grade 10 level. Of the grade 9 students surveyed 25% indicated that they would take mathematical literacy and 66% indicated that they will take mathematics (8% no response). Anecdotal evidence suggests that in schools there are more students, in grade 10, doing mathematical literacy than mathematics – say one class of mathematics and 4 classes of mathematical literacy. Teachers say that the students cannot cope with mathematics (Where does the problem lie? Students cannot cope or they are not being taught the appropriate knowledge and skills at the lower levels of the system).

Grade 12 students were asked what they would like to do post grade 12 – about half indicated that they would like to go to university and a quarter would like to go to a technikon and 8% indicated that they would like to go out to work. Students have high aspirations. For those students who indicated that they would be studying after grade 12, there was an approximately equal amount of students (38%) who indicated that their parents would fund any tertiary studies or that they would have to obtain a student assistance loan. 11% of students indicated that they would have to work to fund their own tertiary studies.

All parents also have high aspirations for their children: two thirds of grade 12 students indicated that their parents would like them to continue with some form of studies post-matric.

5.3. Career intentions of students

Students were given an open–ended question to ask the jobs/ careers that they would like to follow. The open –ended responses were aggregated into the following categories.

Table 9: Career intentions of students

	Grade 9	Grade 12	1st year tertiary
Doctor/health profession/ pharmacy	22	17	4
Engineer/ Scientist	16	34	6
CA/Business manager	15	4	3
Policeman/Soldier/law enforcement	5	2	4
Social worker	4	1	7
Lawyer	4	2	10
Journalism/TV	4	5	
Pilot	4	1	20
Teacher	2	1	8
Fashion design			6
No response	12	10	19

* grade 12 students who completed the questionnaires were the math and science students.

For grade 9 students, the most popular choice was a health related profession, followed by being a scientist/ engineer or following a business career. For grade 12 students one third indicated that they wanted to be a scientist or engineer and 17% wanted a health related profession.

The surprising response was from first year tertiary students indicating the careers they would like to pursue now that they are pursuing science and engineering studies. Very few respondents indicated a science based career.

Grade 3 students were asked about what they wanted to do after finishing school. The most popular choices were doctor ('I want to help others'), policeman/woman or soldier ('I could have a gun or take away guns'), church work ('I could go straight to heaven or get a church-house'), teacher or social worker ('I can help others'). The choices of most 9 year olds seem to be about helping professions.

In addition to what they wanted to do, grade 3 students were asked about the people that they admire. They admire TV stars (like Karabo from Generations because she is a successful woman), musicians and soccer stars. The media people play a very big part for who are their role models.

Students were also asked to indicate the reasons for following that career. The following table indicates their reasons for choosing particular careers.

Table 10: Reasons for choice of careers

	Grade 9	Grade 12	Tertiary
I would like to help people	28	17	9
I enjoy this type of work/ career is interesting	32	57	41
Skills suited to this type of job	8		6
Career would pay well	8	5	9
Please family members	4	2	6
Shortage of skills/more employment opportunities	3	6	3
No response	17	13	25

It is heartening to note that most students choose a particular career because they enjoy this type of work and would like to help people.

5.4. Information about careers

Students were asked, in an open ended question, where they got information about careers. Their responses are indicated in Table 11.

Table 11: Information sources about careers

	Grade 9	Grade 12
Media (newspaper, internet, magazine, TV, books)	29	17
School	12	24
Family members	39	13
Friends	3	2
Community	3	3
Career exhibition		5
Brochures from tertiary institutions		18
Visits to work sites		3
No response	19	12

For grade 9 students, family members, media and school were the main sources where they obtained their information from. Grade 12 students obtained information mostly from school, media, brochures from tertiary institutions and family members.

Students were provided a set of options and asked to indicate who had influenced their career choices.

Table 12: Who influenced career choices?

	Grade 9	Grade 12	Tertiary
Mother/female guardian	33	20	16
Father/Male Guardian	12	7	13
Teachers	7	6	8
Friends	2	2	4
Media (e.g. TV, newspaper magazines)	14	17	10
Someone in my community	3	5	
No one	19	24	25
No response	10	17	18

The most important influence for the career choice, at all levels, seems to be from mother or a female guardian.

5.5. Schools and parent support in choosing a career

Tertiary students were asked about the type of support they received from school and parents in choosing their careers. Grade 12 students were asked about the helpfulness of parents in providing information to make career decisions. The percentage of students that agreed with the statements is provided in the following table.

Table 13: Helpfulness in making career decisions

	Tertiary students about school	Tertiary students about parent	Grade 12 students about parent
provided me with a list of different universities in the country	62	40	33
arranged visits to Universities	45	25	23
encouraged me to take an aptitude test	38	37	24
had discussions with me about different degrees offered at University	60	47	33
arranged events such as Career Day/Night for Parents/Guardians and students	46	-	-
invited Professional Scientists to school/ encouraged me to speak to professional scientist	60	55	28
provided / encouraged me with a career counseling	56	51	31
Made enquiries at university about admission	-	-	31

* In each of the categories there was a 'no response' to each item of around 12 -16%.

It seems that the schools offered more inputs than parents for students to make the career decisions.

6. Assistance Students would like from Parents

The kind of assistance that students wanted from their parents was to send them to extra tuition (14%) or provide resources for stationary etc (15%). Most students thought that parents could not get directly involved in their school work and "they should not be involved".

The kinds of assistance that tertiary level students would like from their parents at university: emotional support and good home environment (40%), financial support (25%).

7. Summary

7.1. Generalisability about parents from data

We administered questionnaires to 950 grade 9 students, 610 grade 12 students and 157 tertiary students. In addition we conducted focus group interviews with 124 grade 3 students. These respondents came from three provinces: Eastern Cape, KwaZuluNatal and Gauteng and were chosen to represent the different socio-economic realities of South Africa. The analysis of student characteristics indicates that this is a fair sample to provide a generalization for the country.

7.2. Description of parents

Just over 80% of the students indicated that the head of the household was one or both the parents and for about 8% of the households it was a grandparent. At least 40% of households are female headed.

The educational profile of parents is 4% had no education, just under 10% had some primary education, around 30% of fathers and 40% of mothers had secondary education (20% of fathers and 20% of mothers had completed matric) and around 30% of both mothers and fathers had completed after matric. This education level of this group seems to be higher than that noted in Census 1996.

About 55% of the fathers and 50% of the mothers are working. It would seem that close to half the parents may not be working. The patterns are different for the students from different social classes – as indicated by the proxy of school type. About 90% of students from ex-HoA schools and 50% from DET schools indicated that their fathers were working. Around 80 % of students from ex HoA schools and 45% from DET schools indicated that their mothers were working.

Of the students who indicated that their parents were working, the response of the type of jobs that parents are involved in range from low earning jobs (e.g. domestic worker) to professionals to high earning jobs.

7.3. Parental involvement in schools

We have characterized involvement as direct or indirect involvement. The activities related to direct involvement are:

(i) payment of school and university fees: about three quarters of students have their school fees paid by one of their parents and around 15% paid either by a

grandparent, aunt or uncle or brother or sister. With regard to university fees, 41% of students indicated that a parent(s) pay for university fees, 23% indicated they were on financial assistance schemes and 21% indicated a bursary/scholarship as the source of finance.

(ii) discussion about what happens in school: between 50-60% of students discuss what happens at school with their parents: around 10% discuss with grandparents and between 15-20% with their siblings. This data suggests that the mother/ sister/ grandmother (i.e. females in the home) play the greater role in interaction with students about what happens in schools.

(iii) parents visiting the school: between 60-70% of the students indicated that their parents had visited the school at some time. The visits were for the purpose of SGB meetings, discussion of the new curriculum and curriculum and career choices. The patterns of attendance are different for ex HoA and DET groups.

(iv) involvement in homework and projects: around 40% of mothers and 20% of fathers 'often' asked about homework.. Just less than 20% of parents helped with homework at the grade 9 level and this drops to around 9% at the grade 12 level.

(v) extra tuition and visits to science centres: About a quarter of grade 12 and tertiary students and 13% of grade 9 students indicated that their mothers 'often' sent them for extra classes. At the grade 9 level, 16% of students from ex HoA schools and 13% of students from DET schools indicated that their mothers sent them for extra classes. The number of students who visited science centre at all levels (grade 9, 12 and tertiary) was low at around 6%.

(vi) buys books and stationary: two-thirds of students indicated that their mothers 'often' bought books and other stationary. 90% of grade 9 students from the ex HoA schools and 52% of students from DET schools indicated that their mothers bought the books and stationary.

(vii) checks report card: around 70% of mothers and 45% of fathers checked the report cards. At the grade 9 level, 92% of students from ex HoA schools and 62% of students from DET schools indicated that their mothers checked their report cards.

(viii) discusses the news items and books: about a quarter of students indicated that parents 'often' and one third indicated that parents 'sometimes' discussed items in the news with them.

(ix) discusses possible career paths: about half the grade 12 students indicated that their mothers 'often' discussed possible career paths.

(x) assistance with mathematics and science homework: Most learners did their mathematics and science homework on their own, a small percentage were assisted by parents and about a quarter were assisted by siblings.

(xi) In general, parents, especially mothers, are involved with what happens in school. Parents are more involved in grade 3 and their involvement decreases at grade 9 and 12. The responses show a stability of responses among the three groups: grade 9 students, grade 12 students and first year tertiary students responded in a similar manner about their senior years in school.

The activities related to indirect involvement are:

ii. links school and everyday practices: parents very seldom link what happens in school to everyday practices or links school activities to traditional practices. In order for links to be made one would need knowledge about and familiarity with both domains.

iii. home environment for learning: most students indicated that the home environment was conducive to learning.

iv. discusses the importance of education: Around 55% of students indicated that parents talked to them 'often' and 20% 'sometimes' about the importance of education. Mothers provided more of this encouragement.

v. the parents views towards science are positive.

7.4. Parental involvement in math and science curriculum choices

Two thirds of students made their own choices about mathematics and science, but they were assisted by parents. Less than 10% of the students indicated that they took the subjects that their friends were taking. 30% of students indicated that teachers decided on

the subjects they should take and 56% of students indicated that they would have like teachers to allow them to make their own choices.

About half the students indicated that parents encouraged them to choose this degree and about two- thirds of parents had discussions with them about their career choices.

7.5. Career choices

Career aspirations

In 2006 all grade 10 learners had to take either mathematics or mathematical literacy. When the questionnaire was administered in October 2005, it seemed that many students did not know about the curriculum choices that the school would be offering the following year. It also seems that many students and parents desired mathematics rather than mathematical literacy. Yet anecdotal evidence indicates that in 2006 more students were registered for mathematical literacy rather than mathematics.

Grade 12 students indicated that their post-grade 12 plans were: to go to university (50%), technikon (25%) or work (8%).

Career intentions of students

For grade 9 students, the most popular choice was a health related profession (22%), followed by being a scientist/ engineer (16%) or following a business career (15%). For grade 12 students one third indicated that they wanted to be a scientist or engineer and 17% wanted a health related profession. The surprising response was from first year tertiary students, who are registered for science and engineering degrees, but indicated non-science related careers when they completed their studies.

Information sources about careers

For grade 9 students, family members, media and school were the main sources where they obtained their information from. Grade 12 students obtained information mostly from school, media, brochures from tertiary institutions and family members.

Who influenced career choices?

The most important influence for the career choice, at all levels, seems to be from mother or a female guardian.

CHAPTER SIX

SURVEY OF PROJECTS THAT OFFER SUPPORT TO PARENTS

1. Introduction

One of the objectives in the Department of Science and Technology Terms of Reference for this study is:

> scope the existence in South Africa, of intervention programmes that promote parental involvement in mathematics and science education.

A conventional analysis of the field with respect to the above objectives would suggest that there very few programmes that promote parental involvement in mathematics and science education. We decided to adopt a broader approach to this question and consider firstly, the educational policies which ensure that there are mechanisms to involve parents in the school education. Secondly we decided to include in the scoping exercise, projects that involve parents with regard to school governance and thirdly we looked at projects that promote parental involvement in mathematics and science education. The South African Schools Act (SASA) makes provision for the involvement of parents in the SGB and the OBE curriculum is underpinned by the understanding that there is a parent-school partnership for learners to achieve the specified outcomes. The newly introduced initiative of the Department of Education in relation to 'no fees' schools can be viewed as a programme to assist parents access an education for their children. In addition there are some programmes and projects which seek to work with parents and promote issues related to the governance of education.

2. Initiatives from Government

2.1. The South African Schools Act and School Governing Bodies and Roles and Responsibilities of Parents

The South African Schools Act No 84 off 1996 makes provision for the involvement of parents in the governance of a school. The structure through which parents participate in a school is the SGB. The SGB, made up of key stakeholders (parents, educators and non-educator staff with parents forming the majority on the SGB), embodies the community level partnership for ensuring a quality education.

The basic functions of all SGB's (and hence parents) are set out in Section 20 of SASA, which includes the right and duty to -

- promote the best interests of the school and strive to ensure its development through the provision of quality education for all learners at the school;
- develop the mission statement of the school;
- adopt a code of conduct for learners at the school;
- support the principal, educators and other staff of the school in the performance of their professional functions;
- administer and control the school's property, and buildings and grounds occupied by the school, including school hostels, if applicable;
- recommend to the Head of Department the appointment of educators and non-educator staff at the school;
- employ educators and non-educators at the school.

While there is every intention of the democratic decision making in a school involving the parents, the reality is that the involvement of parents in the governance of schools is uneven. The mechanism and format for the participation in SGBs is better suited to middle class families than working class families.

In addition to SASA outlining the role of parents in SGBs the Department of Education has published a document entitled the *Rights and Responsibilities of Parents - A Public School Policy Guide.* This policy document outlines information to parents relating to:

- Admission of Your Child to a School;
- School Fees; Governance;
- Language of Learning and Teaching and
- Responsibilities as a Parent.

The document outlines the responsibility of parents towards supporting the learning process of a child. The information provided to parents include:

- make sure that your child attends school regularly;
- assist with the discipline of your child;
- assist the school in promoting a culture of mutual respect and tolerance;

- monitor your child's educational progress;
- ensure that she/he completes her/his homework;
- liaise with the school staff; and
- respond to school notices calling for responses

While all this information is available (on Internet and hard copies), in our interviews with parents they did not indicate that they knew of their rights in schools or that they had received such information. Like many other sectors of policy development and dissemination, while very good policies have been developed these have not necessarily passed to the parents.

2.2. 'No Fee' Schools

Because of the low income levels of many households in the country, the Education Laws Amendment Act 24 of 2005 allows the Minister to identify schools where learners would be exempt from paying fees. It is expected that around 20% of the country's 27 000 public schools will be declared 'no fee' schools. So far seven provinces have identified 'no fee' schools and this total around 7000. When a school is declared 'no fee' school the state then provides a subsidy of R527 per learner per year. The declaration of 'no fee' schools could increase access to schools and education and relieves parents of the responsibility of payment of fees.

2.3. Parents Role in Outcomes Based Education

The Outcomes Based Education includes a principle of the partnership between the school, home and learner. Underlying the design of the educational activities is that parents will assist learners in the home with projects and homework. However it is found that this principle works better in middle class environments where parents can and do get involved in the school work and projects of their children. In fact this involvement has served to further widen the gap between learners from working class homes and learners from homes with more financial resources by say a child from a middle class environment having access to the Internet for information, having the financial resources to buy materials for projects, ensuring that the project is typed and printed on 'good' paper.

3. Initiatives from non-government organisations

3.1. Education Rights Project

The Education Rights Project (ERP) was established in February 2002 as a joint initiative of the Centre for Applied Legal Studies and the Education Policy Unit at the University of the Witwatersrand. The Project assists individuals and communities to assert and realise their right to basic education. The ERP campaigns on five major issues:

- School fees
- Farm schools
- Budgetary and infrastructure provisioning
- The prevention of sexual harassment in schools
- Adult basic education

In each of these areas, the ERP conducts research and provides legal education, advocacy and legal services to people who wish to widen access to and improve the quality of the education provided in their communities. The ERP has written information about:

- Rights of Parents and Learners in terms of the Payment of School Fees;
- Maintaining Discipline while Respecting Learners Rights;
- How to Implement the Language Rights of Learners;
- What Parents & Learners Need to Know when Applying for Admission to a School.

While there is a great deal of useful information available, again this is not disseminated to the vast majority of South Africans and the key challenge is not in the production of more materials but in the dissemination of these materials.

3.2. Religious groups

Various religious groups have attempted to mobilize parents and work with groups of parents in engaging about educational matters. For example religious groups have called on parents to engage on issues like sex education and the curriculum.

3.3. Website of big organizations

Big organizations have mechanisms to communicate with the people who work in the organization. This is a very effective way to communicate adults about work issues as well as issues which affect them as parents.

A scan of the websites of trade unions illustrates how they try to educate their members about their rights as parents in a school and how they can get use the SGB structure to get involved with the education of their children. For example, on the NUMSA website page (http://www.numsa.org.za/article) there is an interview with a NUMSA member who is on the School Governing Body at his child's school. The interview illuminates issues that are of importance to all parents. The interview is reproduced here.

Education: Being a responsible parent. 1 November 2003.
Interview by Judi Mazibuko-Madumo[3], NUMSA with Meshack Mphokela.

Meshack Mphokela is now a Numsa member at SA Truck Bodies in Bloemfontein local and also sits on his child's School Governing Body (SGB) at Ditholoane Primary School in Botshabelo. He tells Judi Mazibuko-Madumo of the importance of being "in charge of the education of our children".

What do you think made parents vote you onto the SGB?

The union taught me how to debate issues and because debating issues leads to understanding them seriously, I then became vocal at this general meeting and was elected deputy chairperson.

Tell me about the decision making processes in the SGB?

SGB meetings are held once a month. The principal of the school gives a report of what took place during the month. He informs us about actions that he instituted to address problems and any thorny issue is left to the SGB to discuss.

Have you been divided on any thorny matter?

I was first elected as the vice chairperson of the structure during bi-elections. When this term ended, I was then elected as chairperson of the SGB. We had a situation in our school and the governing body was deeply divided. But equipped with skills and experience on crisis management as a shop steward in Numsa, I was able to exert influence on other members of the SGB.

What was the 'situation' in which the SGB found itself?

A discrepancy was spotted after our books were audited. After intense debate on the matter, the alleged wrongdoer was suspended and investigations were instituted. The verdict was a corrective one and the person was ordered to refund the money within seven days and resume work. The matter was rather sensitive.

How do you deal with matters of misconduct of learners?
In extreme cases, the principal, on behalf of the SGB, writes a letter to parents three days before the hearing. The learner is advised of his/her rights, eg. the right to representation by his/her parent. Based on the facts presented before us, we arrive at a corrective decision.

What about parent-indebtedness?

[3] Numsa's national education administrator and one of Numsa's writers. This article is copyrighted to the National Union of Metal Workers of South Africa - NUMSA - http://www.numsa.org.za

We first make investigations on the incomes of parent/s and we also check social grants and decide whether or not to grant any exemption. But the thing that frustrates us as the SGB is that officials tell the public that there is free education and for me education is free in terms of political language and in reality it is not. So when parents hear such statements then they stop paying school fees. I think this is a serious problem.

How much are the school fees?

The school fees are R35 per year. We encourage parents to at least pay R5.00 per month. We make thorough investigations on parents' financial status before deciding on exemption. We also support parents who are not able to pay at all. We give them a portion of land and some seeds to plant. Then they sell whatever was ploughed to the community so that they can raise school fees.
If this is the mechanism you have set in place to recoup money from poor parents by wringing them of their last penny, then for me this structure is no less than the agent for collecting school funds and as such the provision of education in public schools becomes a commodity and not a constitutional right? Like I said, there is nothing like free education, we have to keep the school going, so we are forced to collect fees no matter how. But then again the Schools Act tries to play a balancing act by exempting parents, and the qualifying parent should be totally indigent. However we have structured the exemptions process to be as inclusive and transparent as possible. The general meeting of all parents is called to decide on all applications for exemption. The neighbours are our ears and eyes in that general meeting which has the final say on these matters.

Tell me about the language policy?

The matter is still on the table. We want to introduce se-Sotho as an additional subject to cater for kids who stay around the school because at a certain general meeting, parents wanted their kids to be taught in their own languages. Besides the school that caters for both Xhosa and se-Sotho is on the other side of the location and this is too far for the se-Sotho speaking learners. So we want them to be closer.

What is the educator-learner ratio in your school?

1:40 and 1:43 , in some instances. We will apply to the Department of Education for the provision of extra human capacity to provide for the extra learners.

If you could, what provisions of the Schools Act would you review or improve?

I think the Schools Act on paper is alright. But in practice it is not. I think the Ministry of Education has forgotten all about the foundation phase, when a child starts to learn. For me this is the starting point. We need to put in place some kind of a universal method of assessment of learners from grade one right up, so that come grade 12, then we know that we are not faced with under-prepared matriculants.

Any message for parents who do not see the importance of participating in SGB structures?

We must be responsible as parents and be in charge of the education of our children. We must re-direct our efforts on other important educational issues and refuse as SGBs to be made school fees collectors, putting poor parents apart from the rest. For example, in our school, the feeding scheme was put on hold and learners no longer got food. The officials said that this school is for children who are better off, who can afford and then they decided to stop the feeding scheme. We were not involved in the whole process of deciding this route, the district inspectors decided on this unilaterally. We are negotiating with the district to revisit this thing because we really have needy learners in this school.

Have I left anything out?

I just want to add that because of my background as a Numsa shop steward, my community takes me very seriously. They come to me for advice for whatever problems they are facing. I refer them to the relevant people. Recently, I intervened in a matter of a comrade who was a domestic worker. Through the skills that

I have acquired, I managed to win her an out-of-court settlement of R8000 after she was unfairly dismissed.

This could be a powerful way to communicate with parents. One would have to further evaluate the effectiveness of this way of communicating with parents and how members did access this information.

3.4. Fatherhood project

The Fatherhood Project is included in this review to provide information about how a successful project can be set up. The Child, Youth, Family and Social Development (CYFSD) programme at the Human Sciences Research Council is working with a number of partners to generate a positive image of fatherhood that facilitates men's involvement with children.

The aims of the Fatherhood project are:

- To influence social expectations and perceptions about men and their care for children;
- To rally peer and professional support to enable men to be more involved in children's lives;
- To create a sense of shared responsibility for children's development among men and women;
- To engender broad-based and long term commitment to men's involvement with children;
- To identify and address barriers to men's engagement with and protection of young children.

The Fatherhood Project is built around an exhibition of photographs taken by professional photographers, students and children, of men involved in caring and protective relationships with children. The photographs reveal fatherhood in its many aspects and moods and give graphic expression to the possibilities and challenges of men's closer engagement with children. The project thus encompasses a strong advocacy dimension.

There was a great deal of publicity with the Fatherhood Project around the photographic exhibition. This project illustrates the different ways in which there could be the dissemination of information.

3.5. Online information for parents

There is an on line site with guidelines for parents whose children are entering the school system. A site (www.safrica.info) which serves as general information on South Africa has available some information for parents. This website appears to be directed at parents who need information on school enrollment, school fees etc. This site allows parents to access information concerning schooling in South Africa. It is an easy to read web page that attempts to answer parents questions about schooling. There are a variety of questions that this site attempts to answer and some of them include:

- The correct age at which the child should start school.
- Information around private and public schools.
- The financial costs of schooling.
- The class room setting that the child will find him/her self in.
- Outcomes based education.
- The legality of Corporal punishment.
- Finding schools in South Africa
- Home Schooling.

Online information would be available to parents who have Internet access – this means that the vast majority of parents would not be able to access the information. However the information is available and the challenge is the dissemination of information to many more parents.

3.6. Family Literacy Project

The Family Literacy Project is an NGO which was established to work with parents to encourage them in their role of developing early literacy skills. The project works on the basis of developing the literacy skills of women in the Southern Drakensberg Region. The women develop their own literacy skills and at the same time learn how to interact with young children to talk with them, read to them and develop their analytical skills.

The Family Math, Science and Literacy (FMSL) Project was a partnership between COUNT and Woz'obona. In this project they developed modules of work about literacy, science and numeracy that could be used with training of trainers. The purpose is then for teachers to use this with the parents of the foundation phase learners. The materials of the

project would both provide knowledge to the parents as well as how to set up communication between the parent and learners.

Both these are NGO projects and therefore dependent on external funding.

4. Home Schooling

There is a body of information on-line which provides information about home schooling. Home Schooling is legal in South Africa and appears to be growing and as a result there are a number of organizations that are available which give information, support, legal advice and sometime financial support to parents.

In order for parents to attempt home schooling, permission must be sought from provincial authorities and there are various requirements that must be met. There is the Home Schooling Associations in South Africa. Parents who are attempting to home school their children are given a variety of organizations to choose from which lend support to parents in this regard. Some of the organizations available in South Africa that support Home School parents include:

- National Coalition of Home Schoolers
- Pestalozzi Trust
- Association for Home Schooling/ Vereniging vir Tuisonderwys
- Eastern Cape Schooling Association (ECHSA)
- Association for Home Schooling
- KwaZulu Natal Home Schooling Association
- Cape Home Educators

These organizations provide them with legal information for home educators and a platform for home educators to meet and network and lend support to each other.

Home schooling is a small sector of South African schooling and private endeavour. It should not be included in the plans for a government department.

6. Mass communication

6.1. Written materials: The HESA Project

Written materials are used to communicate with parents and communities. These materials inform parents/ communities about different educational issues. One such

publication is that from the Higher Education South Africa (HESA) *A Grade 9 Guide into Higher Education*. At the end of grade 9 learners have to make decisions about their subject choices. This publication provides information that could be useful to parents and learners.

6.2. William Smith Learning Channel on Information for Parents

The Learning Channel broadcasted a few television sessions on Saturdays providing information for parents on subject choices for the grade 10 level. In 2006 a new FET Curriculum was introduced and parents were not well informed by the schools about how to make curriculum choices. The Learning Channel provided information to parents.

7. Summary

The regulatory framework allows for the involvement of parents in the school (SASA) and although imperfect there is some involvement through the structures of the School Governing Body. The underpinning philosophy of the outcomes based education is the parent-learner-school involvement. This philosophy is based on the assumption that parents would have a formal education and therefore be able to participate in their children's education. The intentions of the School Governing Body and the Outcomes Based Education are more suited to middle class homes.

A Google search of the projects which promote and assist parental involvement in education reveals that the projects mostly relate to providing information about governance issues. While there is a large body of information related to parents rights and responsibilities and how they can get involved in governance issues in schools, this information does not seem to be disseminated to most parents. The key challenge is to ensure wide dissemination of the information.

The websites of the trade unions provides a good illustration of how the existing mechanisms can be used to disseminate information to parents.

A review of the landscape reveals that there does not seem to be information about how parents get involved with knowledge and pedagogical activities in a classroom – especially in mathematics and science.

CHAPTER SEVEN

SYNTHESIS OF INVOLVEMENT OF PARENTS in MATHEMATICS AND SCIENCE EDUCATION AND RECOMMENDATIONS FOR STRATEGIES TO MAXIMISE PARENTAL INVOLVEMENT

The purpose of this study was to empirically establish the extent to which parents contribute to children's participation, performance and career choices in science, engineering and technology. The findings would inform the development of strategic interventions that will maximize parental involvement in their children's mathematics and science education.

FINDINGS

1. Literature on parents' involvement in children's education

There is a silence in the South African educational literature about the involvement of parents in the education of their children. Much of the South African educational literature has focused on the role of the school, the teacher and the principal. Parents are the first educators of children but they are not seen as a resource for the learning processes. The international literature on the role of parents documents the middle class activities which stimulate cognitive and social development. A large proportion of the South African population would be classified as 'working class' (both in terms of income and educational level). Much of this literature also focuses on the role of parents in earlier years of children's lives.

This study is critical in bringing to the fore the voices and role of South African parents in the educational experiences of their children.

2. Framework for studying parental involvement in education

In this study a useful definition of parental involvement is the direct and indirect behavior of parents in all aspects of their children's education and learning. Direct parental involvement refers to the involvement of parents in school activities, school decision-making, communicating with the school about the child's progress, helping with homework. Indirect Parental Involvement refers to exposing the child to cognitively stimulating activities that have educational value, creating an environment for learning in the home (access to books, magazines, newspapers, the internet).

3. Parents

Definition of a parent

The people outside of school that are involved in the learners lives are not only biological parents – they may be grandparents, siblings, neighbours or the community. In considering a definition of parents it might be more appropriate to talk about the notion of 'parenthood' rather than 'parents'. In this project we will refer to the notion of parenthood, i.e. we talk about the involvement of the community in the educational activities of the young.

Who are the parents in this study?

In this study we found that 80% of the head of the household was one or both the parents. At least 40% of households are female headed.

The general profile about the parents level of education is that about 4% had no education, about 10% had some primary education, about 30% of fathers and 40% of mothers had secondary education (20% of fathers and 20% of mothers had completed matric) and around 30% of both mothers and fathers had completed their studies after matric.

About half the fathers and mothers are working and the pattern is different for groups from the different school type (and hence resource base) with about 90% of students in ex HoA schools indicating that their parent(s) were working and 50% of students in DET schools indicating that their parent(s) were working. Parents are involved in low earning jobs (e.g. domestic worker) to professionals to high earning jobs.

4. South African adult population

One must understand South African households in terms of the educational level of parents (which then determines the occupations of parents) and the poverty levels in the society. Stats SA (2001) describes the educational level of the South African adult population. 40% of the African population had 'no schooling' or 'some primary' and for the White group 2.6 % had 'no schooling' or 'some primary'. At the other end of the educational spectrum, for the African group, 22% had 'completed secondary' or 'higher education' and 70% of the White group had 'completed secondary' or 'high education'. According to the Millenium Development Report (2005) in 2000, 11% of South African people were living on less than US $1 a day, and 34% were living on less than US $2 a day. The question is, how do we (the state) intervene in preventing this social reproduction where poor people continue to be poor and affluent families continue to enhance and maintain their middle class advantage.

5. Socio –economic status and involvement in education

Whatever the education level or socio-economic status, all parents believe in the importance and role of education to ensure a better life for their children. (*'Imfundo isinkwa sakusasa' (education is tomorrows food*). Parents want their children to have an education in mathematics because they believe that this would allow them to access many opportunities that they were denied. However, the role of working and middle class parents is different. Working class parents spend long times away from home either traveling to and from work in public transport or long working days. Therefore they cannot get involved directly with their children's education but get involved by trying to provide so that the education can take place. Middle class parents can provide a home background and social interactions that is better able to facilitate and support learning in the school.

Working class parents recognize the importance of the FET colleges to provide skills which would allow them to readily and easily access work opportunities and thus an income for the family. While we (researchers, policymakers etc) want to facilitate the

growth of scientific and technical knowledge for long term gains, the need of the family is to ensure immediate employment and income to the family.

6. Parents direct involvement in education

Parents are more involved in grade 3 and their involvement decreases at grade 9 and 12. They are more involved in asking about schooling, showing interest and motivating students about school and providing books and stationary. There is less involvement with the direct help of schoolwork. The pattern of involvement in homework and school projects and assignments changes from grade 3 to 9 to 12 – understandably parents get more involved at the early years and as the student moves to higher grades the instruction is more formal and parents would be less able to participate in the schoolwork. In addition to parents, siblings and friends also assisted – so a community based approach. In general, parents, especially mothers, are involved with what happens in school.

Parents direct involvement in school activities are:

(i) *payment of school and university fees:* about three quarters of students have their school fees paid by one of their parents and around 15% paid either by a afmaily member. 41% of students indicated that a parent(s) pay for university fees, 23% indicated they were on financial assistance schemes and 21% indicated a bursary/scholarship as the source of finance.

(ii) *discussion about what happens in school*: between 50-60% of students discuss what happens at school with their parents: around 10% discuss with grandparents parents, and between 15-20% with their siblings. This data suggests that the mother/ sister/ grandmother (i.e. females in the home) play the greater role in interaction with students about what happens in schools.

(iii) *parents visiting the school:* between 60-70% of the students indicated that their parents had visited the school at some time. The visits were for the purpose of SGB meetings, discussion of the new curriculum and curriculum choices and career choices. The patterns of attendance are different for ex HoA and DET groups.

(iv) *involvement in homework and projects:* around 40% of mothers and 20% of fathers asked about homework.. Just less than 20% of parents helped with homework at the grade 9 level and this drops to around 9% at the grade 12 level.

(v) *extra tuition and visits to science centres:* About a quarter of grade 12 and tertiary students and 13% of grade 9 students indicated that their mothers 'often' sent them for extra classes. The number of students who visited science centre at all levels (grade 9, 12 and tertiary) was low at around 6%.

(vi) *buys books and stationary:* two-thirds of students indicated that their mothers bought books and other stationary. These numbers were higher for students from the ex HoA schools (90%) than DET schools (50%).

(vii) *checks report card:* around 70% of mothers and 45% of fathers checked the report cards. Again the numbers were higher at ex HoA (90%) than DET schools (62%).

(viii) *discusses the news items and books:* about a quarter of students indicated that parents 'often' and one third indicated that parents 'sometimes' discussed items in the news with them.

(ix) *discusses possible career paths:* about half the grade 12 students indicated that their mothers discussed possible career paths.

(x) *assistance with mathematics and science homework:* Most learners did their mathematics and science homework on their own, a small percentage were assisted by parents and about a quarter were assisted by siblings.

(xi) In general, parents, especially mothers, are involved with what happens in school.

(xii) Parents are more involved in grade 3 and their involvement decreases at grade 9 and 12. The responses show a stability of responses among the three groups: grade 9 students, grade 12 students and first year tertiary students responded in a similar manner about their senior years in school.

Parents indirect involvement in activities are:

(i) *links school and everyday practices:* parents very seldom link what happens in school to everyday practices or links school activities to traditional practices. In order for links to be made one would need knowledge and familiarity with both domains.

(ii) *home environment for learning:* most students indicated that the home environment was conducive to learning.

(iii) *discusses the importance of education:* Around half the students indicated that parents 'often' talked to them and 20% indicated that they 'sometimes' talked to then about the importance of education. Mothers provided more of this encouragement.

(iv) the parents views towards science are positive.

7. Parental involvement in math and science curriculum choices

Two thirds of students made their own choices about studying mathematics and science, but they were assisted by parents. 30% of students indicated that teachers decided on the subjects they should take.

8. Career choices

Career aspirations

In 2006 all grade 10 learners had to take either mathematics or mathematical literacy. When the questionnaire was administered in October 2005, it seemed that many students did not know about the curriculum choices that the school would be offering the following year. It also seems that many students and parents desired mathematics rather than mathematical literacy. Anecdotal evidence indicates that in 2006 more students were registered for mathematical literacy rather than mathematics.

Half the grade 12 students indicated that their post-grade 12 plans were to go to university and a quarter indicated that they wanted to go to a technikon.

Career intentions of students

For grade 9 students, the most popular choice was a health related profession (22%), followed by being a scientist/ engineer (16%) or following a business career (15%). For grade 12 students one third indicated that they wanted to be a scientist or engineer and 17% wanted a health related profession. The surprising response was from first year tertiary students, who are registered for science and engineering degrees, but indicated non-science related careers when they completed their studies.

Information sources about careers

For grade 9 students, family members, media and school were the main sources where they obtained their information from. Grade 12 students obtained information mostly from school, media, brochures from tertiary institutions and family members.

Who influenced career choices?

The most important influence for the career choice, at all levels, seems to be from mother or a female guardian.

9. Projects that Offer Support to Parents

The regulatory framework allows for the involvement of parents in the school (SASA) and although imperfect there is some involvement through the structures of the School Governing Body. The underpinning philosophy of the outcomes based education is the parent-learner-school involvement. This philosophy is based on the assumption that parents would have a formal education and therefore be able to participate in their children's education. The intentions of the School Governing Body and the Outcomes Based Education are more suited to middle class homes.

A Google search of the projects which promote and assist parental involvement in education reveals that the projects mostly relate to providing information about governance issues. While there is a large body of information related to parents rights and responsibilities and how they can get involved in governance issues in schools, this information does not seem to be disseminated to most parents. The key challenge is to ensure wide dissemination of the information.

The websites of the trade unions provides a good illustration of how the existing mechanisms can be used to disseminate information to parents.

A review of the landscape of the projects for parents reveals that there does not seem to be information about how parents get involved with knowledge and pedagogical activities in a classroom – especially in mathematics and science. However there are a few Family Literacy Projects that offer adult literacy courses and the adult literacy courses incorporates ways that parents can interact with their children to promote cognitive development.

2. RESPONSES TO THE TERMS OF REFERENCE

2.1. *Define parental involvement (or lack of it) in their children's math and science education, including the appropriate time to start this involvement in order to nurture children's interest in mathematics and science*

- The term 'parenthood' (many people who take on the role of a parent or caregiver to children) which refers to the broader community who interact with the child should be used when discussing parents.
- The voices and role of parents are silent with respect to the educational experiences of children. It is important to re-emphasise and re-assert that role in the discussions and discourses about the education.
- All parents believe in the importance and role of education. The scenarios for education and parental involvement are different for the different social class groups. Children from the poorer communities have a double disadvantage in that the homes do not provide the necessary resources to access the school curriculum and at the same time the school is not providing the quality inputs to ensure that the opportunity to come out of the poverty trap.
- Parents are more involved in issues of school governance but play a lesser in learning in classrooms, especially mathematics and science learning.
- Parents are more involved in asking about schooling, showing interest and motivating students about school and providing books and stationary. There is less involvement with the direct help of schoolwork.
- The pattern of involvement in homework and school projects and assignments changes from grade 3 to 9 to 12 – understandably parents get more involved at the early years and as the student moves to higher grades the instruction is more formal and parents would be less able to participate in the schoolwork.
- In general, parents, especially mothers, are involved with what happens in school.
- Parents recognise the need for their children's' education and recognise the importance of mathematics/ SET.

- The strategy for involvement with parents might be to support parents with activities to promote cognitive growth and development in the early years. These foundational skills are important to access subsequent levels of schooling.

2.2. *Establish the impact of parental attitudes towards math and science on learners' participation and performance in mathematics and science subjects, and to establish the impact of parental involvement in learners' choices of science, engineering and technology careers.*

- Parents recognise the importance of mathematics and science and encourage their children to take mathematics.
- Parents recognise that they do not have the requisite knowledge to assist directly with the knowledge required for good performance in mathematics and science. For parents with low income they offer encouragement to their children and try to get assistance from older siblings or students in the community. For middle class parents, if needed they seek extra tuition to assist in mathematics performance.
- Two thirds of students surveyed indicated that made their own choices about taking mathematics and science as subjects, but they were encouraged by parents.
- Teachers play a role in the choice of mathematics and science subjects, but students indicated that they would rather make their own choices.
- Students surveyed indicated that family members, media and school were their main sources of information about career choices.
- The most important influence to most learners is the mother or female guardian. Parents often indicated that they would support whatever choices their children made.
- Parents in low income households encouraged their children to continue studies in the FET colleges, so that they could learn a skill and then there would be ensured employment.

2.3. *Establish the level of math and science content knowledge (including IKS) required by parents to motivate and influence children to participate, perform and choose careers in science, engineering and technology.*

- Irrespective of their 'formal' knowledge base parents recognise the importance of mathematics and science. For Black people the explicit exclusion from mathematics during the apartheid years, has made them see this subject as important for access and thus they encourage their children to take mathematics.
- Middle class parents, in social interactions with their children, especially at the younger ages link school activities to activities around the home and everyday life. For example they play games with numbers, watch nature programmes. In poorer families, parents with low levels of education do not have the time and are unable to make the links.
- Parents, especially low income parents, see the domain of school science and everyday practices as separate from each other. Similarly with traditional practices – parents do not see any scientific basis for the practices and it as separate from school science. IKS is an important area of valuing traditional knowledge. However for parents to make the links between indigenous knowledge, like traditional medicines, and school science they would have to know both the domains.

2.4.*Scope the existence in South Africa, of intervention programmes that promote parental involvement in mathematics and science education.*

- The regulatory framework allows for the involvement of parents in the school (SASA) and although imperfect there is some involvement through the structures of the School Governing Body.
- The underpinning philosophy of the outcomes based education is the parent-learner-school involvement. This philosophy is based on the assumption that parents would have a formal education and therefore be able to participate in their children's education.
- The intentions of the School Governing Body and the Outcomes Based Education are more suited to middle class homes.
- There are intervention projects which promote and assist parental involvement in education and these intervention projects mostly relate largely to providing information about school governance and parents rights.

- There is information related to parents rights and responsibilities and involvement in school governance, but this information is not disseminated to most parents. The key challenge is to ensure wider dissemination of the information.
- The websites of the trade unions provides a good illustration of how the existing mechanisms can be used to disseminate information to parents.
- There does not seem to be information about how parents can get involved with improving classroom knowledge – especially in mathematics and science.
- Projects like the Family Literacy Projects offer adult literacy courses, a component of which is about how parents can interact with their children to promote their cognitive development.

3. STRATEGIES TO INCREASE PARENTAL INVOLVEMENT

1. We must re-emphasise the role of parents and the community (parenthood) in the educational life of the children. We must re-insert the agenda of parents into our discourses and discussions about the education of children.

2. The reason that the DST (and other stakeholders) embarks on such studies (how to ensure greater parental involvement) is to improve the state of mathematics and science and thus achieve better educational outcomes. Improved educational outcomes are dependent on support from the home and a quality education in school. Therefore we have to look at strategies that refer to both in- school and at the home.

In school

There are three areas that can be strengthened within the schooling system and this would be more the responsibility of the Department of Education:

(i) improving the quality of pedagogical inputs,

(ii) increase information to schools about career choices and opportunities and

(iii) strengthen the mechanisms for communication between the home and the school.

(i) improving the quality of pedagogical inputs,

Parents depend on the school to provide the *quality inputs for the education* of the children, because they do not have the knowledge (especially in higher grades), time, resources (money to access supplementary tuition). The school is the key institution to provide pedagogical inputs and it is essential that they provide a quality education.

Education quality is dependent on the social status and that is linked to race. Children from urban areas and homes with financial resources, build up social and cultural capital at home and have better access to an education that will give them better opportunities in life. Children within poorer environments bring little social and cultural capital from the home to be able to access school and the school curriculum. Literature indicates that a child's education is the sum of the inputs from the home and the school.

Parents are interested and supportive of their children's education. Parents depend on the school to provide the quality educational inputs. But schools which are located in areas where most poor people live, are sites where quality learning is not offered. The learners who most depend on and expect a quality input from the school are not receiving it and the poverty trap and social reproduction continues.

(ii) increase information to schools about career choices and opportunities

Schools offer both pedagogical inputs as well as *career guidance*. One of the subjects in the school curriculum is Life Orientation. Within this 10 credit course, there are inputs about career guidance. In addition to information about careers from the school, middle class parents can provide information from a range of other sources to learners. Families with low paying jobs, do not have such access to information and they depend on the school to provide such information. In the old (NATED) curriculum, schools offered the subject, Career Guidance, for learners in then ex House of Assembly (for White learners) and ex House of Delegates (for Indian learners). In addition schools had a guidance counselor to provide information to learners. In the present curriculum there is no guidance counselor in schools and there is less information about careers for learners. Again, for learners from poor environments, there is very limited information. Parents do not know enough about the curriculum options, about bursaries and about career opportunities.

(iii) strengthen the mechanisms for communication between the home and the school.

We need to find mechanisms that strengthen the *communication between the home and the school.* The present structure of the school governing body and the mechanism of parent meetings does not facilitate the involvement of most parents in the activities of the school. It is difficult for teachers to communicate with parents through written communication because there is a high level of illiteracy among many parents and they are disadvantaged by this mechanism.

Out of school

In looking at out of school strategies to increase parental involvement (and this is where there is a role for Department of Science and Technology) with children's education and mathematics and science education, we need to consider the following:

iv. there are initiatives who have targeted working with parents on how to get involved in their children's education. It is important to strengthen these initiatives and facilitate dissemination of information from these initiatives to a bigger group.

v. create a database of information that already exists for parents (mostly middle class parents) on how to improve interaction with children to facilitate their cognitive development and develop mechanisms to ensure effective communication of this information to a bigger group.

vi. a good starting point for a programme with parents is to start at the early years and develop programmes which could assist parents on how they could stimulate cognitive development and analytical skills.

Dissemination of present information to parents

Since we are using the definition of parenthood to include the broader community the important strategy would be science communication. If we want intervene to promote greater involvement of parents we should not do so by providing structured programmes which requires people to attend a course or meeting (like a teacher upgrading intervention). Rather the programmes would have to interface smoothly with daily lives of parents. Therefore we need to consider media like the radio (e.g. plays about taking

tablets), TV, newspaper, adult literacy courses and brochures for the dissemination of information. There are lessons to be learnt from the dissemination of information around health issues.

Areas where present information can be used for broader dissemination to parents are:

- Information of rights as parents in the education of the child
- Information about school and curriculum issues
- Information about setting up learning environments in the home that re more conducive to learning.
- Mathematics and science information
- Information about careers

There are organizations involved in disseminating information about the rights of parents in the education of the child, the role of the School Governing Bodies, the school and the new curriculum. This information is patchy and not available in an accessible form to all parents. A role for DST could be the co-ordination and pooling of all this information and ensuring that there are mechanisms for better dissemination (e.g. by ensuring translation into different languages, by using different media to disseminate this information). The key is to ensure wider dissemination.

Investment in the early years of children's lives

Various studies indicate that investment in a child's education and health in the early years provides the greatest returns in the area of human, social and economic growth of the individual and the society. Support could be offered to parents about how they can set up activities in the home to facilitate cognitive growth and strengthen analytical skills. Parents are less intimidated about getting involved in their children's education in the early years and therefore a set of programmes targeting these years would be useful. In developing these strategies it is important that the different government departments: Department of Science and Technology, Department of Social Development and the Office of the Child in the Presidency work together.

Involvement in mathematics and science

There is less information for how parents can be involved in assisting with their children's mathematics and science education. The DST could promote initiatives in the following areas:

- The media should be used to re-image mathematics and science so that these subjects are seen as accessible to all and students can achieve success in these areas. The popular media is accessible to both parents and children. For example in popular TV programmes, incorporate a message of mathematics accessibility and attractiveness– i.e. as 'vox populi'. One could have Angela's character in the popular TV programme Generations learning and enjoying mathematics and science and the adults around her engage with mathematics and science. Maths must be seen as 'cool to do' subject and through the 'soapie' parents offered prompts of how they could support their children's learning.
- The National Strategy for Mathematics and Science Literacy and Awareness must include a dimension which highlights the involvement of parents. The broad aim of such a strategy will be to improve the science knowledge and skills of the public. A more mathematically and scientifically literate public could facilitate greater involvement of parents in the school mathematics and science.
- One must use different media to disseminate messages about mathematics and science. For example the "Chappies gum" wrapper is fun and asks general knowledge questions, this idea could be used with science information displayed on popular brands of food. For example there would be simple science information on a cereal box or the wrapping of basic foodstuff (like mealie meal). This easy and non-threatening way of presenting information will ensure that we become a community of knowledge users and transmitters.
- In order for parents to encourage their children to value the traditional practices and see the link with the school science, parents themselves would have to be educated about the value of these traditional practices and the links with the formal science curriculum. This would mean developing public programmes which explicitly makes those links.

Improving science communication

- The popular media will be a very important mechanism for the transmission of science knowledge. The DST should enter into a partnership with the South African Media (Television and Print) for a project to enhance parental involvement.
- The DST could facilitate campaigns to encourage parents to get more involved in their children's education. For example there could be a campaign to get parents more involved in children's homework. This could be structured around having a weeklong set of activities that highlights the ways parents can get involved in homework.. SAASTA could be commissioned to drive such a campaign.
- In addition to the homework campaign, the DST's Science Week could explicitly include one day which highlights the role of parents in children's mathematics and science.
- For science communication the medium of the radio is more effective than the newspaper. Make use of the radio (in all indigenous languages) to run programmes for parents on how they can get involved in their children's education. For example the radio programmes could provide information to parents on the activities they could do to with their children to stimulate their cognitive growth development.
- Use newspapers like "Teacher" to promote popular science writing. This could also serve the purpose of communicating the latest information about careers to teachers who could then pass this on to students.
- Use different communications mechanisms to pass on information about how parents could greater assist their children. Examples are the radio, Government Communication Information Services, municipal newsletters. All newsletters with a large distribution network could be targetted to pass on information about careers.
- Promote radio and TV journalism. DST should prepare a package to take to the science desk at SABC and on how they can assist with developing programmes for children. Analysis of TV programmes indicates that there are good programmes for the ECD area, but less educational programmes which are linked to the school curriculum.

References

Arulmani G & Arulmani S (2004) *Career Counselling : A handbook.* Delhi: Tata McGraw Hill Publishing

Bender S (2004) Female student career aspirations in Science. A summary of a thesis. A Report to the SSTA Research Center . 94-04

Bleeker MM and Jacobs JE (2004) 'Achievement in math and science: Do Mothers' Beliefs Matter 12 years later? *Journal of Educational Psychology* Vol. 96:pp 97 -109

Brooks R (2003) Young people's higher education choices: The role of family and friends. *British Journal of Sociology of Education,* Vol. 24, No. 3

Catsambis S (1998) Expanding the knowledge of parental involvement in Secondary Education. Effects on High School academic success. Report to center for research on the Education of students placed at risk, Baltimore.

Cosser M with du Toit (2002) *The student choice behaviour project, Phase 1: Factors affecting the choices of Grade 12 learners.* Cape Town: HSRC publishers.

Cox A (2004) *A longitudinal study of the occupational aspirations and perceptions of six to nine year old South African children.* Unpublished Masters treatise, University of Port Elizabeth, Port Elizabeth, South Africa.

Department of Education. (1996) National Education Policy Act, Number. 27 of 1996. Pretoria: Department of Education

Department of Education (2002) Rights and Responsibilities of Parents - A Public School Policy Guide.

Department of Education (2003a) The Foundation Phase (grade 3) systemic evaluation (2000/2001) Report. Pretoria. Government Printers

Department of Education (2005) Intermediate Phase (grade 6) systemic evaluation Report. Pretoria. Government Printers

Department of Science and Technology (2002) South Africa's National Research and Development Strategy. Pretoria: Department of Science and Technology

Dornbusch SM, Ritter PL, Leiderman PH, Roberts DF, Fraleigh MJ (1986) 'The relation of parenting style to adolescent school performance' *Stanford centre for the study of youth Development.*

Dwyer DJ, Hecht JB (1992) Causes underlying minimal parental involvement in the education of their children. Paper presented at the annual meeting of the Mid-Western Educational Research Association . Chicago , 16 October 1992.

Education Rights Project (no date) Rights of Parents and Learners in terms of the Payment of School Fees. http://www.erp.org.za/htm/payment.htm (Downloaded on 2006/ 05/13).

Education Rights Project (no date) How to Implement the Language Rights of Learners. http://www.erp.org.za/htm/language.htm (Downloaded on 2006/05/13)

Education Rights Project (no date) What Parents & Learners need to know when applying for Admission to a School. http://www.erp.org.za/htm/admission.htm. (Downloaded on 2006/05/13)

Human Sciences Research Council (2005) *Human Development Report.*

Freeman M, Nkomo N, Kleintjies S (2004) *Guardianship in the time of HIV/AIDS – Realities, perceptions and projections. (A mental health view point)* A report prepared for the National Department of Health , Nov 2004.

Grolnick WS, Slowiaczek ML (1994) Parents involvement in children's schooling: A multidimensional Conceptualisation and motivational model. *Child Development* , Vol 65 , 237-252

Jawitz J, Case J, Tshabalala M (2000) Why not engineering ? The process of career choice amongst South African Female students. *International Journal of Engineering Education.* Vol 6 pp 470 –475

Lankard BA (2002) Family Role in Career Development. ERIC Clearinghouse on Elementary and Early Childhood Education , University of Illinois. ERIC DIGEST No. 164

Lyons T (2004) 'Choosing physical science courses : The importance of cultural and social capital in the enrolment decisions of high achieving students.' *International symposium for Science and Technology Education*

Maynard S and Howley A (1997) Parent and Community Involvement in Rural Schools. *ERIC Digest* – Clearinghouse on Rural Education and Small schools

Marcus T (2002) (2nd Ed) *Living and Dying with AIDS.* Prepared by the CINDI (Children in Distress) Network.

Maree JG and Beck G (2004) 'Using various approaches in career counselling for traditionally disadvantaged (and other) learners: some limitations of a new frontier. *South African Journal of Education.* Vol 24: pp 80-87

Mbokodi S, Singh P, Msila V (2003) Parental Involvement – a missing link. http://teacher.mg.co.za

Milbourne LA, Haury DL (1999) Helping students with Homework in Science and Math. ERIC Clearinghouse for Science Mathematics and environmental Education, Columbus, OH

Mbeki, T (2001) "Address of the President of South Africa, Thabo Mbeki, at the Second Joint Sitting of the Second Democratic Parliament", Cape Town.

Mbeki, T (2005) "Address of the President of South Africa, Thabo Mbeki, at the Third Joint Sitting of the Second Democratic Parliament", Cape Town.

Moleke P (2005) The State of Labour Marker Deracialization in S Buhlungu, J Daniel, J Lutchman, R Southall (Eds). The State of the Nation 2005 Cape Town: HSRC Press

Mullis IVS, Martin MO, Gonzalaz EJ and Chrostowski SJ (2004) TIMSS 2003 International Mathematics Report. Chestnut Hill MA: TIMSS and PIRLS International Study Centre Lynch School of Education, Boston College

NISHE (2005) A Grade 9 guide into Higher Education. A Project of HESA. http://www.hesa-enrol.ac.za/nishe/grade9.htm.

Paplia DE and Olds SW (1992) *Human Development.* Boston : McGraw Hill

Programme for International Student Assessment 2003 (2004) *Learning for tomorrow's world. OECD: PISA*

Reddy, V. (2000). Achieving Success in an Unequal Society: Life Histories of Black South African Scientists. Unpublished PhD thesis: University of Durban Westville

Reddy, V., Berkowitz, R. & Mji, A. (2005) Supplementary tuition in mathematics and science: an evaluation of the usefulness of different types of supplementary tuition programmes. (Research conducted for the Department of Science and Technology, South Africa).

Reddy, V. (2006) The state of mathematics and science education: schools are not equal. In *State of the nation: South Africa 2005-2006.* Buhlungu, S., Daniel, J., Southall, R. & Lutchman, J. (eds). Cape Town: HSRC Press. 392-418.

Reddy, V. (2006) *Mathematics and science achievement at South African schools in TIMSS 2003.* Cape Town: HSRC Press.

Richter L and Morrell R (2006) Baba: Men and Fatherhood in South Africa. HSRC Press.

South Africa (2005) Millennium Development Goals Country Report.
http://wwwdoh.gov.za/docs/reports/2005/mdgd/part1.pdf

Statistics South Africa (2001) *Census 2001.* Pretoria : Statistics South Africa

Statistics South Africa (2004) General Household survey. Pretoria: Stats SA

Statistics South Africa (2005) The Labour Force survey 2004. Pretoria : Statistics South Africa.

Stead GB and Watson MB (1993) *Occupational knowledge and aspirations of black South African Adolescents* . Paper presented at the XVI International School Psychology Colloquium, Banska Bystrica , Slovakia

Steinberg L, Elmen JD, Mounts NS (1989) 'Authoritative Parenting, Psychosocial Maturity, and Academic Success among Adolscents. *Child Development.* Vol. 60 pp: 1424 - 1436

Taylor J, Harris MB, Taylor S (2004) Parents have their say ... About their college-Age children's career decisions. *Winter 2004 Journal.*

Tsagala E and Kordaki M (??) Essential factors that affect students' choices to study computer sciences: gender differences. University of Patras.

Wang W, Taylor SI, VanBrackle A, Kaneda T (2003) What I want to be when I grow up: A qualitative study of Americans and Japanese children's occupational aspirations. *Child Study Journal* . Vol 33: pp 175 – 186.