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**Developing education quality indicators in South African schools: Multilevel analysis of factors affecting learner achievement**

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## Outline of presentation

- Background of the school quality initiatives in South Africa
- The South Africa Systemic Evaluation Study
- Development of indicators of education quality
- Multilevel statistical analysis
- Major findings from the multilevel modeling
- Concluding remarks

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## Background of the quality school initiatives

- National Education Quality Initiative
- Initiatives of Post-apartheid government (since 1994) to improve the quality of education for all irrespective of background characteristics
  - Curriculum reform to address challenges of post-apartheid schooling
  - A framework for understanding the process of achieving access to quality education
  - A reform in school governance to promote democratic participation of all stakeholders
  - Restructuring of the further education and training to accelerate the acquisition of needed skills

## The South Africa systemic study

\*Main objective:

\*research questions:

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- what is the context in which learning and teaching are taking place?
  - what is the level of achievement of the learner at key points of the education system (grades 3, 6, and 9)?
  - what factors affect learner achievement?
  - how can the level of achievement be improved?

\*2003 baseline study, 2004 foundation study

## 2004 Grade 6 Systemic Evaluation Survey

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- **Sampling—34,015 grade 6 learners from 998 randomly selected schools**
- **Learners responded to assessment test items in Mathematics, Natural Science, and language (items piloted in 2002 and field tested in 2004)**
- **Learners, teachers, parents and principals responded to survey questionnaire about the context of schooling**

## Development of indicators

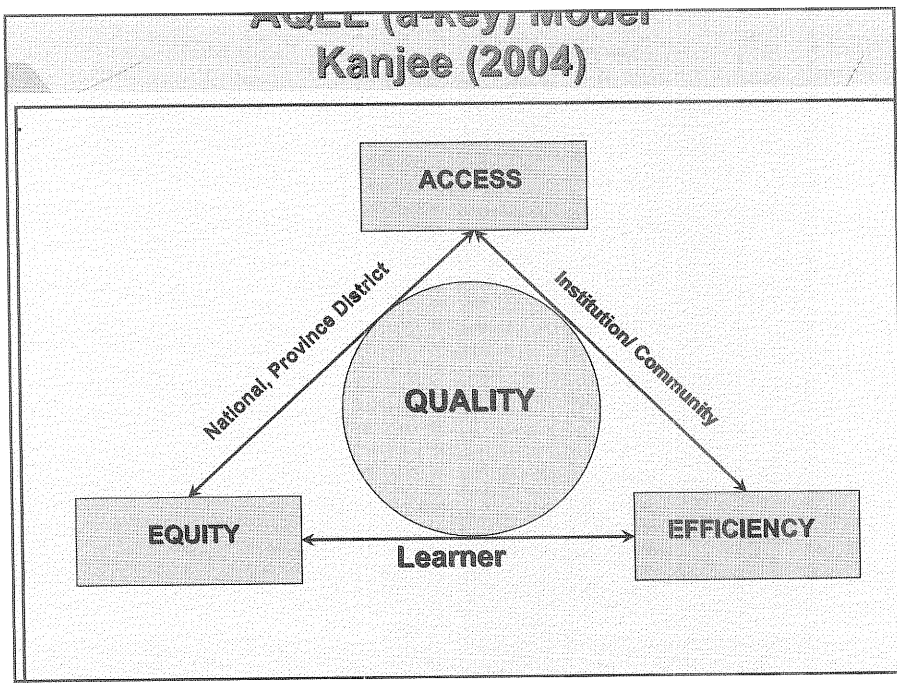
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- **Survey participants' responses to schooling context questionnaires used to create schooling quality indicators**
- **Indicators classified based on four policy goals; Access, Quality, Efficiency and Equity (AQEE)**

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## Defining AQEE

- **Access**
  - Getting to school
  - Getting into school
  - Getting through school
- **Quality**
  - What learners should know
  - Where learning occurs
  - How learning takes place
  - What is actually learnt
- **Efficiency**
  - Functioning of structures and systems
  - Availability, allocation and use of human & physical resources
  - Throughput and repetition rates
- **Equity/Redress**
  - Inclusivity
  - Absence of unfair discrimination



## Scale and interpretation of schooling context indicators

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score range	Interpretations
0 to 3	Unacceptable/very low
3.1 to 5	Largely problematic/poor
5.1 to 7	Problematic/inadequate/limited
7.1 to 9	Satisfactory but could improve
9.1 to 10	Very good/high



## Scale and interpretation of learner achievement scores

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Achievement level	Description	Percentage band
1	Not achieved	1% - 39%
2	Partly achieved	40% - 49%
3	Achieved	50% - 69%
4	Outstanding	70% - 100%



## Multilevel statistical modeling

- Widely used in school effect research
- estimate the variation in school effect
- Identify indicators of successful schooling

## Null model- measure of school effect

$Y_{ij} = B_{oj} + R_{ij}$	1-learner level
$B_{oj} = B_{oo} + U_{oj}$	2-school level
$Y_{ij} = B_{oo} + R_{ij} + U_{oj}$	3

- $Y_{ij}$  –achievement of learner i in school j
- $B_{oj}$  –the achievement level of school j
- $R_{ij}$  –within school residual
- $U_{oj}$  –between school residual (measure of school effect)
- Total variance of learners' achievement levels=variance within-school + variance between-school

## Schools learners attend do make a difference in their achievement levels

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Average school achievement level ( $B_{00}$ ) = 33.2%  
(level 1--standard not achieved)

$$B_{0j} = B_{00} + U_{0j}$$

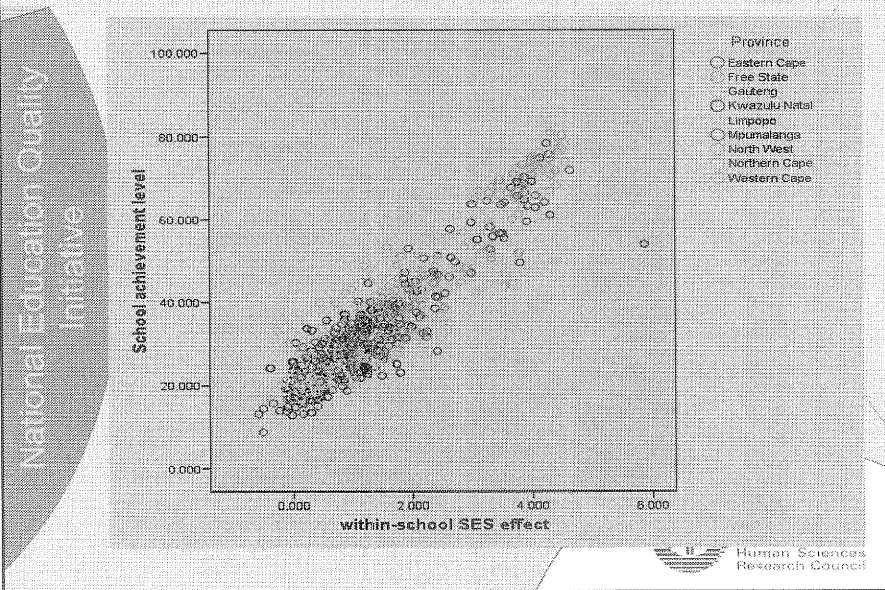
- $R_{ij}$  variance (within-school variance)=101.8
- $U_{0j}$  variance (between-school variance) = 214.3
- $Y_{ij}$  variance (total variance)=101.8+214.3=316.1
- Proportion of variance between-school= $214.3/316.1 = 0.678 = 67.8\%$

## The impact of socioeconomic status (SES) on learner achievement levels

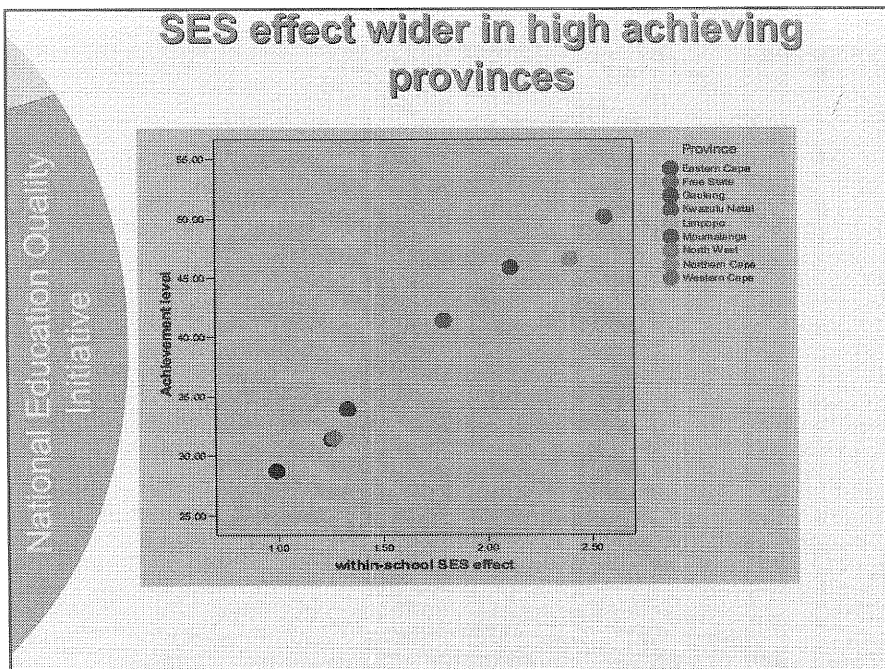
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- $Y_{ij} = B_{0j} + B_{1j} \cdot SES_{ij} + R_{ij}$
- $B_{0j} = B_{00} + U_{0j}$
- $B_{1j} = B_{10} + U_{1j}$
  
- $B_{10}$  the average effect of SES within school (=1.3)
- $U_{1j}$  variance- the variation of SES effect across school (2.0 and Statistically significant at  $p=0.05$ )

## SES effect wider in high achieving schools



## SES effect wider in high achieving provinces





**Block entry method by Cohen and Cohen (1983) used to identify the most important indicators of school quality**

- method entails sets of independent variables that are added to model equations in blocks
- method described as theoretically conservative and statistically rigorous
- method allows for the control of potentially confounding independent factors
- Following the policy goals, indicators were divided into six blocks: equity, access, efficiency, quality of school context, quality of principal and teaching staff, and quality of learners schooling engagement and the involvement of their parents in their education
- Indicators removed from multilevel equation one at a time based on p-values (variable with the highest p-value was removed first) until all the variables in the full model were statistically significant

**Most important indicators of school quality**

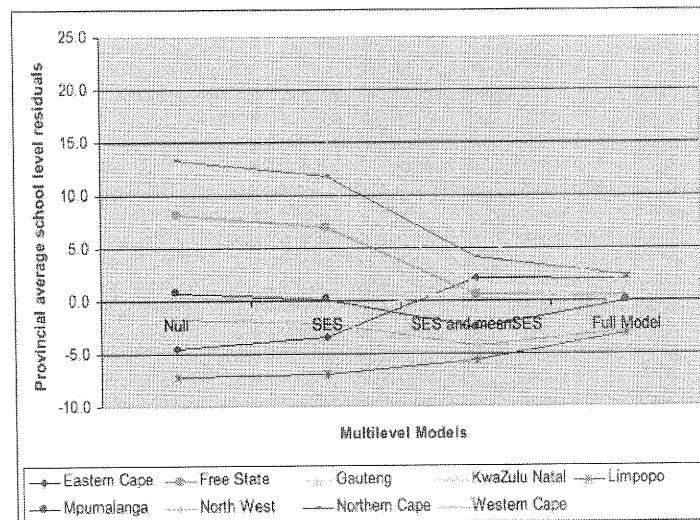
Socioeconomic status of school (meanSES) (equity)	2.3
Entry into schools (access)	1.3
Communication with district school board (efficiency)	-0.8
Learner throughput rate (efficiency)	0.9
Teaching resources (quality-c)	0.2
School discipline (quality-c)	1.0
School safety (quality-c)	0.7
Class size (quality-c)	0.3
Staff qualification (quality-pt)	0.4
Professional development (in-service training) (quality-pt)	-0.5
Homework practices (quality-lp)	1.1
Learner participation/engagement (quality-lp)	3.5
Parental involvement (quality-lp)	3.1

## The impact of block of indicators on the variation of school achievement levels

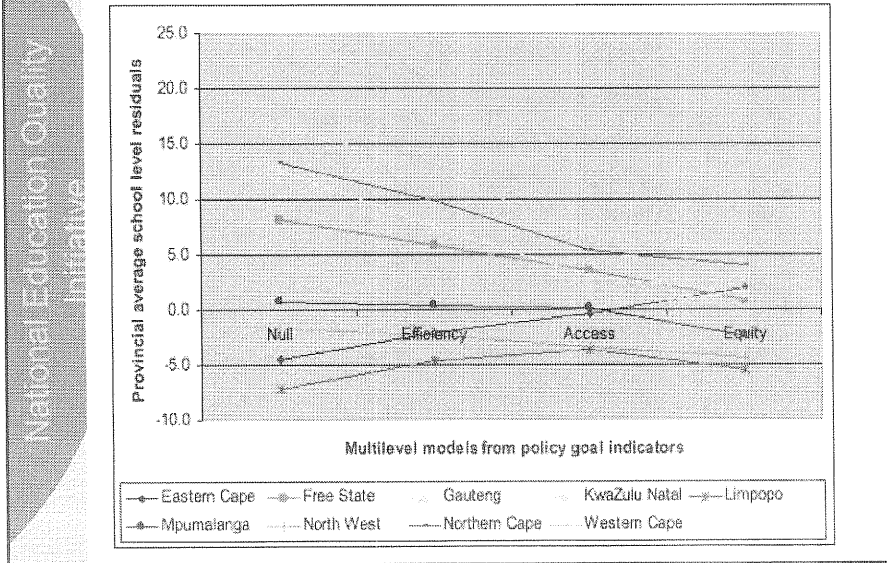
Policy Goal	# of indicators	important indicators	Variation between schools explained
Access	4	3 (1)	38.4
Quality	20		
Principal and educators	7	5 (2)	8.6
Context (school climate)	6	4 (4)	38.2
Learner and parents	7	4 (3)	51.6
Efficiency	5	3 (2)	18.4
Equity	3	2 (2)	42.2



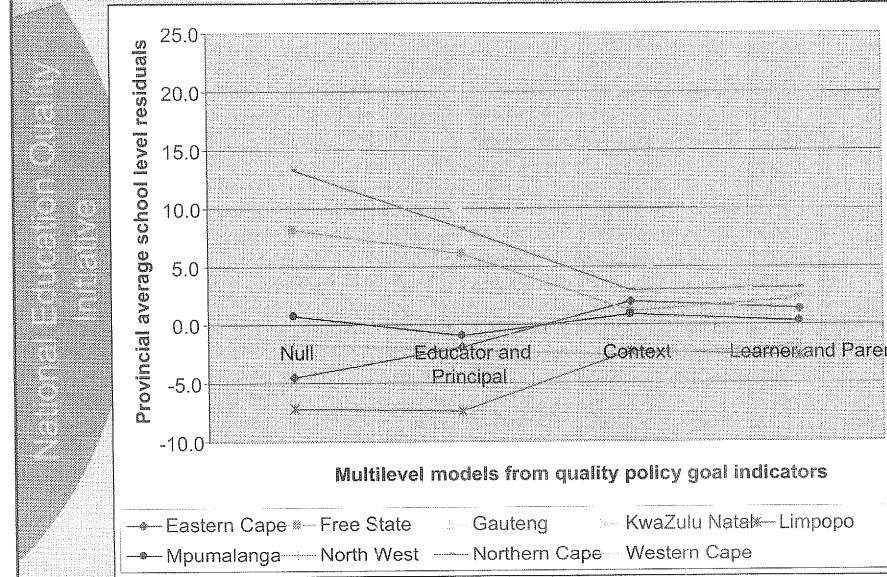
## Impact of the most important indicators on the variation in provincial achievement levels



**The impact of the policy goals (efficiency, access, and equity) indicators on the variation of provincial achievement levels**



**Impact of quality policy goal indicators on provincial differences in their learners' achievement levels**



## Concluding remarks

- School do make a difference in learner achievement levels.
- The most successful learners tend to attend schools;
  - Where there are adequate resources
  - Where students actively participate and engage in their learning
  - Where parents are actively engaged in the education of their learners.
- In high quality schools, learners from poor families are not as successful as their middle class counterparts.
- Provincial achievement levels relatively the same for schools of similar quality.

## Next step – Further analyses

- Multivariate multilevel analysis
- Analysis to determine whether school effect indicators vary by SES
- School effect analysis for each province

## Thank You

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## Additional slides

**Definitions**

**Examples**

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## Policy Goal - Access

The concept of access to education generally refers to the provision of educational opportunity to all citizens and includes entry into learning institutions, and access to learning materials and educational information, and comprises the following five features:

- \* **Access to the learning site** – as defined by how long it takes learners travel to school and the distance travelled;
- \* **Entry into learning site** – as defined by: (a) obstacles to attending schools (e.g. children with special needs); (b) admission policy and criteria (e.g. school fees) (c.) student enrolment
- \* **Access to information** – as defined by the accessibility of educational information at home and at school (e.g. newspapers, books, computers, library); and
- \* **Access to learning materials and textbooks** – as defined by the accessibility of learning materials and textbooks at home and at school materials (e.g. chalk, commercially made wall charts, exercise books, textbooks, etc.) that are used in the teaching and learning process.

## Policy Goal - Quality

In the AQEE model, quality is defined as:

- \* **What a learner should know**, which refers to the policies and goals of the education system as reflected in mission/value statements and noted in the curriculum and standards;
- \* **Where learning occurs**, that is, the context within which learning occurs (e.g. textbook availability, support systems, class size, location and safety, distance type of school, sanitary facilities, etc.);
- \* **How learning takes place**, which refers to the implemented curriculum and the characteristics of learner-teacher interaction – teachers qualifications and competence, school management (classroom, teachers, principal), language and instruction, such as whether teaching is learner-centred, whether teachers are qualified, the role that learners play in their learning (e.g. homework practices, SES, interests, ), the role that parental involvement plays, literacy rate, teacher and learner attitudes towards learning, and other teacher practices (e.g. homework, assessment and record keeping), content coverage, instructional time, discipline and commitment
- \* **What is actually learnt**, which refers to the outcomes of learning or the attained curriculum; that is, the knowledge, skills, attitudes (interests) and values that learners acquire (i.e. performance indicators or item indicators).

## Policy Goal – Efficiency

The concept of efficiency refers to the appropriate use of education resources and facilities to improve access to, and the quality of, education provided. This concept includes the mechanisms and structures in place to address the various needs of the education system (e.g. district offices). Efficiency generally comprises the following:

- **Resource allocation**, which refers to how the availability, allocation and use of human, financial and material resources within a system are managed and employed at different levels within a system (e.g. enough teaching staff);
- **Systems structures functioning**, which refers to the functioning of the current structures and systems (e.g. provinces, regions, districts and schools) and how these are staffed and managed (e.g. district managers, School Governing Bodies, etc.) regarding the formulation, implementation and monitoring of policy and practice within the system; and
- **Throughput**, which refers to the number of learners that enter and leave a system, as well as the number of learners that repeat any grades.

## Policy Goal – Equity

The concept of equity is based on the principle that all students can learn and achieve and that they should be provided with an equal opportunity to do so irrespective of their background and (dis)ability.

- **Inclusivity**, which refers to the capacity of the education system to address the specific needs of all children, irrespective of their language, gender, religion, ethnicity, geographical location or (dis)ability; and
- **Absence of unfair discrimination**, which refers to the capacity of the education system to address unfair discriminatory practices and their consequences for any specific subgroup actively. (However, the use of practices targeted at specific groups to address inequity within the system is both acceptable and necessary; for example, the introduction of additional Mathematics and Science programmes specifically for female learners.)

## Indicators correlated to learner performance

Indicator	Language (LOLT)	Mathematics	Natural Sciences
Teaching resources available to educators	0.46	0.46	0.37
Socio-economic status	0.44	0.45	0.41
Access to Information at home	0.42	0.44	0.40
School safety	0.44	0.42	0.40
Learner participation	0.39	0.39	0.39
School resources	0.41	0.37	0.37
Communication	0.31	0.36	0.28
Small class size	0.28	0.31	0.28
Parental involvement/perception	0.33	0.31	0.31
Discipline at school	0.31	0.31	0.24
Entry into schools	0.27	0.29	0.27
Access to Information at school	0.31	0.25	0.29
Access to learning material and textbooks	0.20	0.20	0.18

## School safety index

- The school safety index was constructed from school principal, parent and learner responses pertaining to perceptions of feeling safe; experiences of intimidation, bullying and sexual harassment; the carrying of weapons in school; and school activities for ensuring safety (e.g. security services, scholar patrols, fire extinguisher).



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### Learner Participation index

- The learner participation index refers to the frequency and nature of learner interaction and participation in the learning process and comprises the following indicators: learner attitude, learner morale, learner participation in the Mathematics, Language (LOLT), and Natural Sciences class, library use, language of learning and teaching (LOLT) in the classroom, and extramural activities provided by the school. Responses were obtained from learners to questions such as: do learners play an active or passive role in their learning, do they work in groups, are they given projects and assignments, do they make use of the library, and what is their attitude towards the school and their educators?

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### Quality policy goal indicators and provincial differences in their learners' achievement levels



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Legislation acts that mandate the Department of Education to assess and evaluate the South Africa education system

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- **Section 8(1) of the National Education Policy act (DoE, 2003, p.8)**
- **Section 48 of the Assessment policy for general education and training**