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Highlights from TIMSS 2011: South Africa

Towards Equity and Excellence

TRENDS IN INTERNATIONAL MATHEMATICS AND SCIENCE STUDY (TIMSS 2011)

- TIMSS is an opportunity to assess and benchmark South African mathematics and science performance in an international study. TIMSS is conducted every four years since 1995. In TIMSS 2011, 45 countries participated at the grade 8/9 level.
- It is important to measure learner achievement through national, regional and international measures. These studies provide information about the well being of our educational system; so that we could better manage and improve our systems.
- In August 2011, the HSRC administered the TIMSS 2011 mathematics and science instruments in 285 schools to 11969 grade 9 learners.
- We had conducted previous TIMSS in 1995, 1999 and 2002 and have comparable data to monitor system-level trends in a global context.

Today's Presentation

- We present initial analysis from TIMSS 2011 data.
- We will report on:

i. Methodology

ii. TIMSS 2011 achievement; Trends in achievement since 1995, Comparison between TIMSS 2002 & 2011

iii. Curriculum coverage

iv. School & Home Resources

v. Teacher & Classroom Resources

vi. Language & achievement

vii. Attitudes

Methodology

- All country participants had to follow very strict guidelines to ensure that samples were nationally representative.
- The general aims of the TIMSS 2011 sampling design is:
    - To ensure that the data provides accurate and efficient estimates of the South African grade nine school population;
    - To provide accurate measures of change in the student achievement from cycle to cycle.
- Hence TIMSS follows a 2-stage stratified cluster sampling design. With schools sampled at the first stage and intact classes as the second stage of sampling.
- Variables used for stratification were:
    - Province
    - Language offered by the school
    - School type (Public, Independent and Dinaledi)

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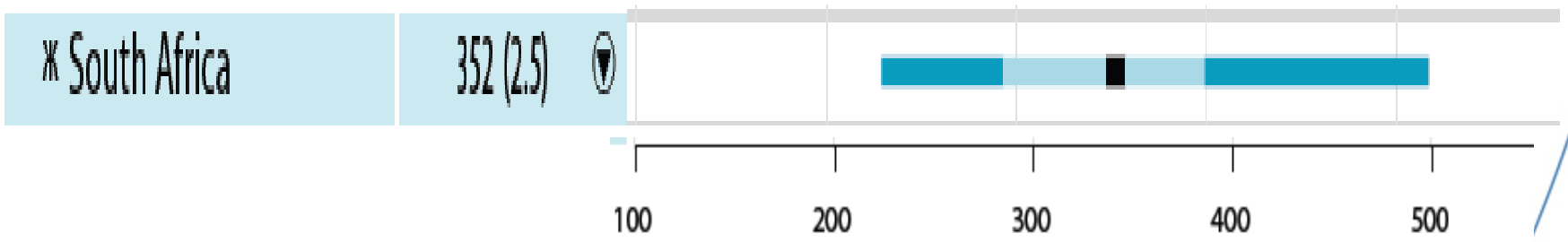
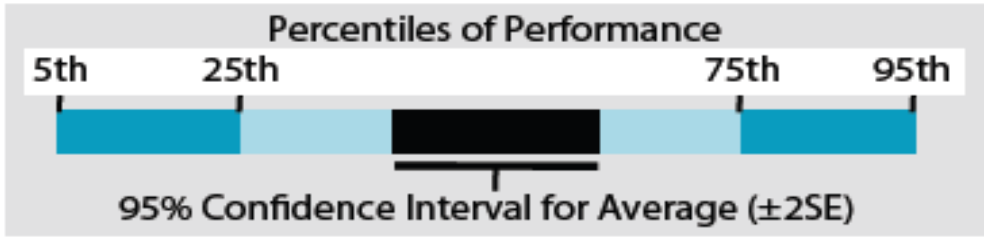
Scaling of TIMSS achievement data

- TIMSS assessments cover a wide range of topics in mathematics and science.
- Hence a **matrix-sampling booklet** design is used where learners are only administered a subset of all the items in the matrix.
- In order to obtain learner scores on the entire assessment, Item Response Theory (IRT) scaling method is used to impute learner scores.
- TIMSS scaling approach uses plausible values to obtain proficiency scores in mathematics and science.
- To improve reliability of scores; IRT uses scores in conjunction with background information to impute scores.

Mathematics Score distribution explained





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Mathematics Score distribution explained

- The length of the distribution relates to variation.
- Important to note is that this variation should decrease/ become narrow over time (between TIMSS cycles).
- Black centre portion: Mean scores on the TIMSS achievement scale (with 95% confidence interval)
- The 5th percentile : 5% of the scores will be less than or equal to the score at that point of the range.
- The 95th percentile: 95% of the scores will be less than or equal to the score at that point of the range.
- The lighter shading on either side of the black area indicates the range of scores achieved by the middle 50% of the learners.

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Trends: TIMSS 1995 to 2011

- The TIMSS achievement scale has a centre point of 500 and a standard deviation of 100 which were metrics established in 1995 (first cycle of TIMSS).
- It is scaled to remain constant so that comparisons can be between countries and across years.
- Data from the previous cycle and data from successive cycles are scaled using a process called – concurrent calibration.
- Hence placing all data on the same scale for comparability.

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Key messages from TIMSS 2011

- South African mathematics and science national average scores, although still low, has improved from 2002.
- The difference between the highest and lowest scores in 2002 to 2011 has decreased.
- The greatest improvements in scores is observed at the lowest end, from the lowest performing schools and provinces, and in schools formerly designated for Africans.
- The top end has not shown any major improvements and the former House of Assembly/ Model C and Independent schools perform at similar levels, but lower than the middle (Centrepoint) score.

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1. Distribution of Mathematics and Science achievement in participating countries

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Exhibit 1.2: Distribution of Mathematics Achievement

TIMSS 2011 Mathematics 8th Grade

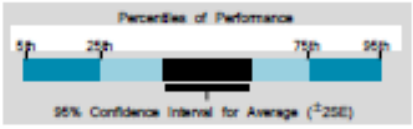
Country	Average Scale Score	Mathematics Achievement Distribution
Korea, Rep. of	613 (2.9)	▲
2 Singapore	611 (3.8)	▲
Chinese Taipei	609 (3.2)	▲
Hong Kong SAR	586 (3.8)	▲
Japan	570 (2.6)	▲
2 Russian Federation	539 (3.6)	▲
3 Israel	516 (4.1)	▲
Finland	514 (2.5)	▲
2 United States	509 (2.6)	▲
‡ England	507 (5.5)	
Hungary	505 (3.5)	
Australia	505 (5.1)	
Slovenia	505 (2.2)	▲
1 Lithuania	502 (2.5)	
TIMSS Scale Centerpoint	**500**	
Italy	498 (2.4)	
New Zealand	488 (5.5)	▼
Kazakhstan	487 (4.0)	▼
Sweden	484 (1.9)	▼
Ukraine	479 (3.9)	▼
Norway	475 (2.4)	▼
Armenia	467 (2.7)	▼
Romania	458 (4.0)	▼
United Arab Emirates	456 (2.1)	▼
Turkey	452 (3.9)	▼
Lebanon	449 (3.7)	▼
Malaysia	440 (5.4)	▼
1 Georgia	431 (3.8)	▼
Thailand	427 (4.3)	▼
Ψ Macedonia, Rep. of	426 (5.2)	▼
Tunisia	425 (2.8)	▼
Chile	416 (2.6)	▼
Ψ Iran, Islamic Rep. of	415 (4.3)	▼
Ψ Qatar	410 (3.1)	▼
Ψ Bahrain	409 (2.0)	▼
Ψ Jordan	406 (3.7)	▼
Ψ Palestinian Nat'l Auth.	404 (3.5)	▼
Ψ Saudi Arabia	394 (4.6)	▼
Ψ Indonesia	386 (4.3)	▼
Ψ Syrian Arab Republic	380 (4.5)	▼
※ Morocco	371 (2.0)	▼
Ψ Oman	366 (2.8)	▼
※ Ghana	331 (4.3)	▼
Ninth Grade Participants		
Ψ Botswana	397 (2.5)	▼
※ South Africa	352 (2.5)	▼
2 ※ Honduras	338 (3.7)	▼

100 200 300 400 500 600 700 800

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

▲ Country average significantly higher than the centerpoint of the TIMSS 8th grade scale

▼ Country average significantly lower than the centerpoint of the TIMSS 8th grade scale



- For mathematics, Asian countries – Korea, Singapore, Chinese Taipei, Hong Kong and Japan - are top performers.
- South Africa, Botswana and Honduras conducted the study at Grade 9 level.
- South African performance is still at the low end, but has improved since 2002. In 2002 South Africa scored 285 points at the grade 9 level. In 2011 the score was 352.
- The top South African performers approached the average performance of the top performing countries.

2. Trends in Mathematics and Science achievement in South Africa: 1995, 1999, 2002 and 2011.

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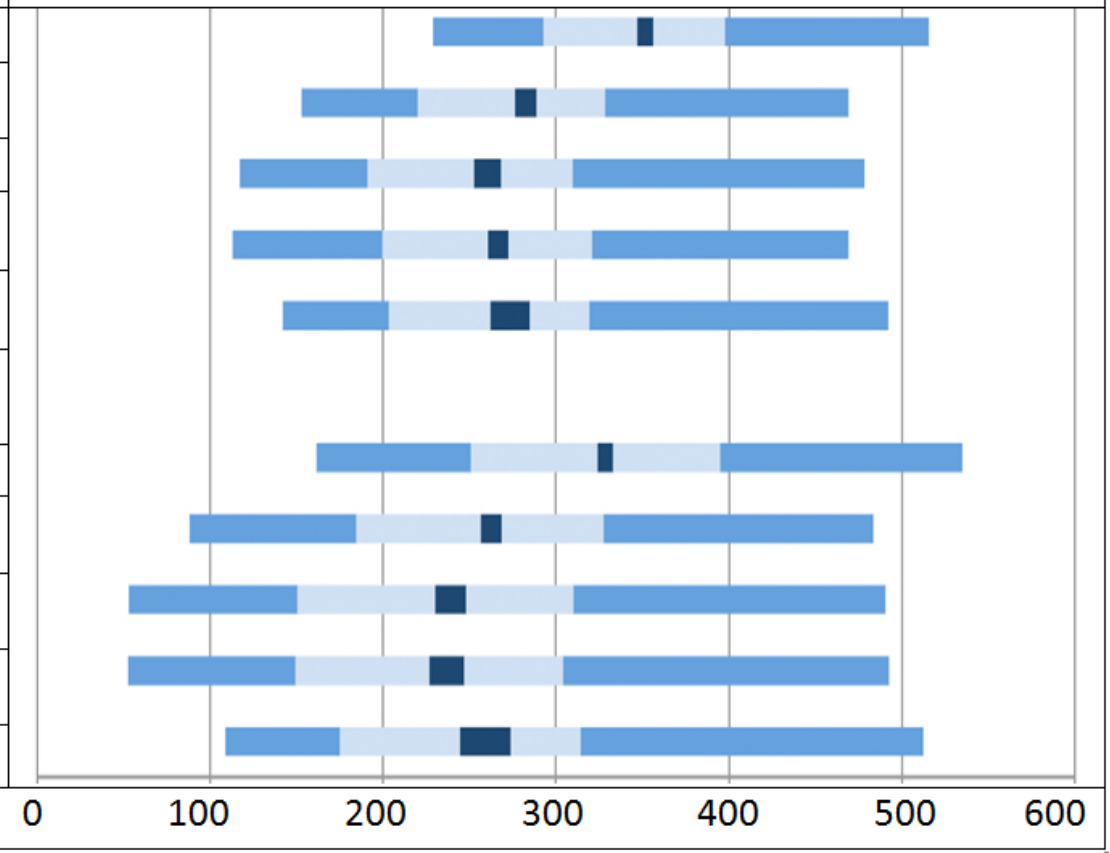
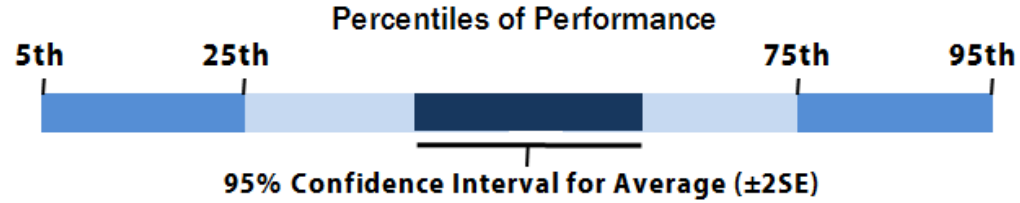
MATHEMATICS	Average scale score	Achievement distribution
Grade 9 TIMSS 2011	352 (2.5)	
Grade 9 TIMSS 2002	285 (4.2)	
Grade 8 TIMSS 2002	264 (5.5)	
Grade 8 TIMSS 1999	275 (6.8)	
Grade 8 TIMSS 1995	276 (6.7)	
SCIENCE		
Grade 9 TIMSS 2011	332 (3.7)	
Grade 9 TIMSS 2002	268 (5.5)	
Grade 8 TIMSS 2002	244 (6.7)	
Grade 8 TIMSS 1999	243 (7.8)	
Grade 8 TIMSS 1995	260 (7.9)	





Trends between TIMSS 1999 and TIMSS 2011

- For TIMSS 1995, 1999 and 2002, the average score remained the same – perhaps due to the structural and educational changes in the country since 1994.
- Between TIMSS 2002 to 2011, there is an increase in achievement scores.
- Score distribution: the scores at the lower end increased.
- TIMSS estimates within a 4-year cycle a country could expect up to 40 point improvement –i.e. improve by one grade level.
- South African scores improved by around 60 points – general improvement by 1.5 grade levels between 2002 and 2011.

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3. Provinces: Achievement and Change in Achievement between 2002 to 2011.

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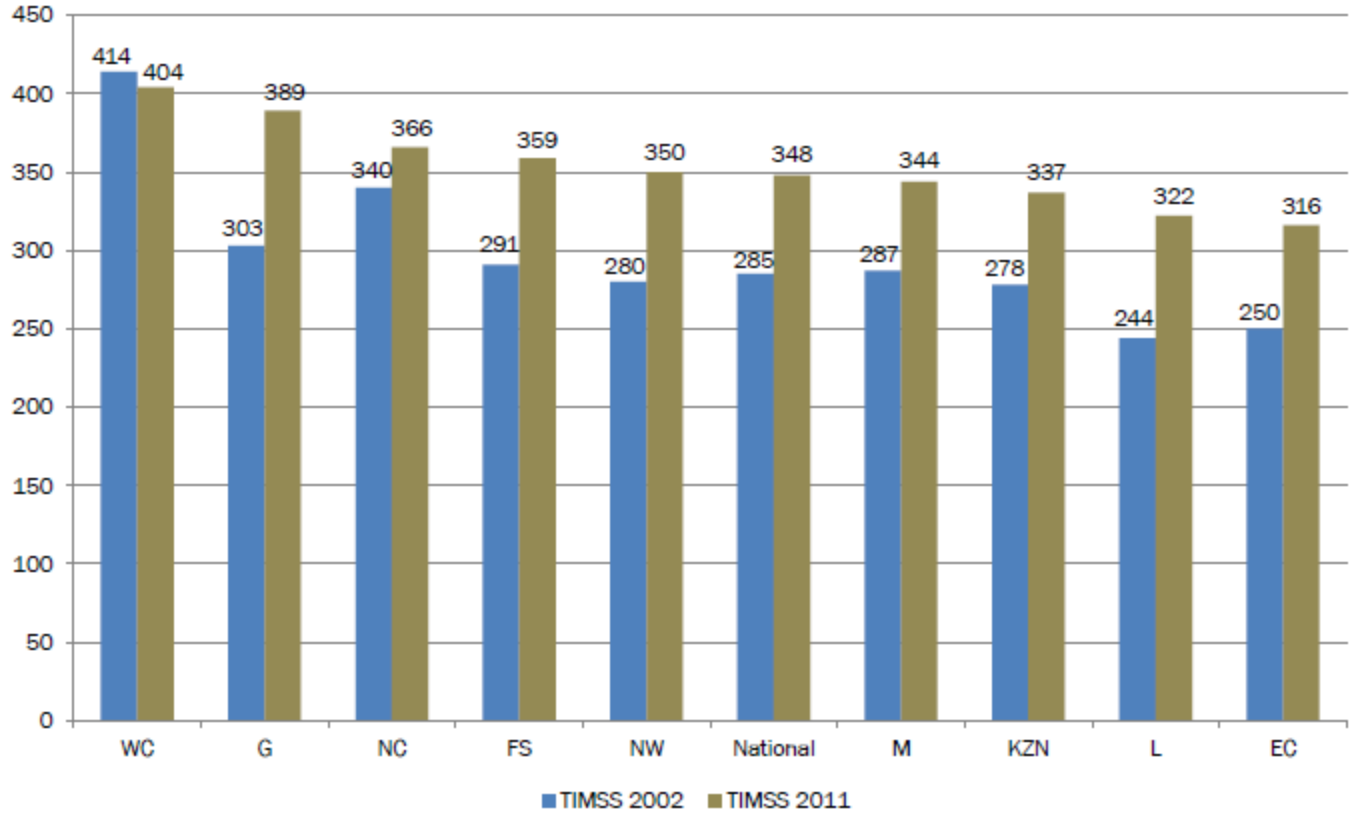
Change in achievement by province between 2002 to 2011



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Provincial performance

- All provinces, except Western Cape, increased the mathematics and science scores between 2002 and 2011.
- The changes in the Western Cape and Northern Cape scores is not statistically significant.
- The order of greatest improvement in mathematics scores are: Limpopo (1.33), Gauteng (1.31), Eastern Cape (1.27), NorthWest (1.26), Free State (1.24), KwaZuluNatal (1.23), Mpumalanga (1.2), Northern Cape (1.07), Western Cape (0.99).
- In 2002, the difference between highest and lowest performing province was 170 points. This decreases to 86 in 2011 – moving towards equitable outcomes.

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4. School Type: Achievement and change in achievement

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4.1.Public and Independent Schools

- In the study we oversampled the group of independent schools so that we could report on performance in public and independent schools.
- Independent schools scored higher than public schools. For mathematics:

Public schools:	348 points
Independent schools:	474 points

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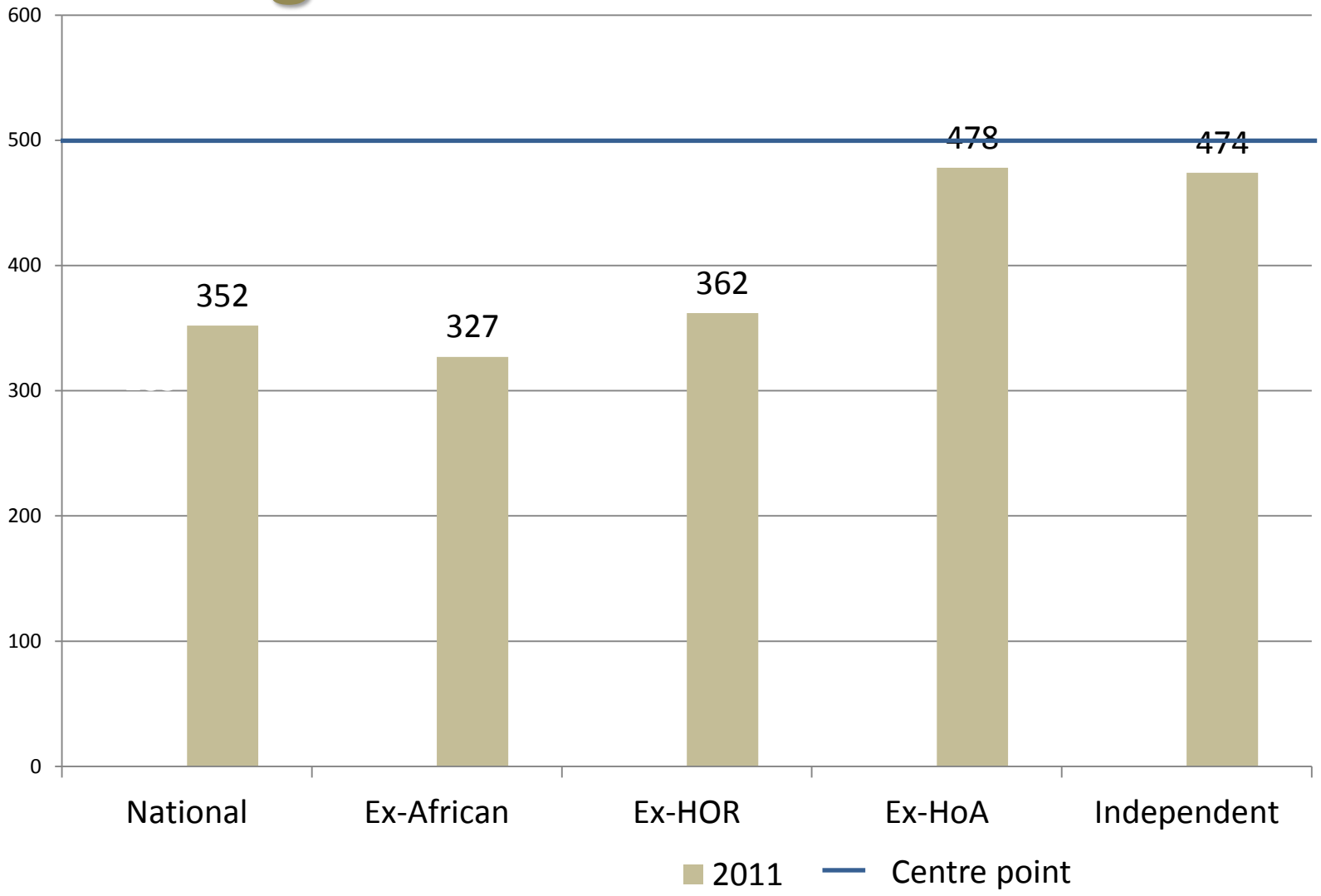
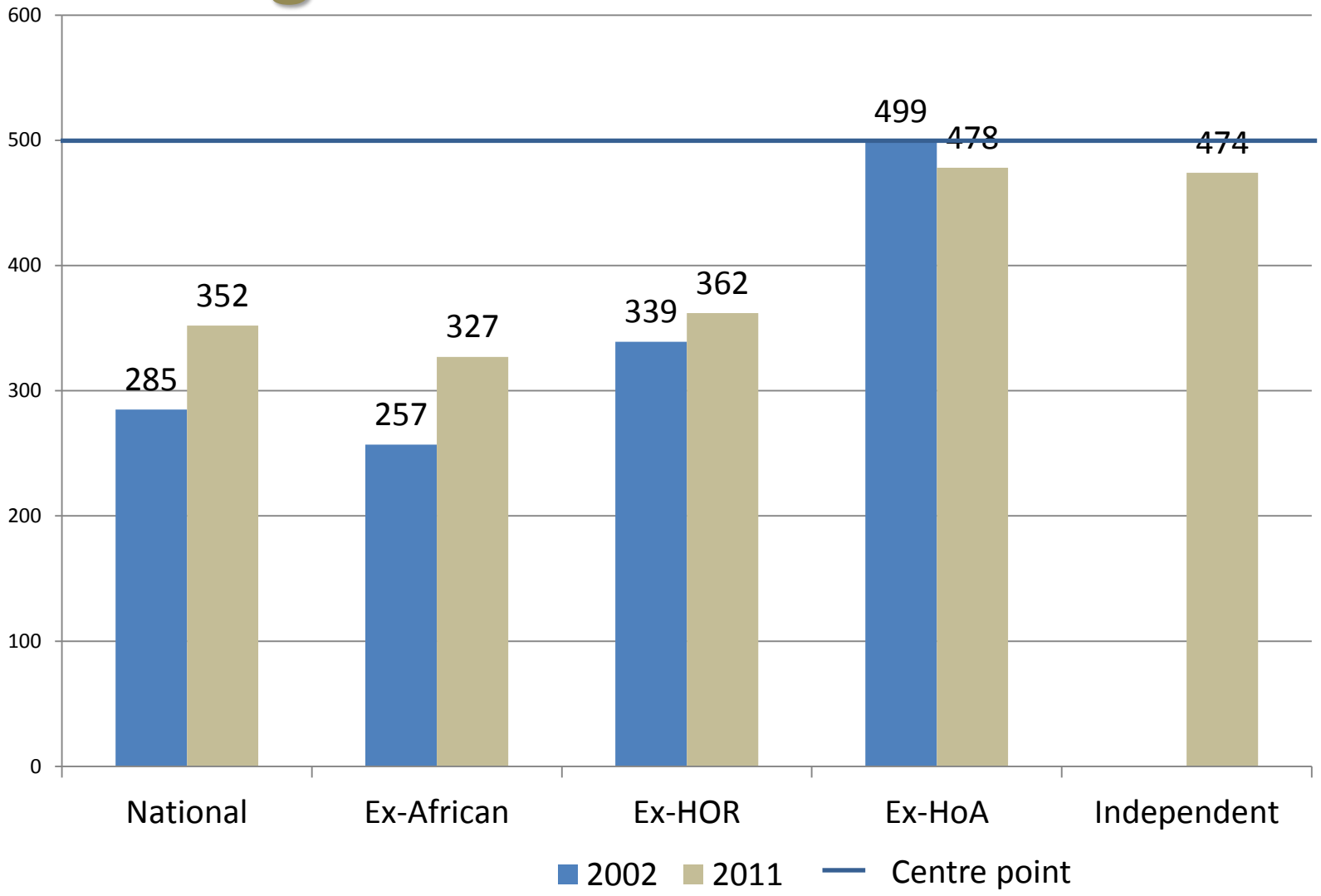
4.3. Former racial departments: Changes between 2002 to 2011



4.3. Former racial departments: Changes between 2002 to 2011



Performance by School Types

- The greatest improvement in average achievement scores, between 2002 and 2011, was in former African schools.
- The Independent Schools and former House of Assembly schools perform at similar levels.
- Former HoA, Quintile 5 and Independent schools achieve average scores below the Centrepoint/ middle score of 500.

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5. Performance at International Benchmarks

Describe what learners know and can do.

Helps identify learners that can perform at high skills level

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Performance at scores above 400: access to S&T careers and indicator of quality

	Advanced Benchmark (%) >625	High Benchmark (%) >550	Intermediate Benchmark (%) 475	Low Benchmark (%) >400	Less than 400 points
Gr 8 TIMSS 1995	0.3	2	6.6	13.6	**87%**
Gr 8 TIMSS 1999	0.2	1.5	5.7	13.2	**86.8%**
Gr 9 TIMSS 2002	0.6	1.5	2.8	10.5	**89.5%**
Gr 9 TIMSS 2011	1	3	9	24	**76%**

Performance at scores above 400: access to S&T careers and indicator of quality

	Advanced Benchmark (%) >625	High Benchmark (%) >550	Intermediate Benchmark (%) 475	Low Benchmark (%) >400	Less than 400 points
Gr 8 TIMSS 1995	0.3	2	6.6	13.6	**87%**
Gr 8 TIMSS 1999	0.2	1.5	5.7	13.2	**86.8%**
Gr 9 TIMSS 2002	0.6	1.5	2.8	10.5	**89.5%**
Gr 9 TIMSS 2011	1	3	9	24	**76%**
BOTSWANA	0	2	15	50	**50%**

6. Future.....?

- Participation in TIMSS 2015.
- Work towards improvement of both lower and top end of performance.
- With the effort and commitment of schools, teachers and learners and support from the educational departments we should set the target for an improvement by **30 points to reach a score of 382 in 2015 & 40% of learners score above 400 points.**

Projected scores

YEAR	Grade 9 Mathematics scores
2023	**442**
2019	**412**
2015	**382**
2011	**352**
2002	**285**
1999	**296 (extrapolated)**
1995	**294 (extrapolated)**

CONTEXTUAL INFORMATION : Using Learner, Teacher, School & Curriculum Questionnaires

Provide insights into factors that are positively related to academic success.

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SCHOOL & HOME RESOURCES

Literature

- Learners draw resources, both tangible and intangible, from school and home environments – impact on learners' learning experience and performance
- Higher levels of resources are linked to better educational outcomes
- Learning is more difficult in learning environments where discipline, absenteeism, fear of injury or loss of personal property is a problem

Learning environment at school

- Three school safety and discipline indices (Principal, Teachers, Learners)
- School climate (resources, learner background, teacher working conditions)

Learning environment at home

- Home educational resources
- Learning resources at home

School environment

School discipline and safety index (Principals report)

- 4% of learners attended schools with hardly any problems – 4 times less than the international figure of 16%
- 3% of public school learners and 34% of independent school learners attended schools with hardly any problems with discipline and safety
- In the EC, MP, NC, NW all learners attended schools with discipline and safety problems
- Data suggests a negative impact on performance: e.g. Math performance range in public schools is 31 points and in independent schools 82 points

Safe and orderly school index (Teachers report)

- Math teachers: 21%, Science teachers: 23% of the grade 9 learners attended safe and orderly schools

Students bullied at school index (Learners report)

- Three in every four learners (75%) experience bullying weekly/ monthly – the international figure is 41% of learners
- Learners in MP, LP, KZN worst off (more than 80% bullied)
- Data suggests that class size has a negative effect on bullying

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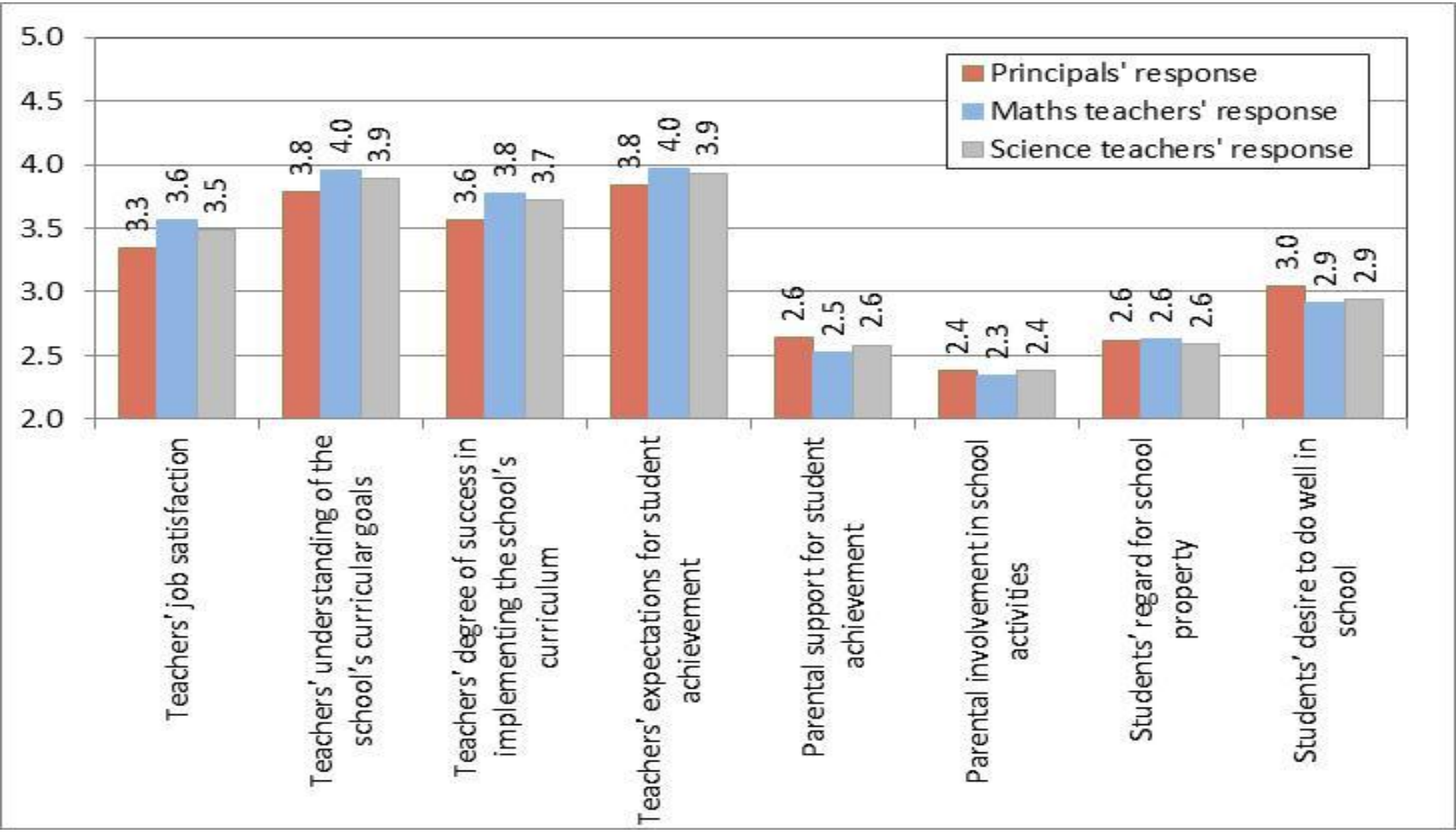
SCHOOL CLIMATE

Comparison between principals', math and science teachers' responses regarding questions on school climate



Teachers' working conditions

Mathematics and science achievement scores by type of school and by teachers' report on working conditions

Type of school	Teacher working conditions index	Learners taught by mathematics teachers		Learners taught by science teachers	
		Percent of learners	Mathematics achievement score (SE.)	Percent of learners	Science achievement score (SE.)
Public	Hardly any problems	8	459 (21.7)	4	499 (16.2)
	Minor problems	26	362 (7.1)	30	344 (9.7)
	Moderate problems	66	330 (3.1)	66	306 (4.6)
Indepen-	Hardly any problems	47	519 (22.4)	47	522 (19.8)
dent	Minor problems	43	414 (24.5)	50	433 (27.4)
	Moderate problems	10	411 (31.6)	3	321 (10.8)

Nationally, 9% of learners were taught by Math teachers who had hardly any problems with working conditions, while 5% of learners were taught by Science teachers who had hardly any problems with working conditions.

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Resources in school

Percent of learners whose teachers use these resources to teaching math and science

	Textbooks		Workbooks or Worksheets		Computer Software for mathematics and science instruction	
	As Basis for Instruction	As a Supplement	As Basis for Instruction	As a Supplement	As Basis for Instruction	As a Supplement
Maths (SA)	71 (3.5)	27 (3.4)	43 (3.7)	51 (3.7)	5 (1.7)	19 (2.9)
Maths (Int.)	77 (0.4)	21 (0.4)	34 (0.5)	62 (0.5)	7 (0.3)	55 (0.5)
Science (SA)	66 (3.6)	28 (3.2)	39 (3.8)	52 (3.7)	3 (1)	17 (2.9)
Science (Int.)	74 (0.4)	24 (0.4)	35 (0.5)	60 (0.5)	16 (0.4)	61 (0.5)

Resources in school

Instruction affected by resource shortages	Not Affected		Range
	Percent of learners	Average Achievement	
Maths (SA)	5 (0.9)	510 (15.2)	160
Maths (Int.)	25 (0.5)	488 (2.2)	35
Science (SA)	5 (1.0)	499 (24)	166
Science (Int.)	22 (0.4)	494 (1.9)	30

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Instruction - Limiting factors

Learners in classrooms where teachers report that instruction is limited by:

	A lack of prerequisite knowledge or skill		Lack of nutrition		Lack of sleep		Disruptive learners	
	Not At All		Not At All		Not At All		A Lot	
	% of learners	Avg Achieve-ment	% of learners	Avg Achieve-ment	% of learners	Avg Achieve-ment	% of learners	Avg Achieve-ment
Maths (SA)	7 (1.4)	365 (11.7)	37 (3.3)	379 (6.7)	41 (3.5)	350 (5.7)	21 (3.2)	342 (6)
Maths (Int.)	15 (0.4)	490 (1.9)	63 (0.5)	477 (0.8)	43 (0.6)	477 (1)	17 (0.4)	444 (1.8)
Science (SA)	9 (2.4)	340 (21)	38 (3.0)	351 (8.7)	31 (3.4)	330 (8.5)	22 (3.3)	338 (10.7)
Science (Int.)	20 (0.4)	496 (2)	64 (0.5)	485 (0.8)	42 (0.5)	484 (1)	17 (0.4)	462 (1.8)

Home educational resources

Components of the Home Educational Resources Scale	Percent of learners with:		
	More than 100 Books in their home	Own Room and Internet Connection in Home	At Least One Parent with a University Degree or Higher
South Africa	9 (0.4)	25 (0.7)	19 (0.7)
International Avg.	25 (0.2)	53 (0.2)	32 (0.2)

Home educational resources

Home educational resources Index	Many Resources		Some Resources		Few Resources	
	Percent of learners	Average Achievement	Percent of learners	Average Achievement	Percent of learners	Average Achievement
Maths (SA)	3 (0.2)	487 (8.3)	55 (0.8)	362 (2.8)	42 (0.8)	333 (2.7)
Maths (Int.)	12 (0.1)	530 (1.2)	67 (0.2)	470 (0.6)	21 (0.2)	415 (1)
Science (SA)	3 (0.2)	504 (9.9)	55 (0.8)	347 (4)	42 (0.8)	305 (4.1)
Science (Int.)	12 (0.1)	540 (1.1)	67 (0.2)	480 (0.6)	21 (0.2)	424 (1)

Conclusion

- Learners draw resources, both tangible and intangible, from school and home environments – impact on learners' learning experience and performance
- Higher levels of resources are linked to better educational outcomes
- Learning is more difficult in learning environments where discipline, absenteeism, fear of injury or loss of personal property is a problem

Curriculum: Introduction

- Curriculum stability
- Performance increase
- International representative curriculum coverage
- Mathematics performance higher than the science performance

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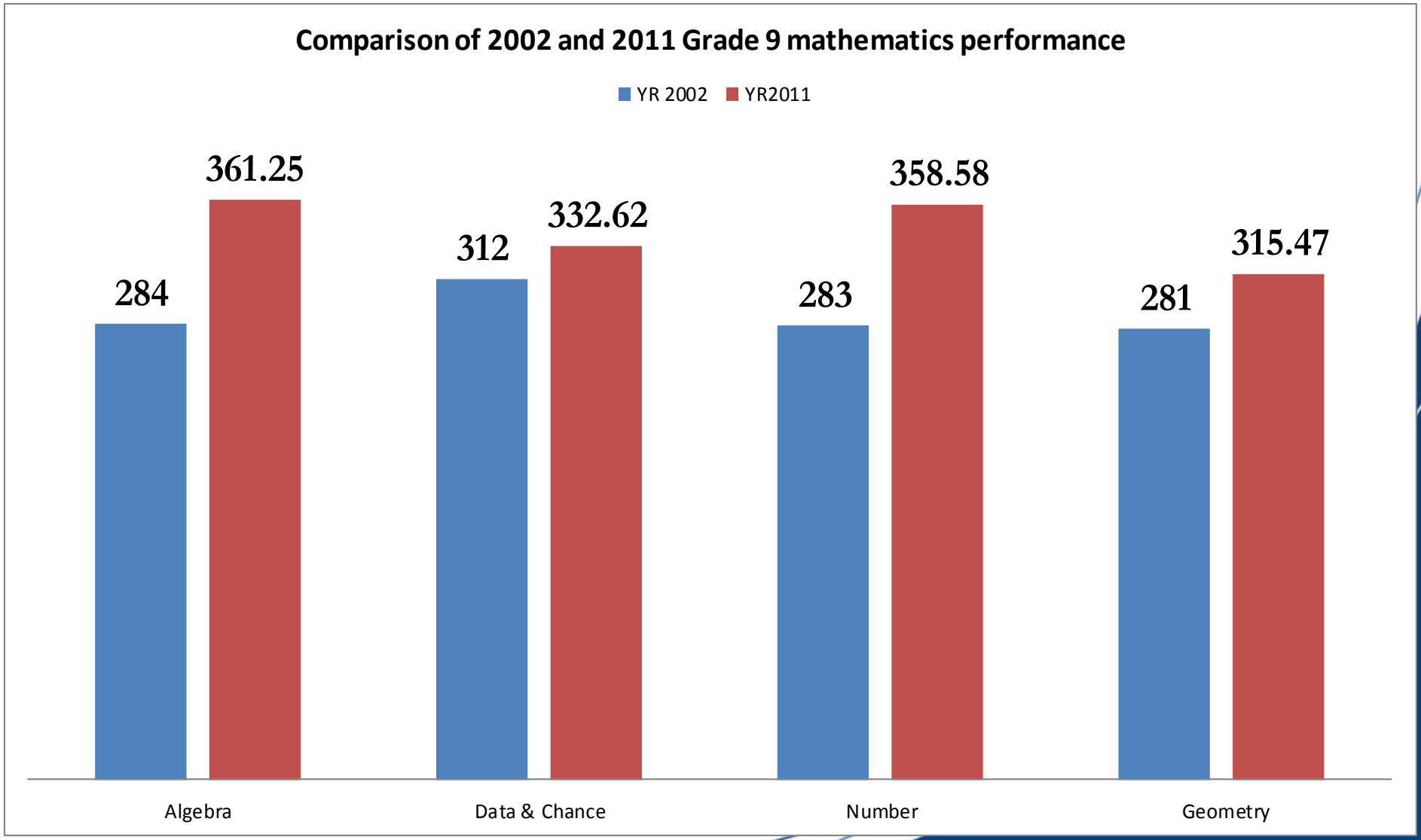
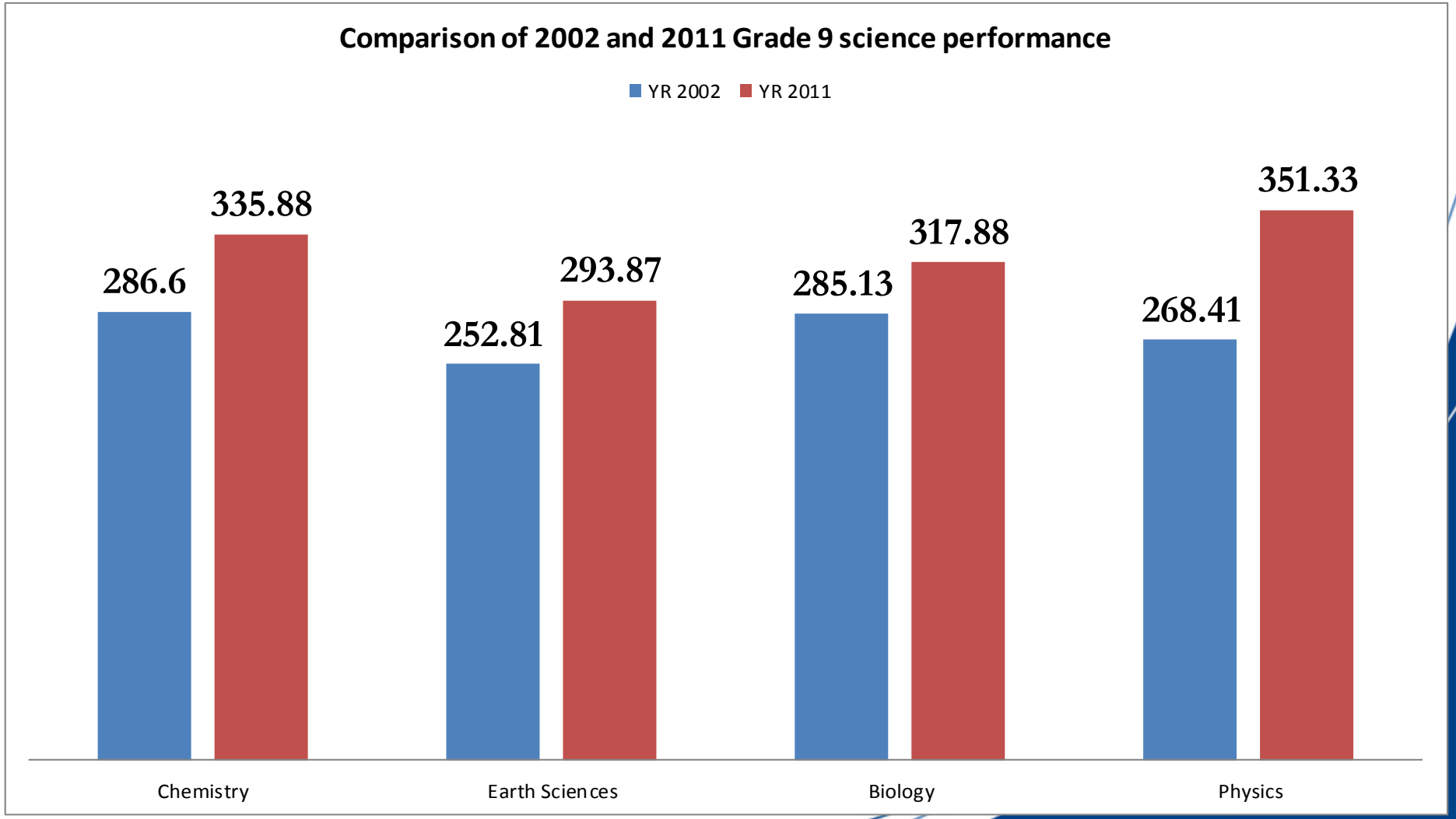
Changes in Curriculum landscape

Curriculum	Years	Reasons	Duration	
Interim syllabus	1995 - 1997	Changing from Apartheid system to the democratic system	2 years	
Curriculum 2005	1998 – 2001	Skewed curriculum, lack of human resources for implementation, curriculum and assessment policy not aligned policy overload, no classroom transferability, inadequate teacher training, and inequitable quality of materials.	3 years	
Revised National Curriculum Statement	2002 - 2011	Lack of a plan for implementation, an overabundance of policies, guidelines and interpretations of policies and guidelines at all levels of the education system, and unclear role of subject advisor.		
Curriculum Assessment Policy Statement	2012			

Mathematics performance difference between 2002 and 2011



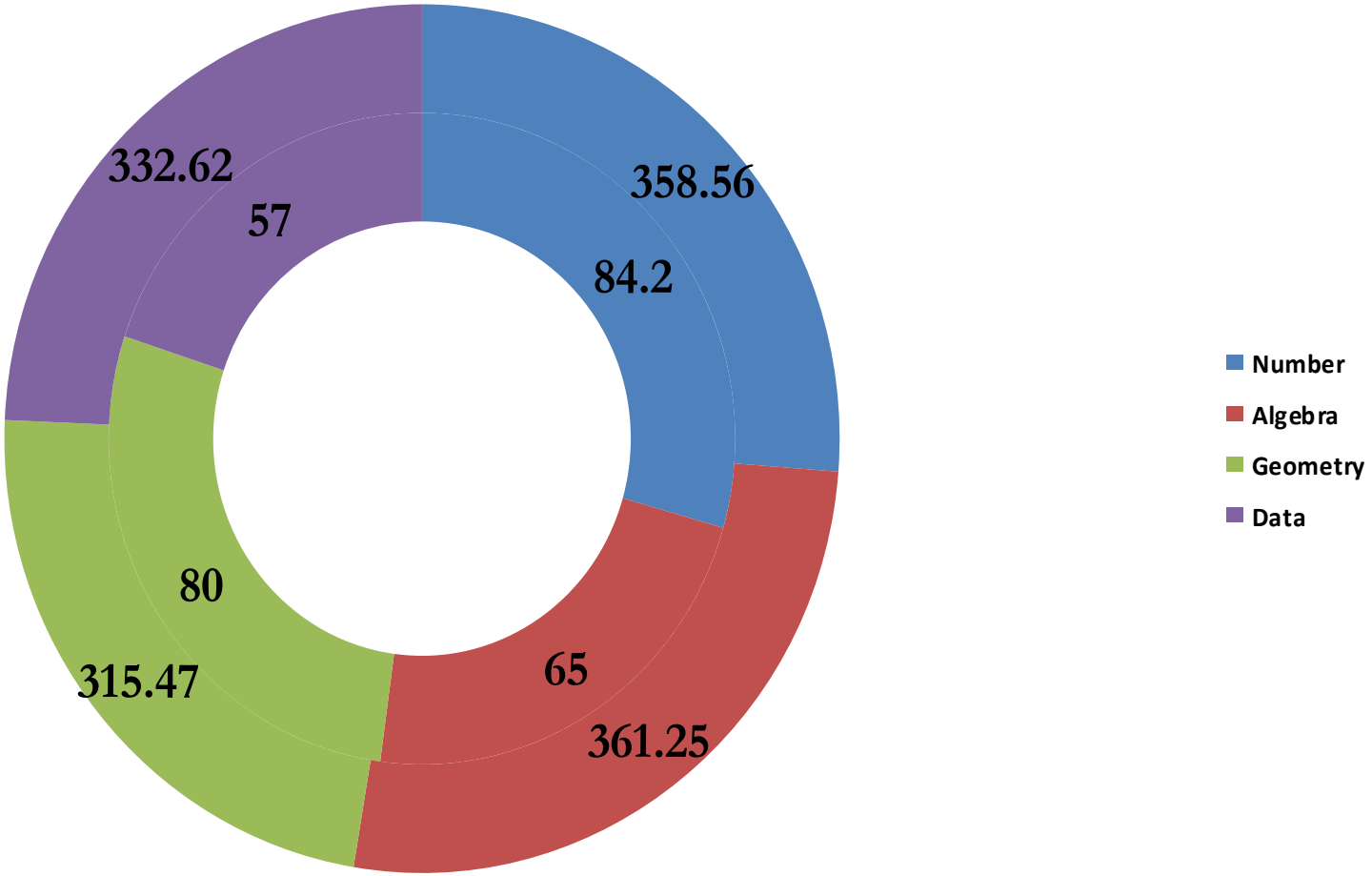
Science performance difference between 2002 and 2011



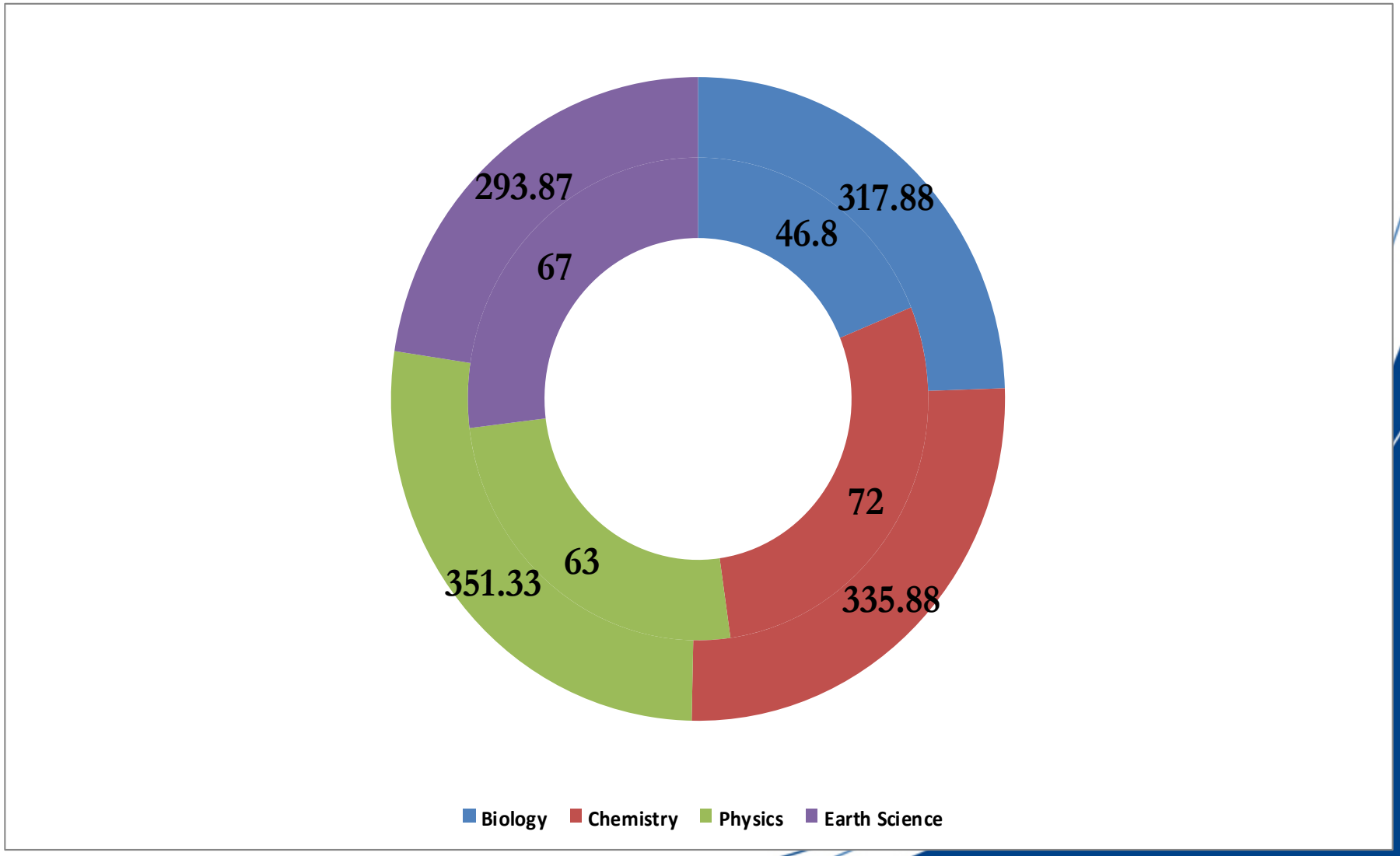
Curriculum coverage in percentages

	IEA TCMA intended	SA Intended	SA reported implemented
Mathematics	100	94	72
Science	100	90	62

Math topics coverage and performance



Science topics coverage and performance



Conclusion

- Improvement of mathematics and science performance in 2011
- Curriculum stability for the ten year period
- Curriculum implementation challenges continued

  In general mathematics coverage was higher than science coverage, this might have translated to the overall better mathematics performance. However, there is no direct relationship between performance and curriculum coverage.

TEACHERS

- Examines the context for TIMSS learners' learning
- Aim: describe variables that are most likely to have an impact on or be associated with achievement
- Indicative rather than representative of SA teachers
- Learner is the unit of analysis

- We will report on:
  - Gender, Age, Years of teaching, Academic preparation, Professional development, Preparedness to Teach, and their Confidence in Teaching and Career Satisfaction

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KEY ISSUES

- Maturation of teaching force: experienced teachers – increased from 10 to 14 years overall teaching experience.

- Increase in percentage of teachers with post-matric and academic qualifications and a high percentage of teachers with subject specialisation in mathematics and science.

- Teachers are very confident in their preparedness to teach and confident in teaching mathematics and science.

GENDER

Percentage of Students by Teacher Characteristics		2011	Achievement Scores	2002	Achievement Scores
Mathematics	Female	42%	364	39%	276
	Male	58%	337	61%	291
Science	Female	57%	330	43%	272
	Male	43%	318	57%	266

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EXPERIENCE

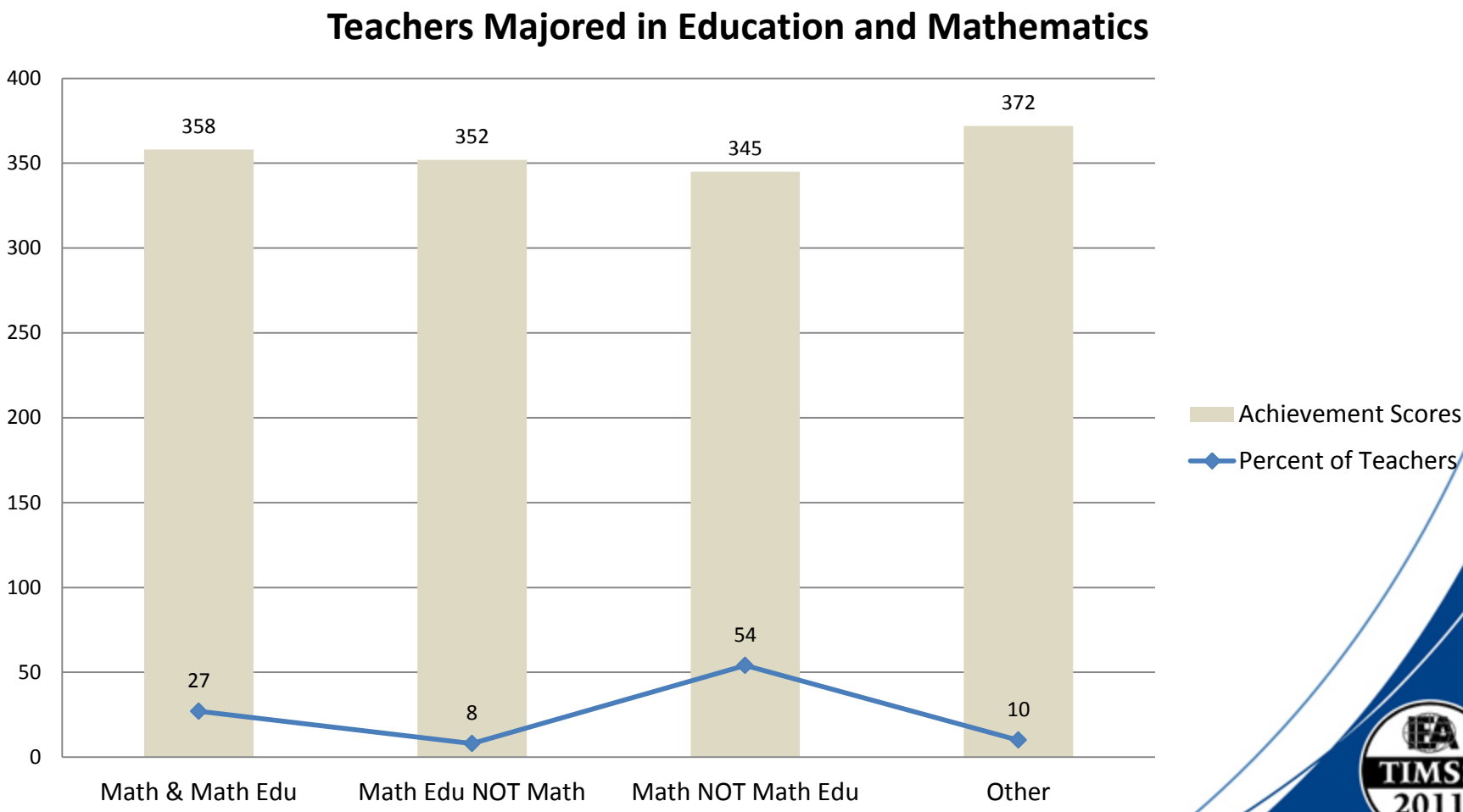
	20 Years or More		At least 10 years but less than 20 years		At least 5 years but less than 10 years		Less than 5 years		Ave: Years of Experience
MATH	Students %	AA	Students %	AA	Students %	AA	Students %	AA	
SA	**30%**	344	**33%**	358	**18%**	364	**19%**	345	**14**
Int.	**36%**	474	**28%**	470	**19%**	463	**18%**	458	**16**
SCIENCE									
SA	**29%**	346	**31%**	304	**20%**	341	**20%**	345	**14**
Int.	**33%**	480	**29%**	480	**19%**	475	**20%**	471	**15**

Academic Preparation

MATHEMATICS				
Percentage of Students by Their Teachers' Educational Level	SA 2011	2011 Achievement Scores	2011 Int.	SA 2002
Finished Grade 12	2%	~	3%	5%
Finished diploma	38%	338	11%	64%
Finished first degree	43%	356	63%	23%
Finished honours degree or higher	17%	353	24%	8 %

SCIENCE				
Percentage of Students by Their Teachers' Educational Level	SA 2011	2011 Achievement Scores	2011 Int.	SA 2002
Did not complete Grade 12	1%	~		1%
Finished Grade 12	1%	~	2%	2%
Finished diploma	46%	314	8%	61%
Finished first degree	33%	326	63%	26%
Finished honours degree or higher	20%	342	27%	10%

Educational Emphasis on Mathematics



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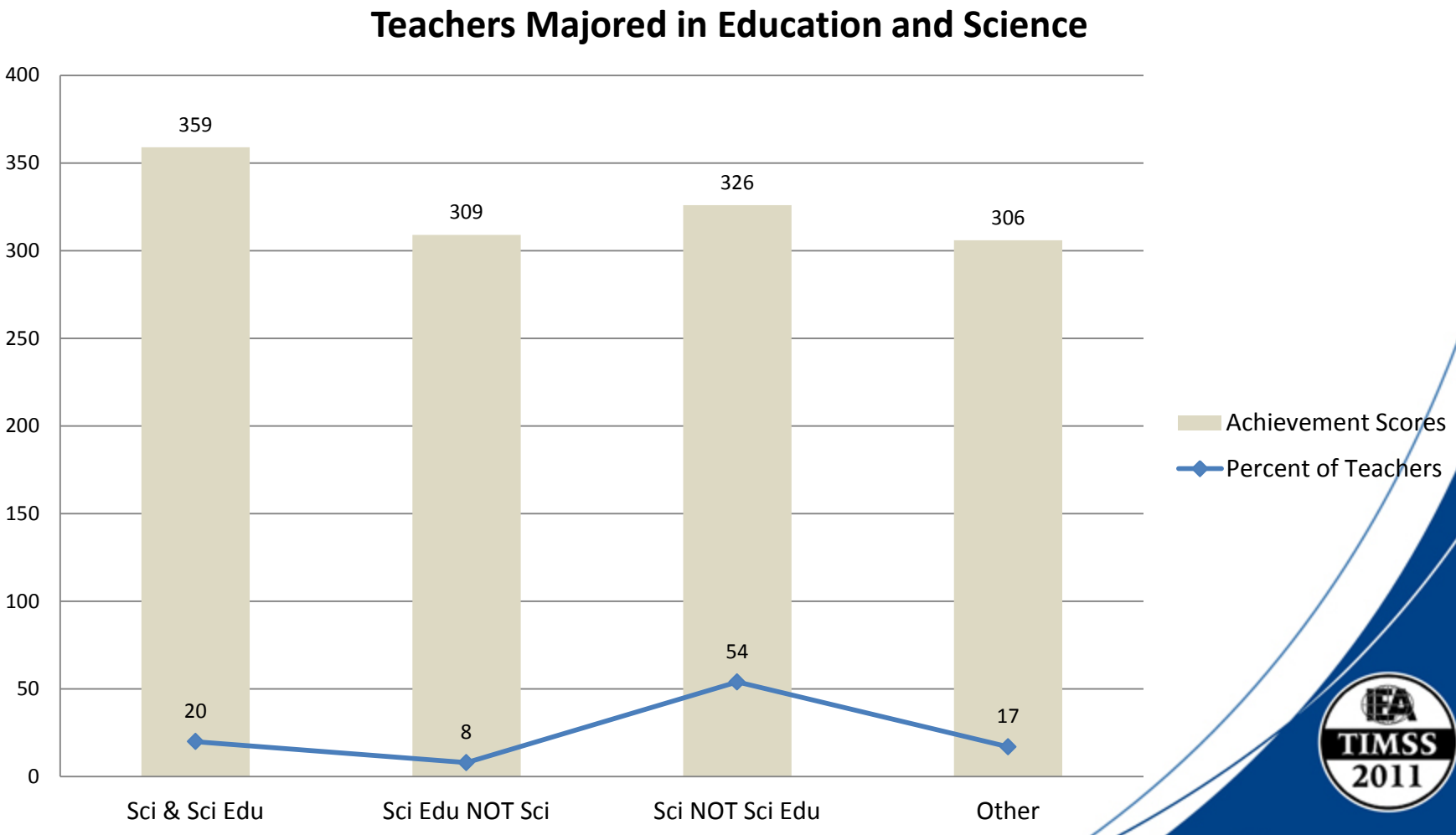
Educational Emphasis on Science



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Teachers' Preparation to Teach

- Overall Mathematics (19 Topics): 88%; Int Avg: 84%
- Overall Science (20 Topics): 76%; Int Avg: 72%

Mathematics Topics	SA Avg. 2011	Int. Avg. 2011
Numbers (5 Topics)	93%	92%
Geometry (6 Topics)	85%	85%
Algebra (5 Topics)	92%	87%
Data and Chance (3 Topics)	80%	62%

Science Topics	SA Avg. 2011	Int. Avg. 2011
Biology (7 Topics)	84%	77%
Chemistry (4 Topics)	79%	82%
Physics (5 Topics)	76%	78%
Earth Science (4 Topics)	57%	47%

Confidence in Teaching and Career Satisfaction

Teachers Confidence in Teaching	Very Confident		Somewhat Confident	
	Students %	Average Achievement	Students %	Average Achievement
Math: SA Avg	89%	354	11%	336
Math: Int. Avg.	76%	470	24%	456
Sci: SA Avg	81%	332	19%	317
Sci: Int. Avg	73%	479	27%	467

Teacher Career Satisfaction	Satisfied		Somewhat Satisfied		Less Than Satisfied	
	Students %	Average Achievement	Students %	Average Achievement	Students %	Average Achievement
Math: SA Avg	42%	351	48%	357	10%	332
Math: Int. Avg.	47%	473	45%	464	7%	462
Sci: SA Avg	38%	323	54%	331	8%	345
Sci: Int. Avg	47%	481	45%	474	8%	473

Conclusion

- South African TIMSS 2011 teachers are:
  - Older
  - Experienced
  - Well qualified
  - Well prepared
  - Confident
  - Satisfied
- Audit of teacher qualifications
  - National level, or
  - Representative sample

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THE IMPORTANCE OF LANGUAGE

- Assumptions:
  - Learners move from "learning to read" to "reading to learn"
  - Text-rich, language-dependent background and activity enhance conceptual, cognitive and academic proficiency among learners
- TIMSS data allow for analysis of the association between learner achievement and contextual language factors/conditions closely related to writing, reading and speaking (within the three categories shown in the table to come)

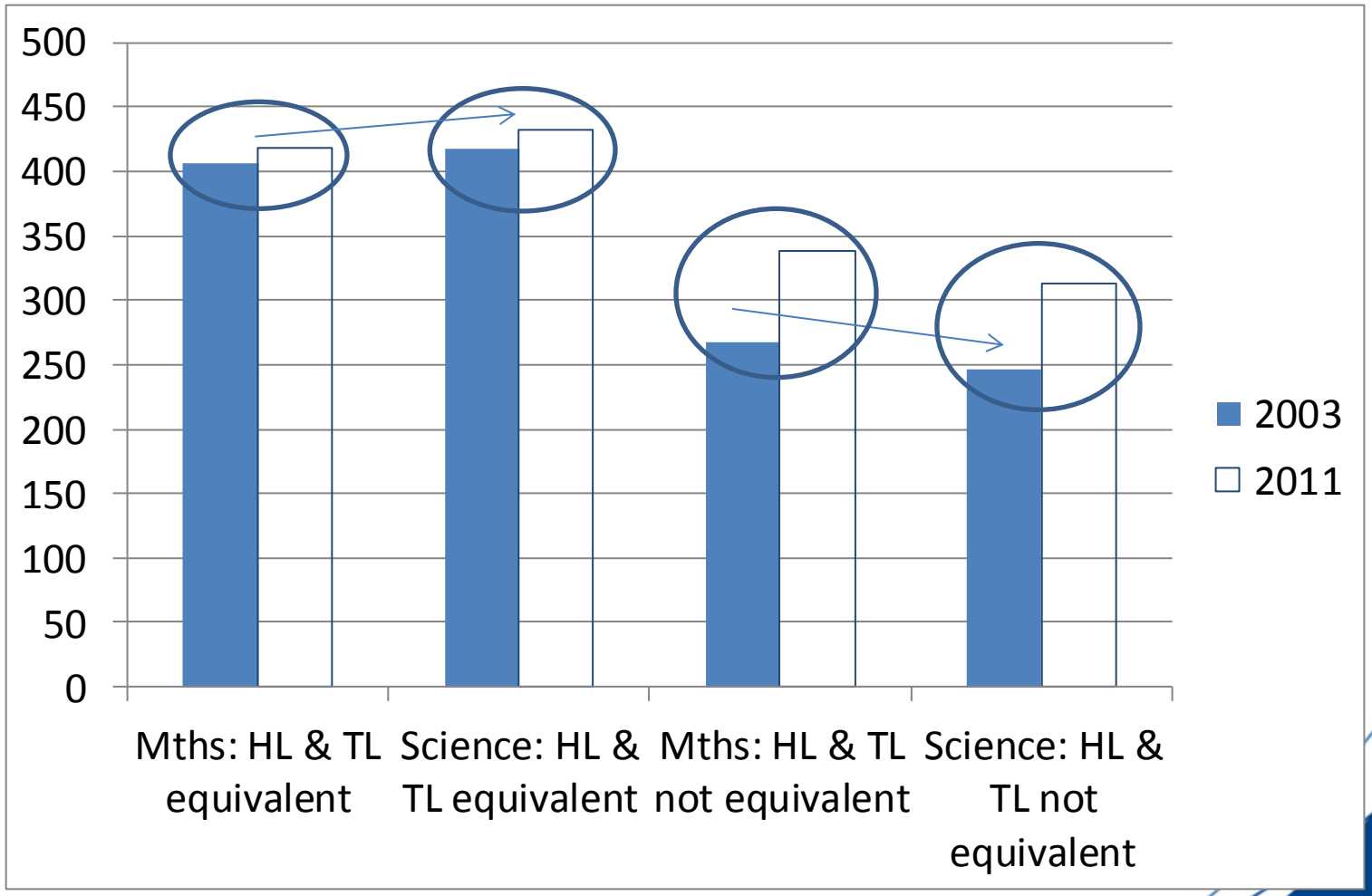
Context and learner achievement

Factor affecting lo-hi score differences in the next column	For Maths
I. Demographic and structural conditions	
Home and instructional/test language equivalence	80
Perceived learner difficulty understanding spoken school lang.	65
Female & male parent/caregiver qualification level	85 & 90
II. Access to language opportunities and support	
Schools sending extra learning materials home	37
Exposure to writing through homework (frequency ; volume) (3+ times per week; 16-30 to 31-60 minutes in volume)	35 (teachers) 40 (learners)
Frequency of speaking the test language at home	84
Number of books at home	46
III. Resource constraints and limitations	
Effect of textbook/learning material shortages on instruction	107
Resources: - software use in class - computers, Internet, TV, dictionaries* at home	40 46 (39*)

… Language vulnerability of Science

Factor affecting lo-hi score differences in the next column/s	Maths	Science
I. Demographic and structural conditions		
Home and instructional/test language equivalence	80	120
Perceived learner difficulty understanding spoken school lang.	65	65
Female & male parent/caregiver qualification level	85 & 90	118 & 122
II. Access to language opportunities and support		
Schools sending extra learning materials home	37	45
Exposure to writing through homework (frequency ; volume) (3+ times per week; 16-30 to 31-60 minutes in volume)	35 (teachers) 40 (learners)	Erratic
Frequency of speaking the test language at home	84	141
Number of books at home	46	61
III. Resource constraints and limitations		
Effect of textbook/learning material shortages on instruction	107	135
Resources: - software use in class - computers, Internet, TV#, dictionaries* at home	40 46 (39*)	57 66 (76#)

Home / test language equivalence



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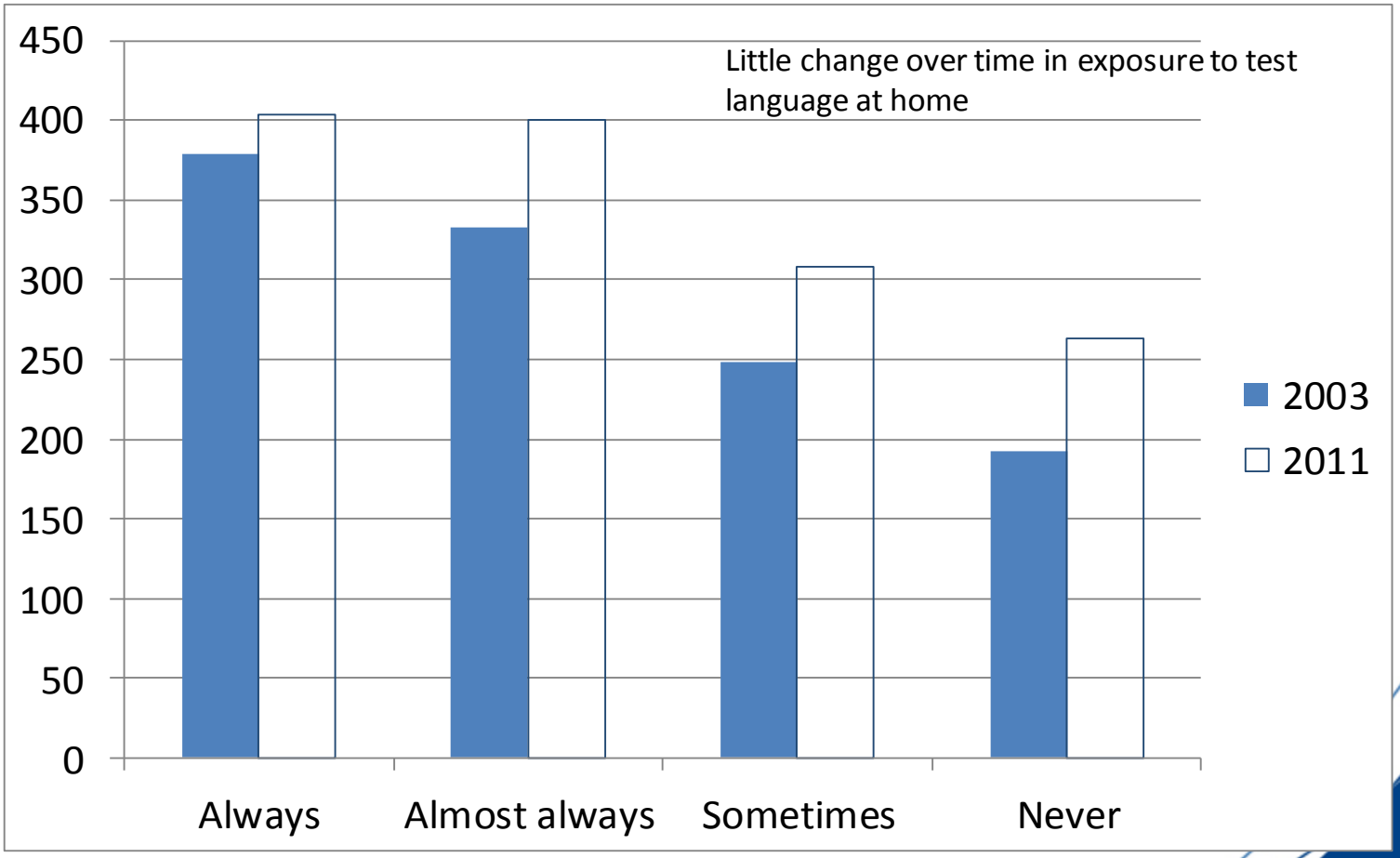
Science and speaking Test Lang. at home



Only 25% of learners always or almost always speak test language at home

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Synthesis and implications

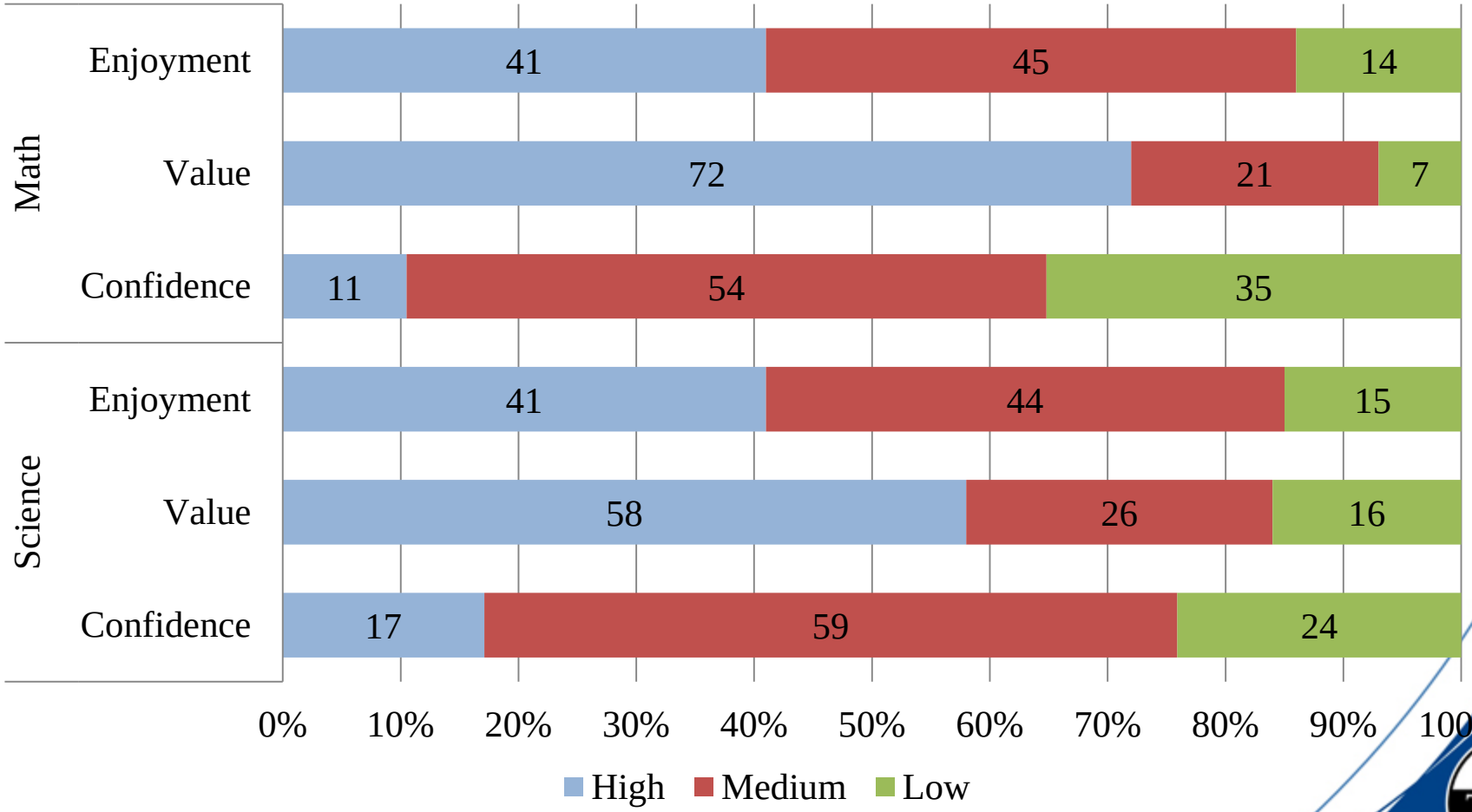
- Many language-linked learning conditions have improved
- The school system has to ensure that as many as possible learners' home and test languages are the same; else learners' proficiency in the language of learning and teaching (testing) should be increased
- The latter will benefit from greater exposure of learners to reading and writing of extended text, and to speaking the language of instruction at home, especially with a view to increasingly language-dependent contents/subjects
- Strong efforts are required to overcome constraints associated with language-based resources

LEARNER ATTITUDES AND BELIEFS

Items used to measure each attitudinal theme

Attitudinal theme	Items used
Enjoyment of mathematics and science	• I enjoy learning mathematics/ science
Valuing Mathematics and Science	• I would like to take more Mathematics/Science in school • I think leaning mathematics/ science would help me in my daily life • I need mathematics/ science to learn other subjects • I need to do well in mathematics/ science to get into the university of my choice • I would like a job that involved using mathematics/ science • I need to well in mathematics/science to get the job that I want
Confidence in Mathematics and Science	• I usually do well in mathematics/ science • Mathematics/ science is more difficult for me than for many of my classmates • Mathematics/ science is not one of my strengths • I learn things quickly in mathematics/ science

Enjoyment, Value and Confidence in Mathematics and Science 2011



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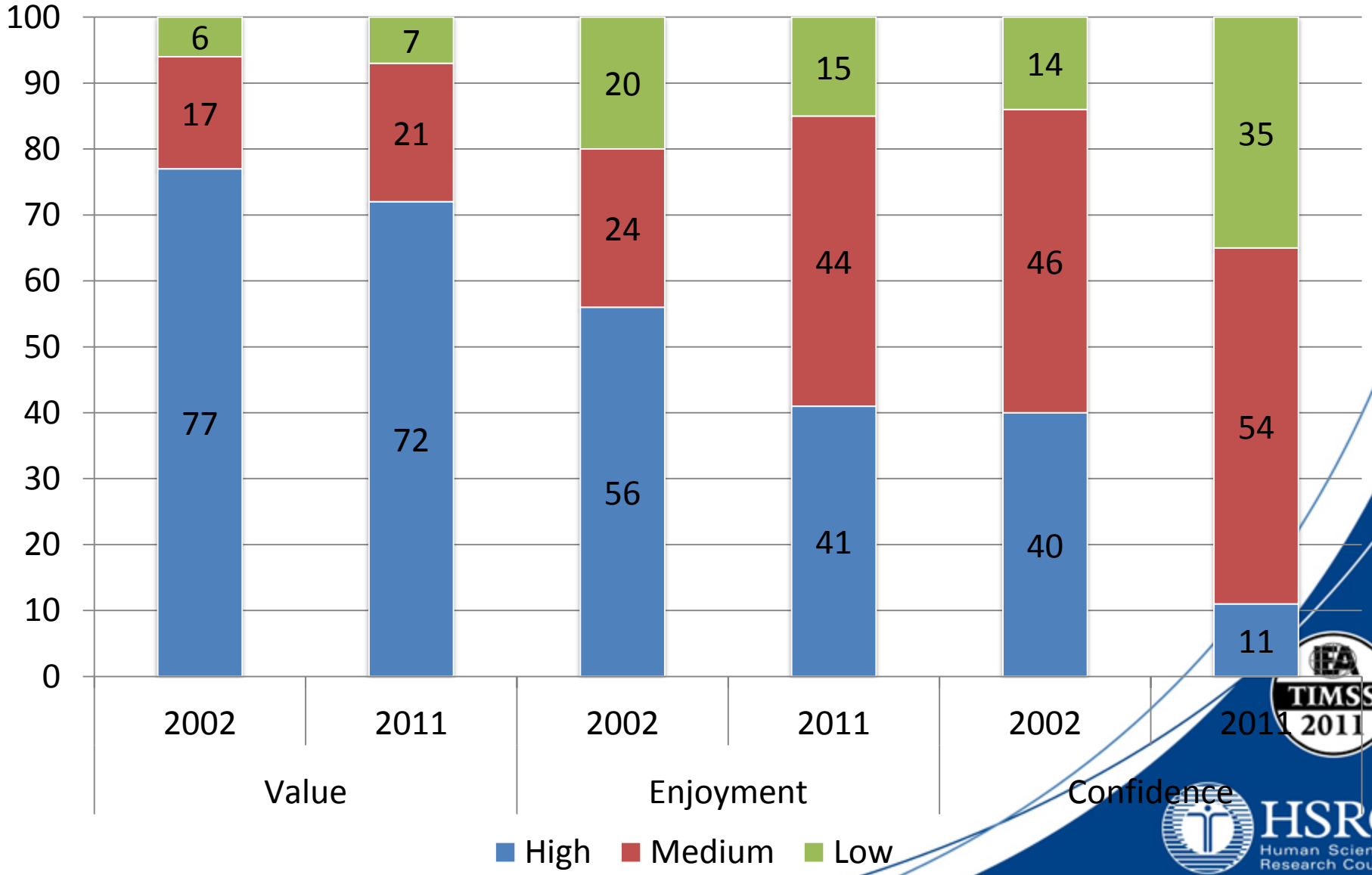
Trends in Mathematics [2002 to 2011]



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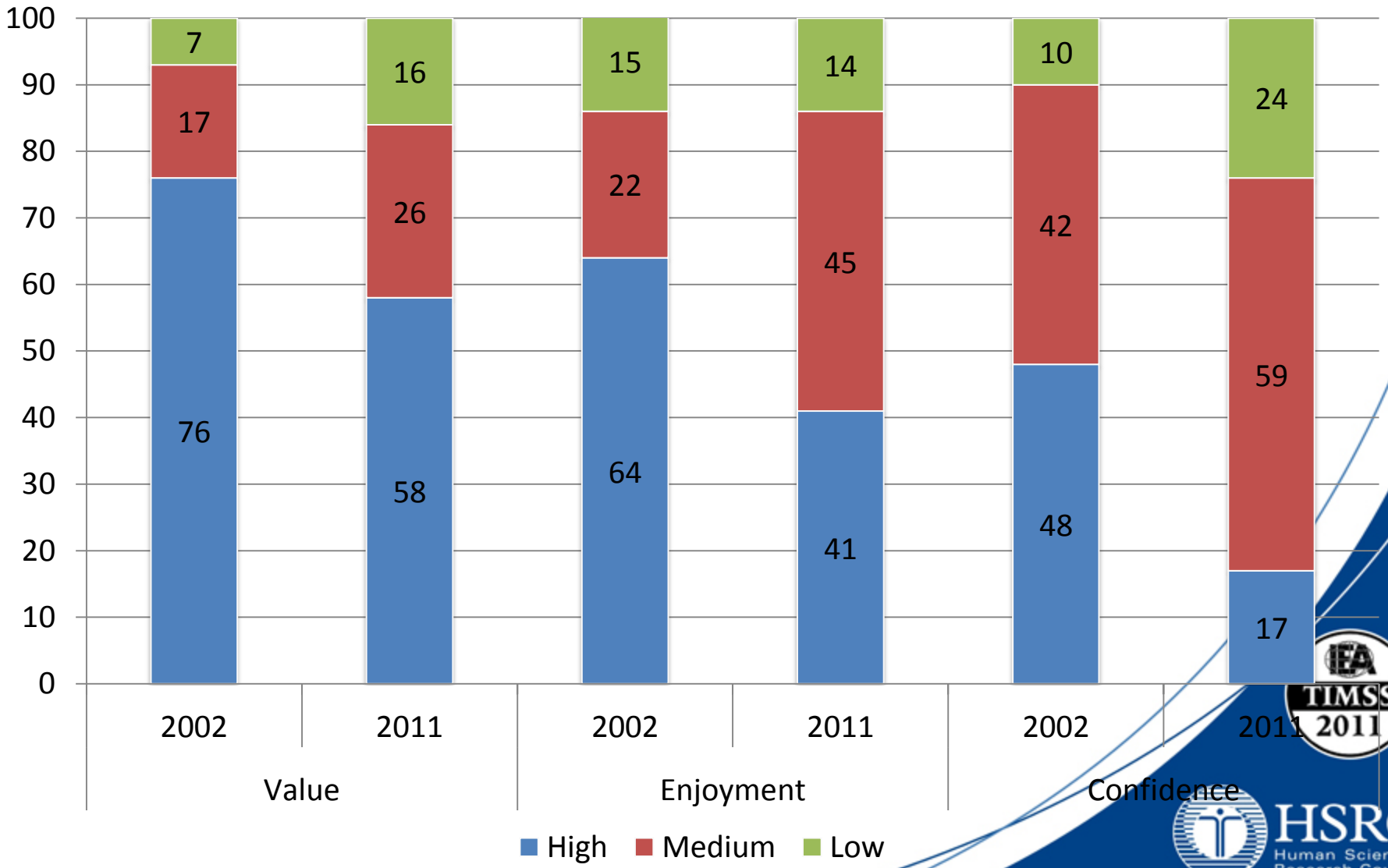
Trends in Science [2002 to 2011]



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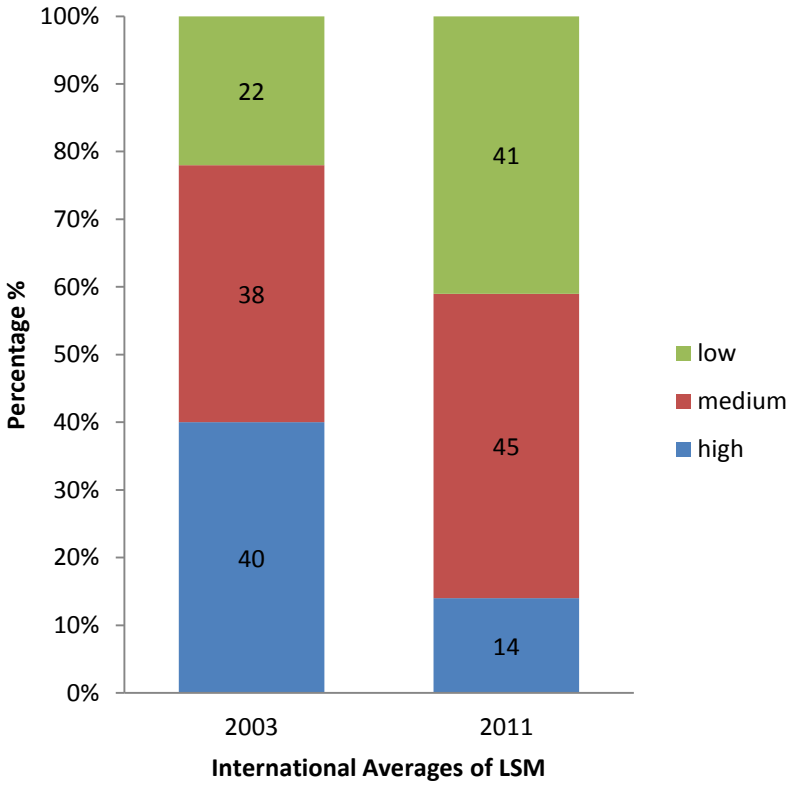
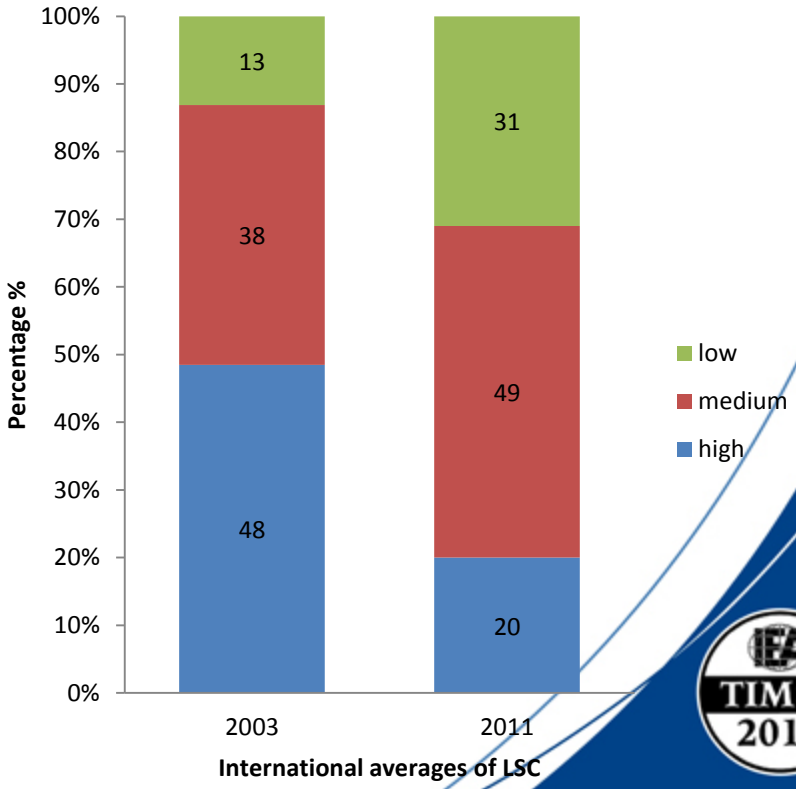
Decrease of Self-confidence as an international phenomenon

Learners self confidence in Maths



Learners self confidence in Science



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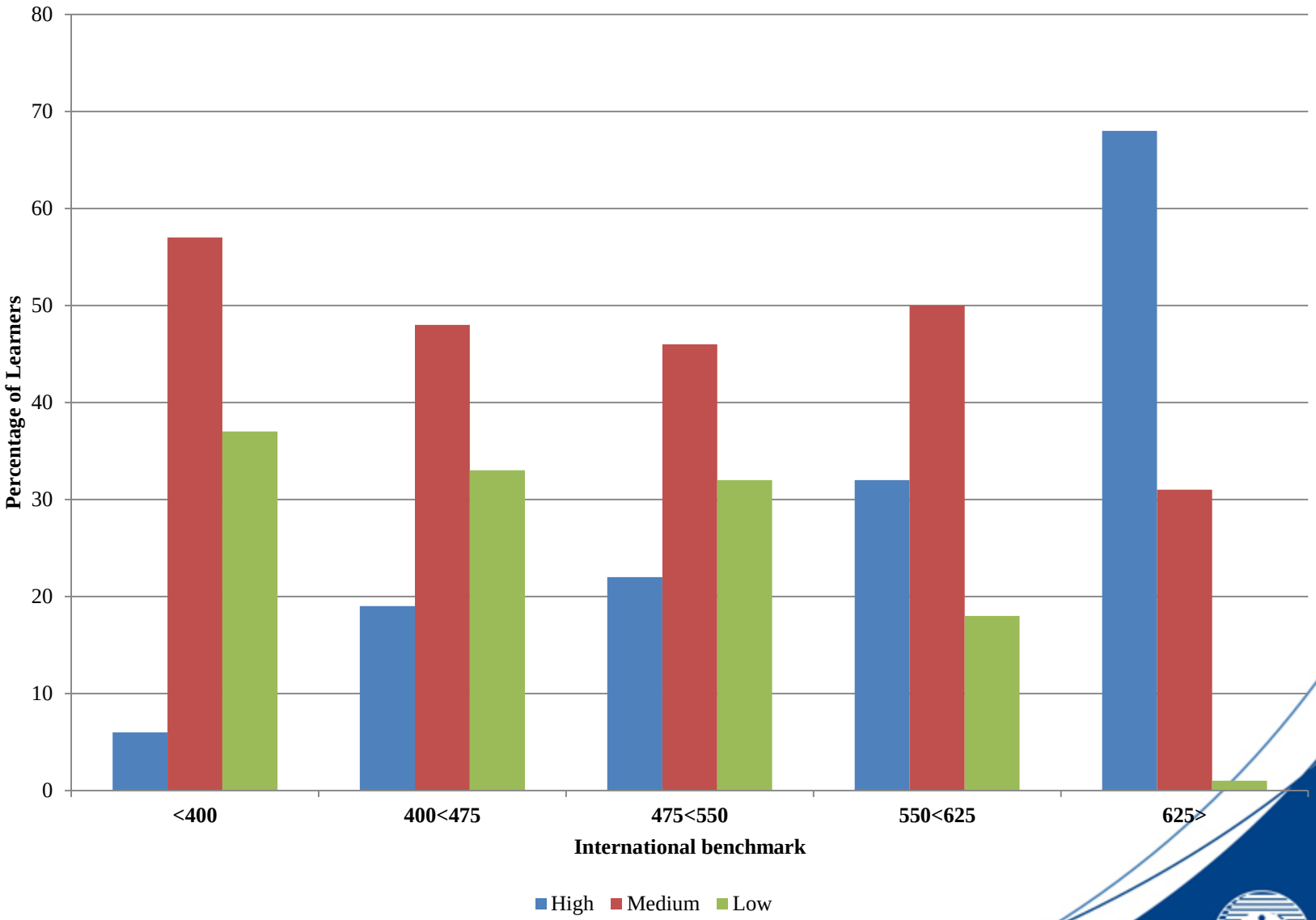
Learners' self-confidence in mathematics by international benchmarks 2011



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Summary

- Learners' attitudes towards mathematics and science were found to be moderate to high
- Learners self-confidence in learning mathematics and science had a dramatic decrease.
- School type and school location were found to have slight impact on attitudes towards the learning areas.
- Boys were found to have significantly higher positive expressions of value of science and confidence in learning mathematics, while girls expressed higher value of mathematics.
- Only the learners with moderate levels of confidence showed mixed patterns in relation to achievement