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Utilization of TIMSS results in Germany

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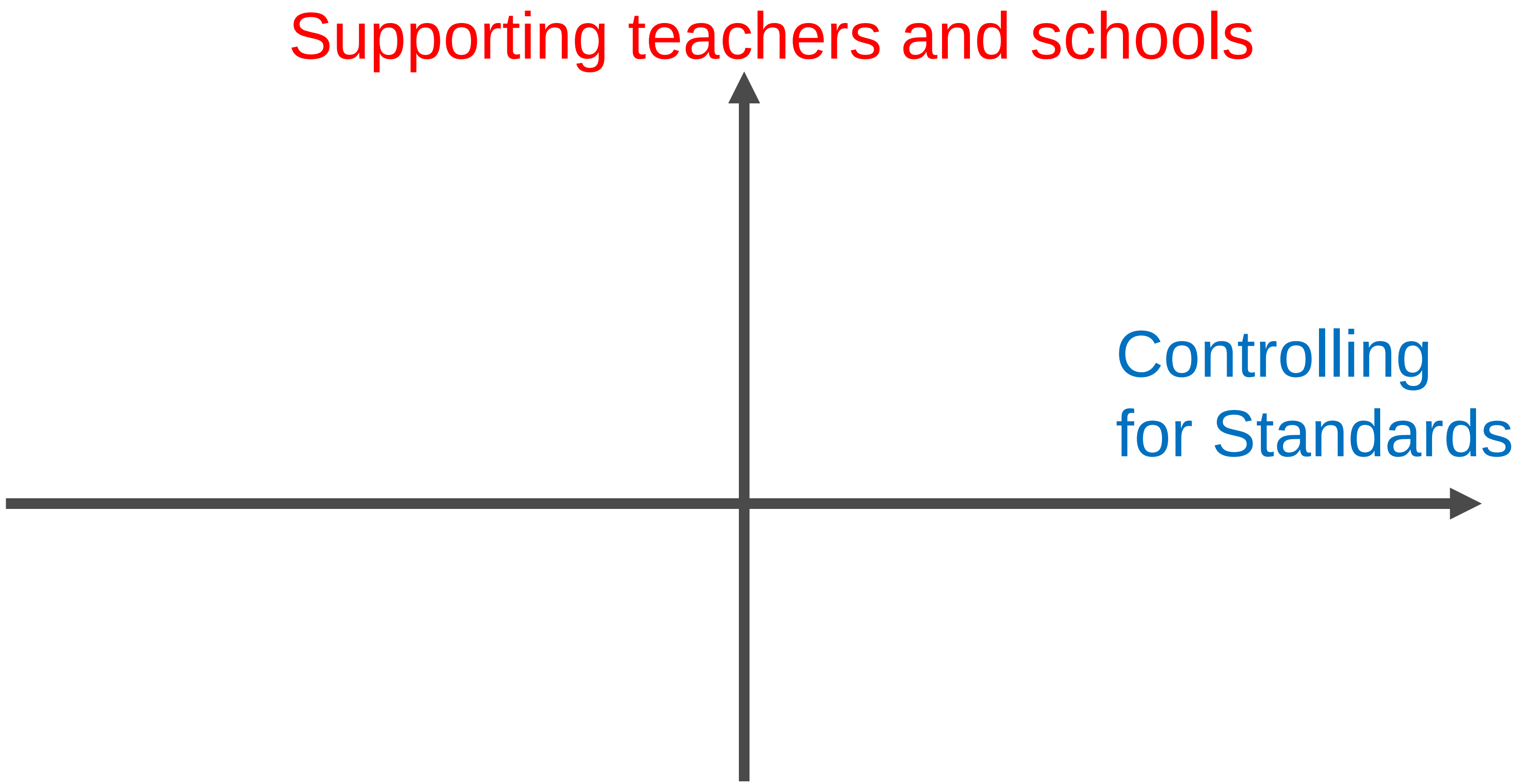
Overview

- Background: The German tradition of educational governance
- The TIMSS Shock, and it‘s consequences for educational policy
- Research consequences:
  exploring quality in teaching and learning
- Science/Math reforms triggered by
  TIMSS 1995 and subsequent research
- Change in Student Achievement until 2009
- Lessons to be learned

A typology of educational cultures (Fend)



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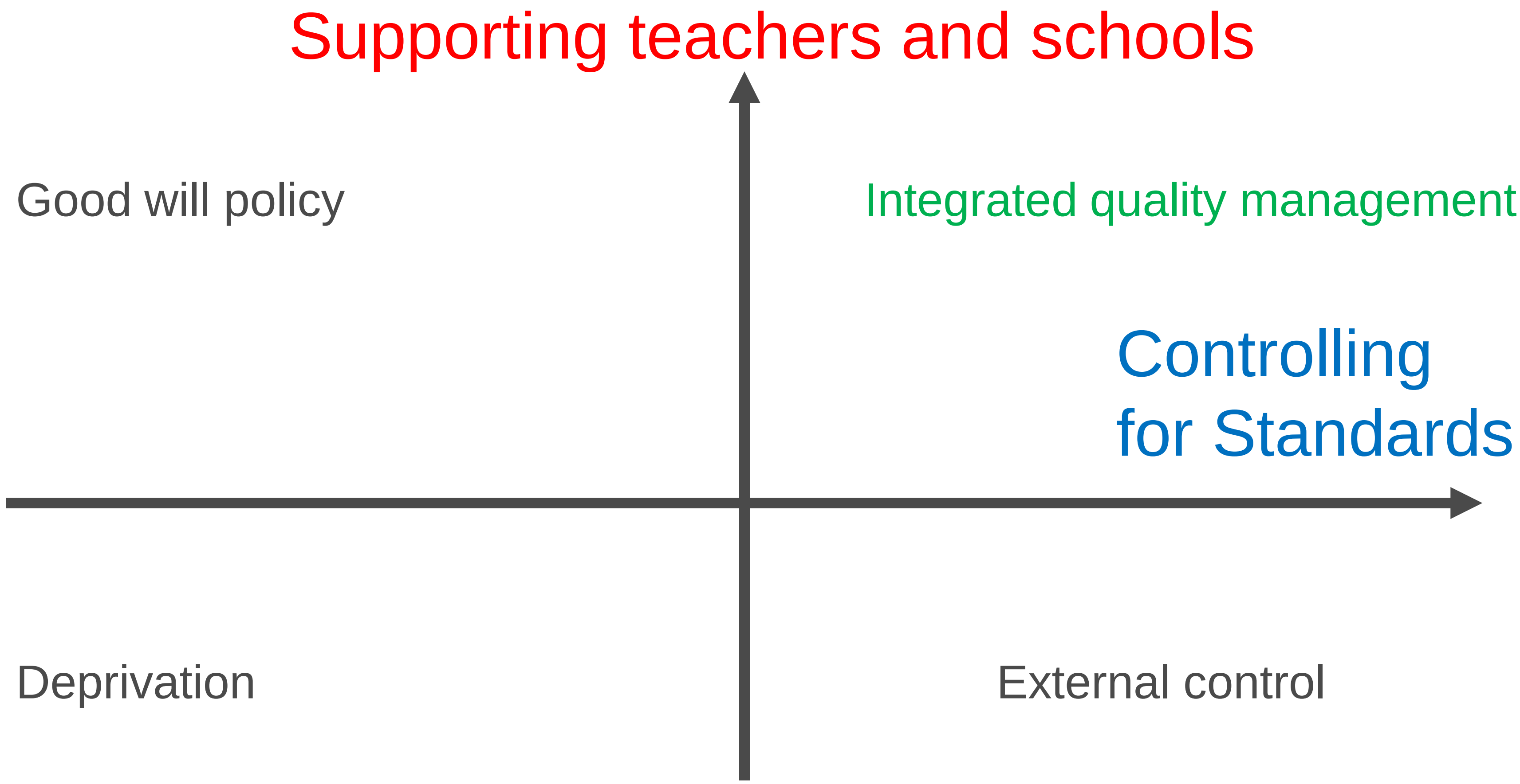
A typology of educational cultures (Fend)



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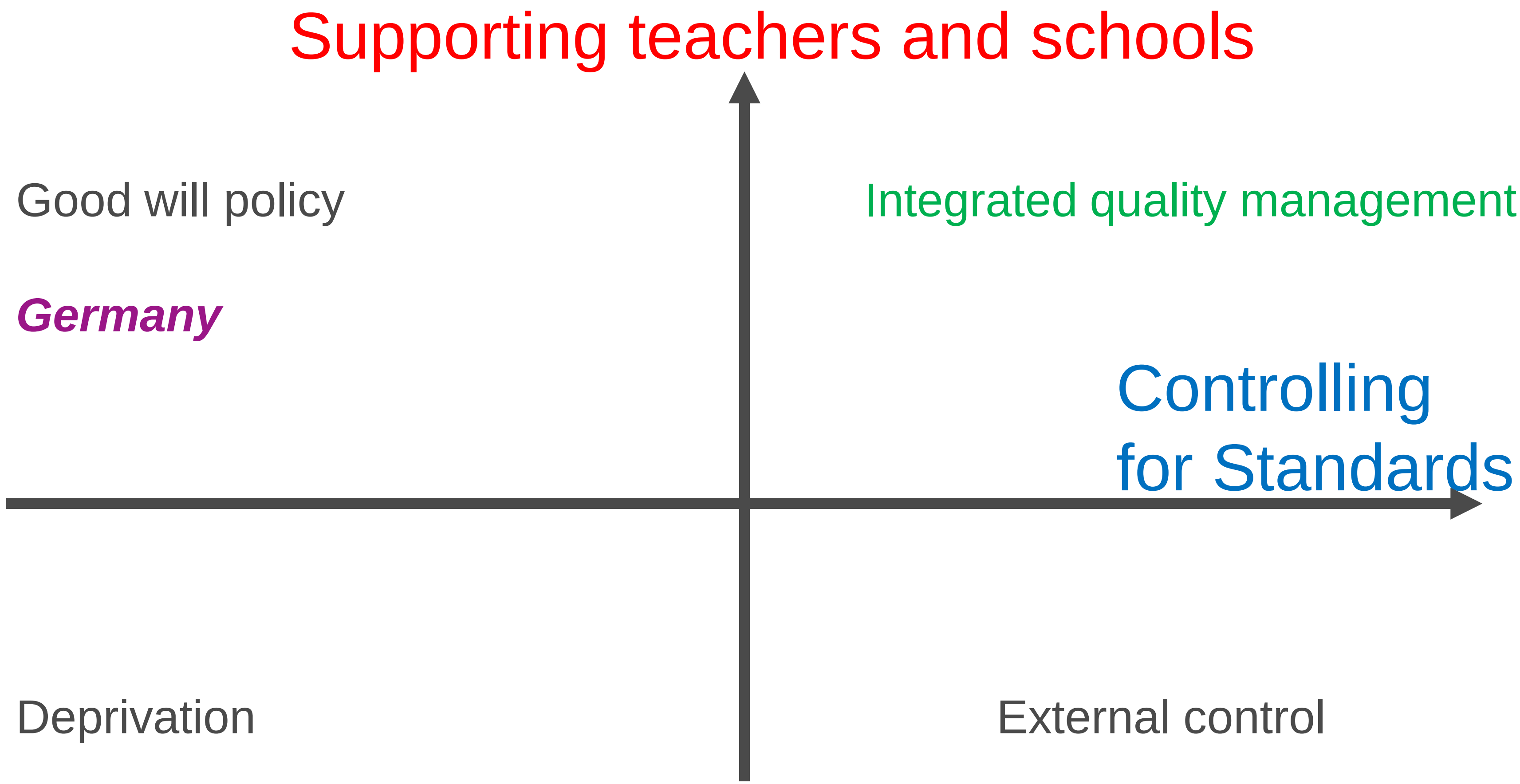

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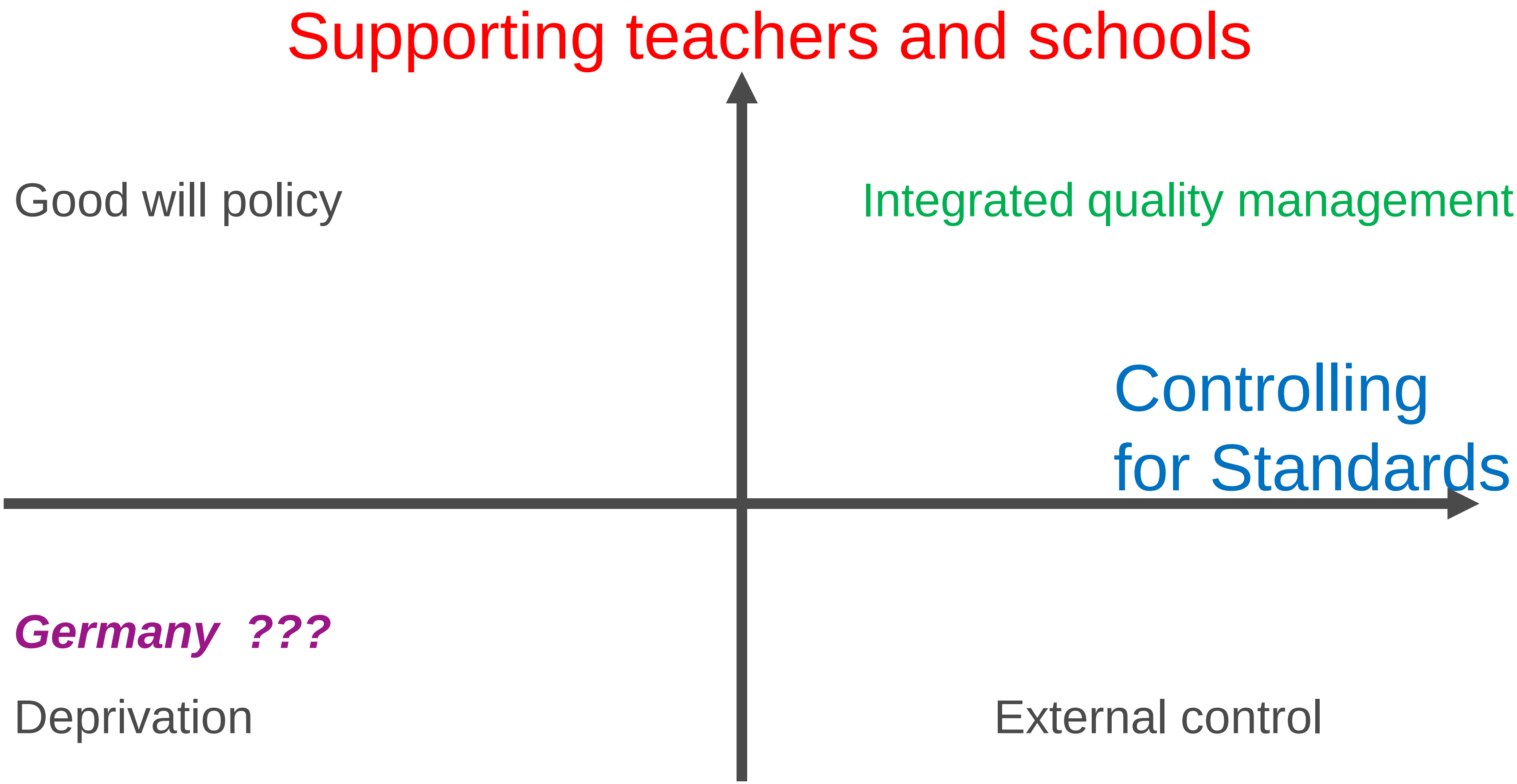

German Participation in IEA studies

FIMS 1964
FISS 1970

German Participation in IEA studies

FIMS 1964
FISS 1970

Reading Ability Study IRLS 1991 (Lehmann)
TIMSS 1995 (Grades 7/8, and 12) (Baumert, Lehmann, Bos, Klieme)

TIMSS 1995, Grade 8
„Shock“: mediocre results

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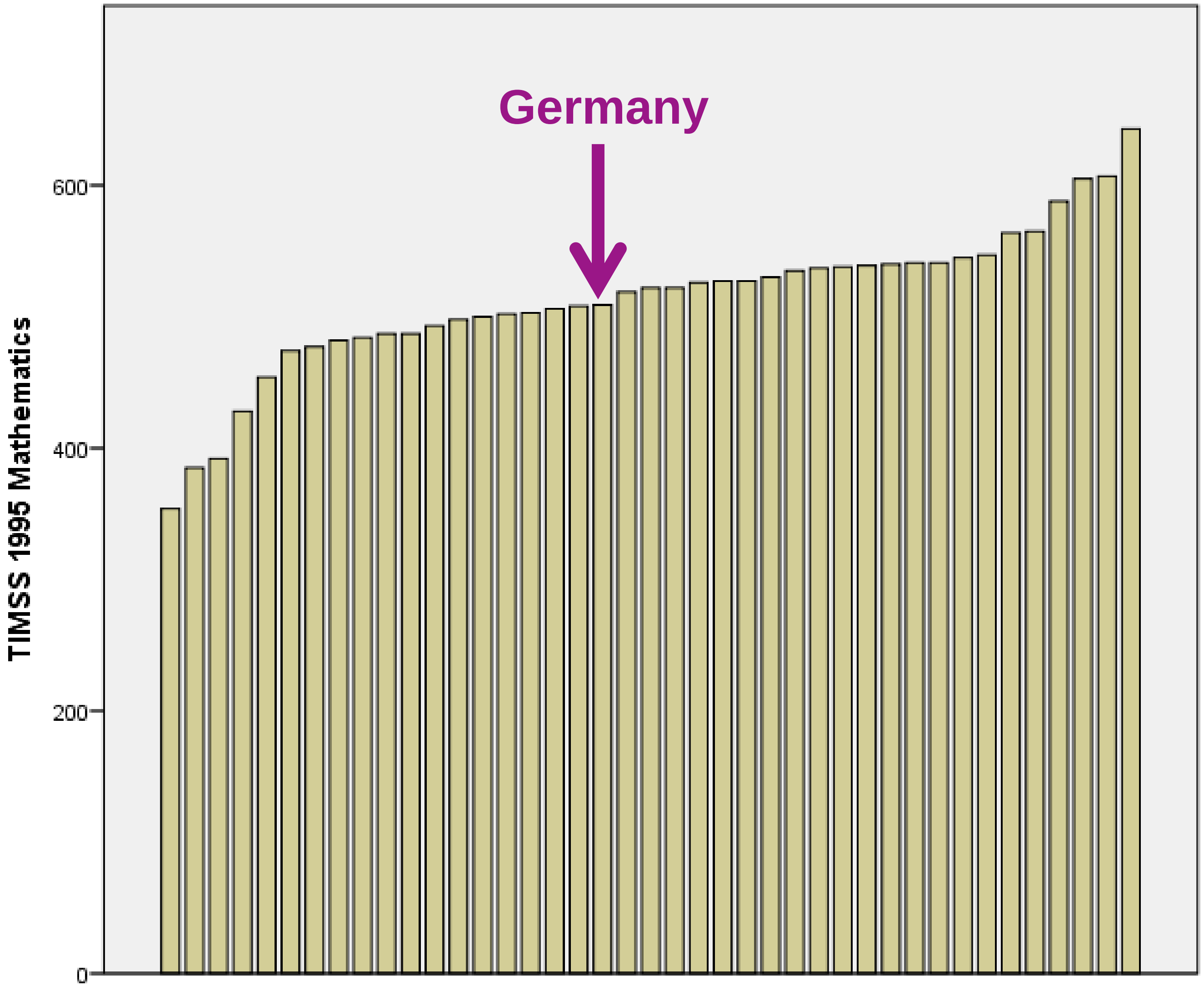

Policy reactions to the Shock

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More control

•*National* standards established,
since 2009 used for system monitoring & school evaluation.

•School inspectorates, National indicator-based report

•Certification (*Abitur*) based on state-wide exit exams

•Regular participation in national and international surveys (LSA)

German Participation in IEA studies

FIMS, FISS

Reading Ability Study IRLS 1991
TIMSS 1995 (Grades 7/8, and 12)

Civic Education Study 1999

PIRLS 2001
PIRLS 2006
TIMSS 2007 (grade 4)
PIRLS & TIMSS 2011 (grade 4)

TEDS-M

German Participation in ILSA studies

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FIMS, FISS

Reading Ability Study IRLS 1991
TIMSS 1995 (Grades 7/8, and 12)

Civic Education Study 1999

PIRLS 2001
PIRLS 2006
TIMSS 2007 (grade 4)
PIRLS & TIMSS 2011 (grade 4)

PISA 2000
2003
2006
2009
2012

TEDS-M

PIAAC

Reactions by Scientists

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Fostering Educational Research

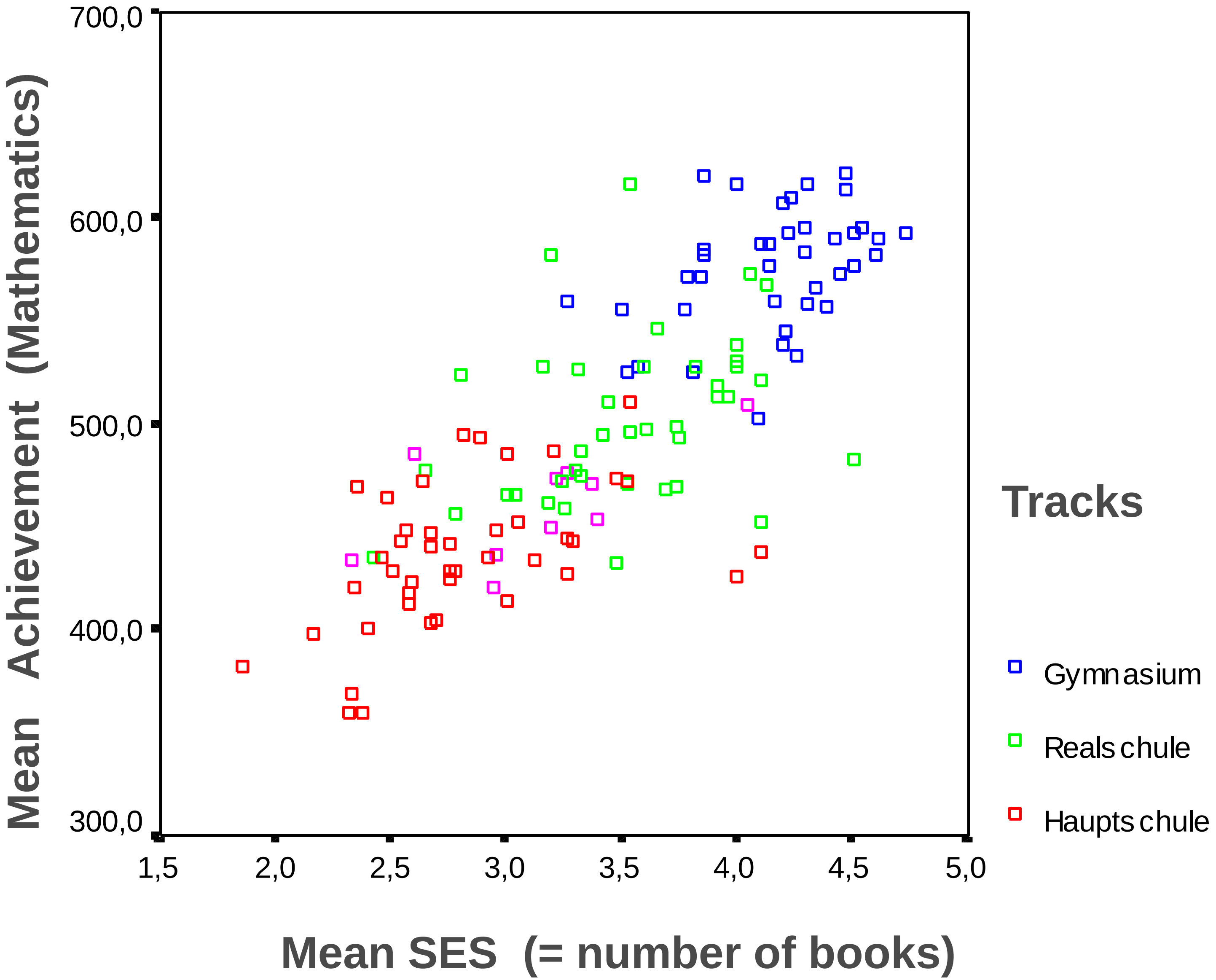
•Building a strong infrastructure for both fundamental and applied research (includes IEA-DPC, Hamburg)

•Enhancing the design of international Large Scale Assessments to allow for insights into the quality of teaching and learning
(e.g., participation in TIMSS-Video, with longitudinal assessment design)

•Secondary analyses of international data sets using complex methods (multidimensional scaling, DIF analysis, multi-level modeling)

TIMSS 1995, Grade 8

Exploration #1: large inequity - linked to tracks

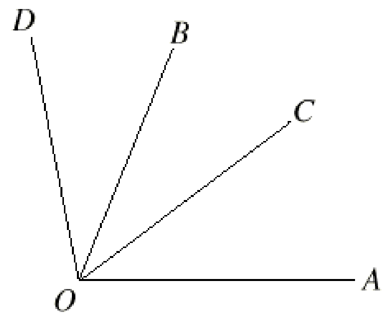


TIMSS 1995, Grade 8
Exploration #2: weak profile of competences

Relative strengths of Japanese students
percent correct in Germany 34%, in Japan 85%

Q10. In the figure, the measure of $\angle AOB$ is 70º, the measure of $\angle COD$ is 60º, and the measure of $\angle AOD$ is 100º.

(DIF ≅ +2/3)



What is the measure of $\angle COB$?

Answer:______________________________

TIMSS 1995, Grade 8
Exploration #2: weak profile of competences

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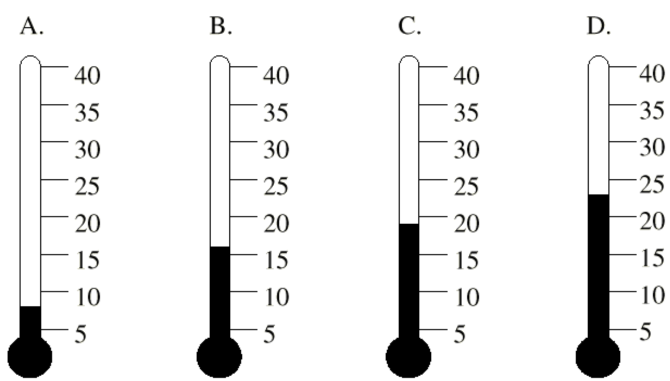
Relative strengths of German students
percent correct in Germany 84%, in Japan 64%

(DIF ≅ -1.0)

P17. This table shows temperatures at various times during the week.

TEMPERATURES					
	6 a.m.	9 a.m.	Noon	3 p.m.	8 p.m.
Monday	15°	17°	20°	21°	19°
Tuesday	15°	15°	15°	10°	9°
Wednesday	8°	10°	14°	13°	15°
Thursday	8°	11°	14°	17°	20°

Which thermometer shows the temperature at 8 p.m. on Monday?



TIMSS 1995, Grade 8

Exploration #2: weak profile of competences (Analysis of item DIF)

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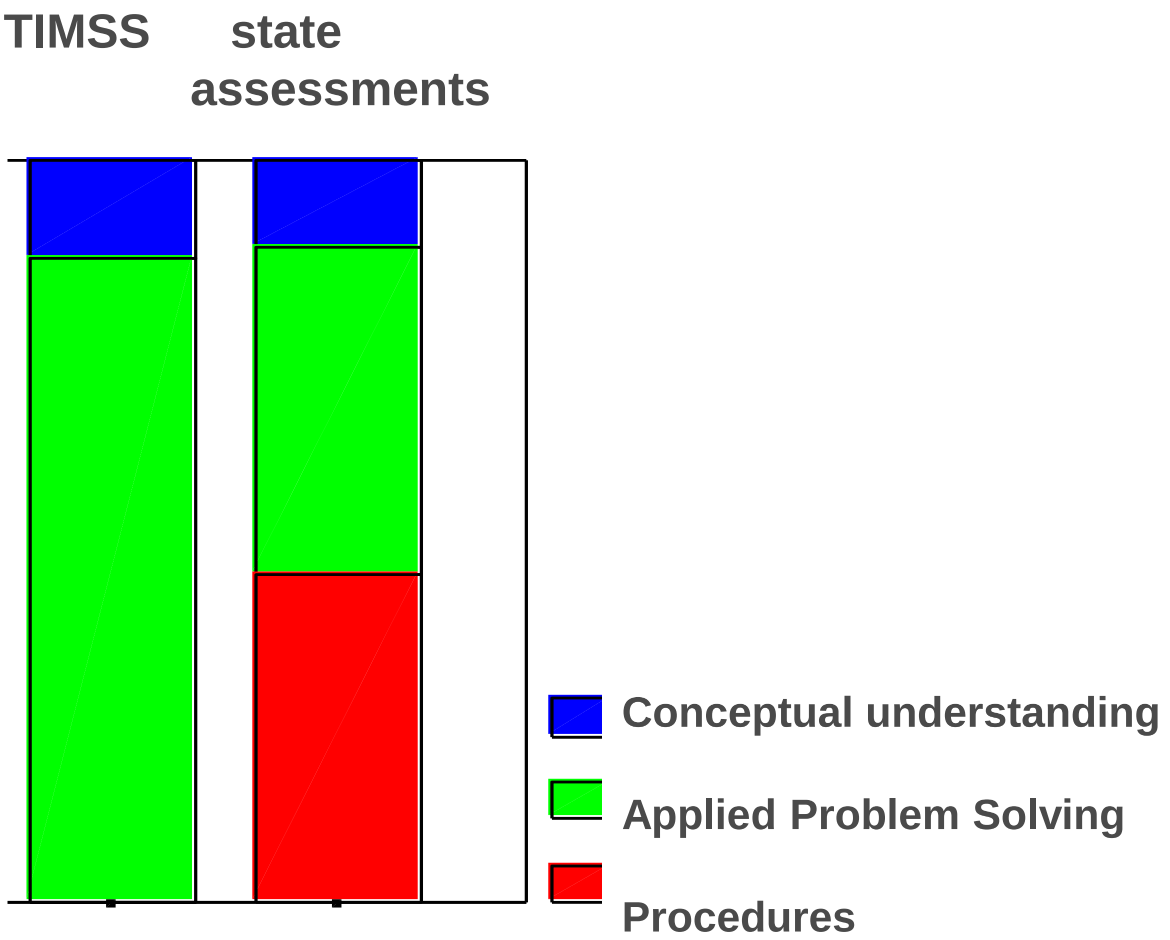
Based on 153 TIMSS grade 8 math items

Cognitive demand	Explained variance (adjusted)	Direction
(1) General cognitive level	9 %	+ J
(2) Openness	2 %	+ J
(3) Application	11 %	+ G
(4) Content domain	7 %	Geometry + J Algebra + J Data analysis + G

TIMSS 1995, grade 8

Exploration #3: low demanding curriculum



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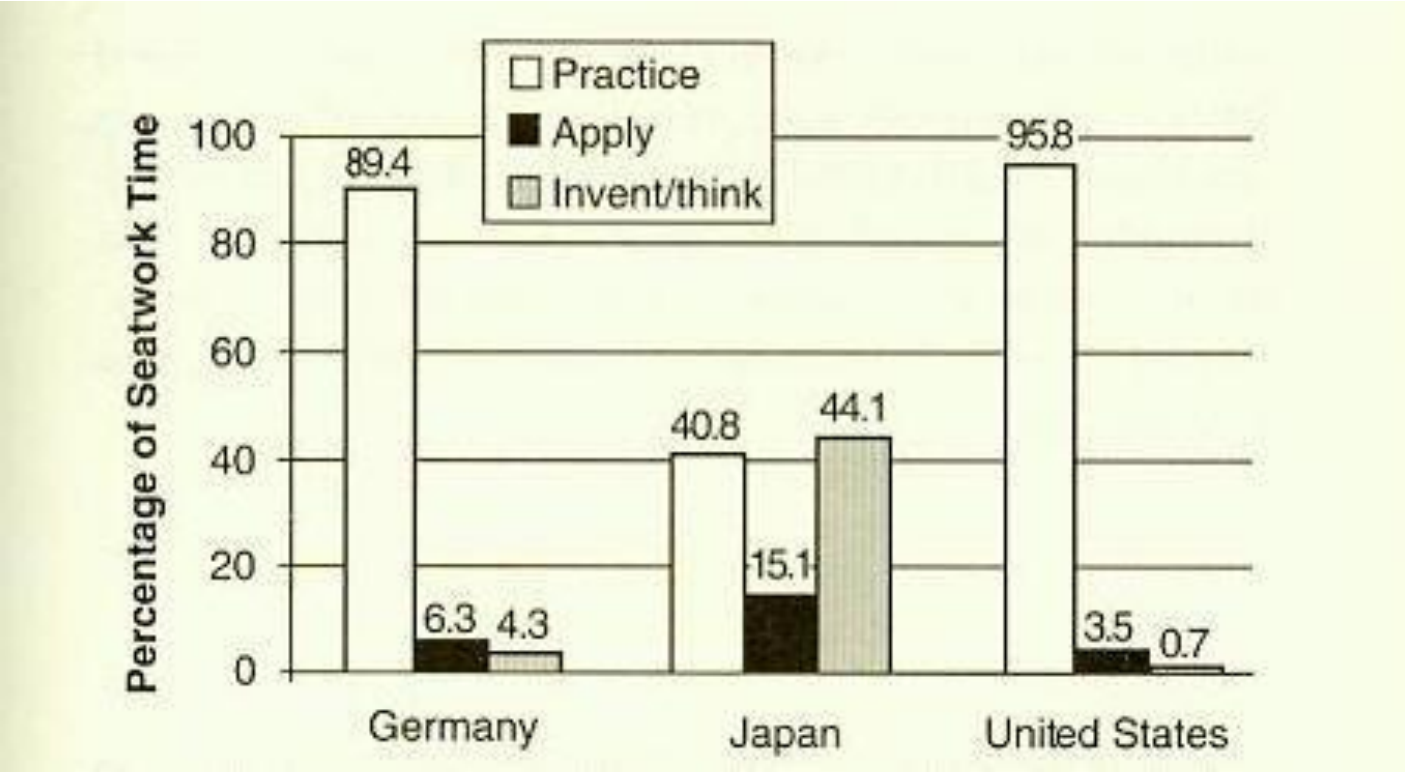
TIMSS 1995 Video Study

Exploration #4: low level of cognitive activation in classrooms



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TIMSS 1995 Video/Germany:

high-inference video-ratings (Clausen,Klieme & Baumert 2002)

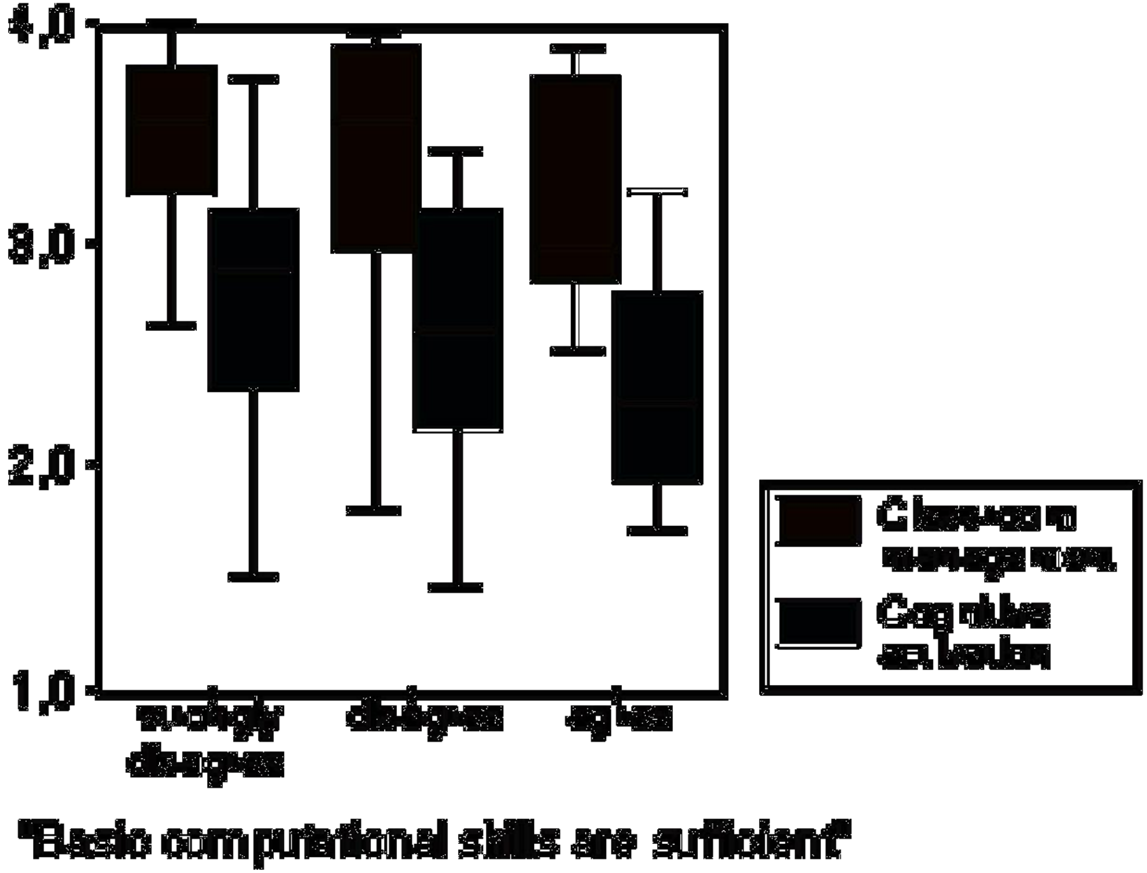
(national sample, 100 + 86 lessons)

Classroom Management	Supportive climate	Cognitive Activation
Effective treatment of interruptions „teacher intervenes immediately, before disturbance may evolve“ Clarity of rules Interruptions (-) Waste of time (-) Monitoring Time on task Teacher Unreliability (-) **Clarity and structuredness of the Instruction**	Social orientation: „teacher takes care of his students‘ problems“ Teachers diagnostic competence with regard to social behavior **Individual reference norm in evaluation** Rate of interaction (-) Pressure on students (-)	Teacher’s ability to motivate students: „can present even abstract content in an interesting manner “ **Errors as opportunities** **Demanding tasks** Practicing by repetition (-)

TIMSS 1995 Video/Germany: Explaining one-year-growth in student achievement and motivation

Dimension	**Criterion (mean residual, aggregated on class level)**	
	Achievement gain	**Gain in motivation**
Classroom management	**.07**	**- .15**
Student orientation	**-.03**	**.22 ***
Cognitive activation	**.22 ***	**-.04**

TIMSS 1995 Video/Germany: Classroom Management and Cognitive Activation are related to teacher beliefs



Policy reactions to the Shock

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- Regular participation in national and international surveys (LSA)

+ more support for schools, teachers, and students

- new pedagogical initiatives
  (focus: mathematics and science - less: reading, migrant students)
- all-day schooling
- teacher professionalization

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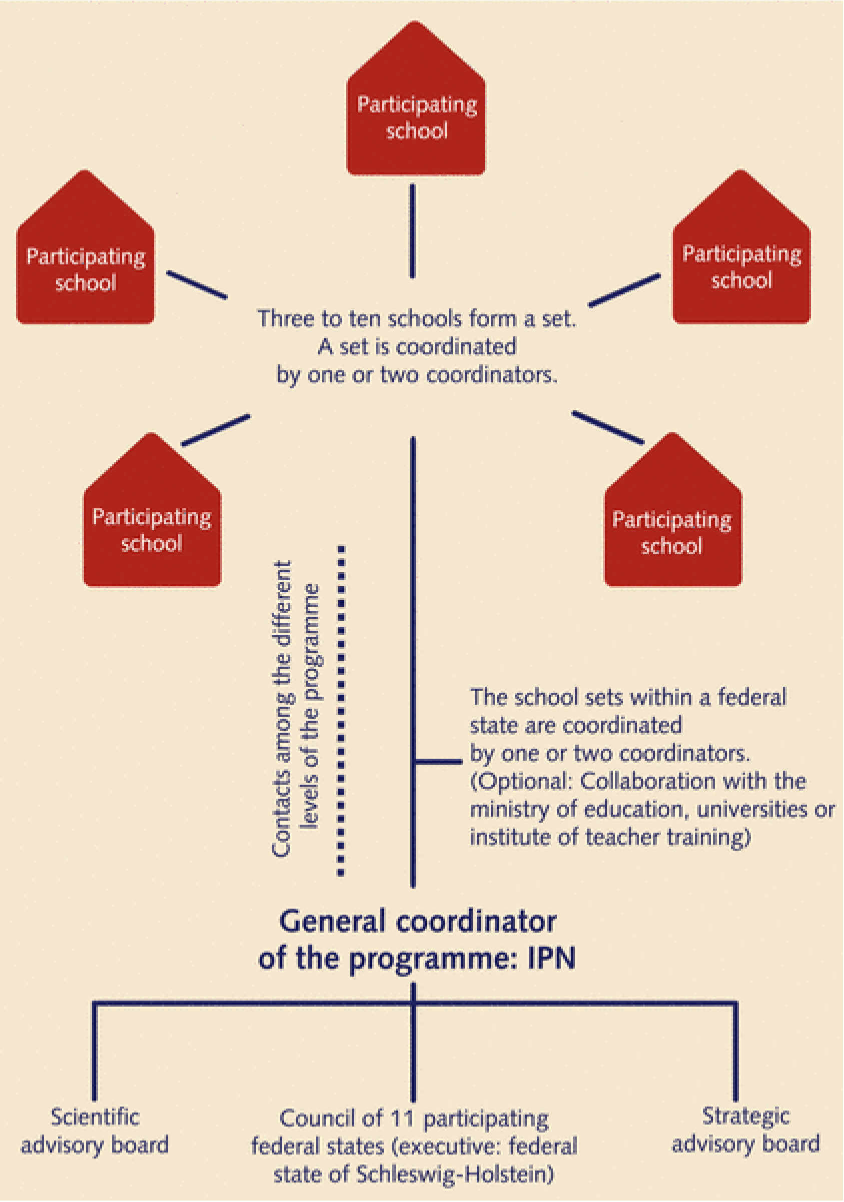
Focus: The SINUS program (1998 – ongoing)

- systematic development of Science and Mathematics Education
- based on expert report from the TIMSS research team (Baumert/Prenzel)
- more than 1800 schools participated in regional networks
- centralized development of training material for teachers and students + evaluation
- regional support from Mathematics and Science education experts

+ numerous other STEM-initiatives

(SINUS for primary schools, “Science in context”, national center for professional development in mathematics teaching….)


Participating school
Participating school
Participating school
Three to ten schools form a set.
A set is coordinated
by one or two coordinators.
Participating school
Participating school
Contacts among the different levels of the programme
The school sets within a federal state are coordinated by one or two coordinators. (Optional: Collaboration with the ministry of education, universities or institute of teacher training)
General coordinator of the programme: IPN
Scientific advisory board
Council of 11 participating federal states (executive: federal state of Schleswig-Holstein)
Strategic advisory board

Focus: The SINUS program (1998 – ongoing)

Module 1: Developing a Task Culture

Tasks play an important role in math and science lessons and should not merely be a part of the routine curriculum. It is the aim of this module *to create and apply mathematical tasks that*
enable students to find different ways of solving problems.

systematically revise existing knowledge of the student and supplement it with new material.
inspire the setting of new tasks.

Focus: The SINUS program (1998 – ongoing)

Module 2: Scientific Working

A high potential is attributed to scientific thinking and working pattern in the classes. The following list of practical scientific aspects has proven beneficial for use in teaching even in the absence of a scientific method (Duit and others 2004):

Observation and measurement
Comparison and classification
Investigation and experimentation
Estimation and verification
Discussion and interpretation
Modelling and computation
Research and communication

Focus: The SINUS program (1998 – ongoing)

Module 3: Learning from Mistakes

Separation of learning and performance situations

Focus of this module is on reviewing errors as a learning opportunity. This at first results in the prerequisite that *making mistakes is permitted in the class without assessment and humiliation*. It is not the punishment of mistakes with bad grades, but appreciation of the success of the learning process that should be in the foreground.

Mistake as a learning opportunity is a chance for both teachers and pupils

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Focus: The SINUS program (1998 – ongoing)

Module 4: Gaining basic Knowledge

Module 5: Cumulative Learning

Module 6: Interdisciplinary working

Module 7: Motivating girls and boys

Module 8: Cooperative leraning

Module 9: Autonomous Learning

Module 10: Progress of Competences

Module 11: Quality assurance

Result (?): Student achievement 2000-2006 (PIRLS + PISA)

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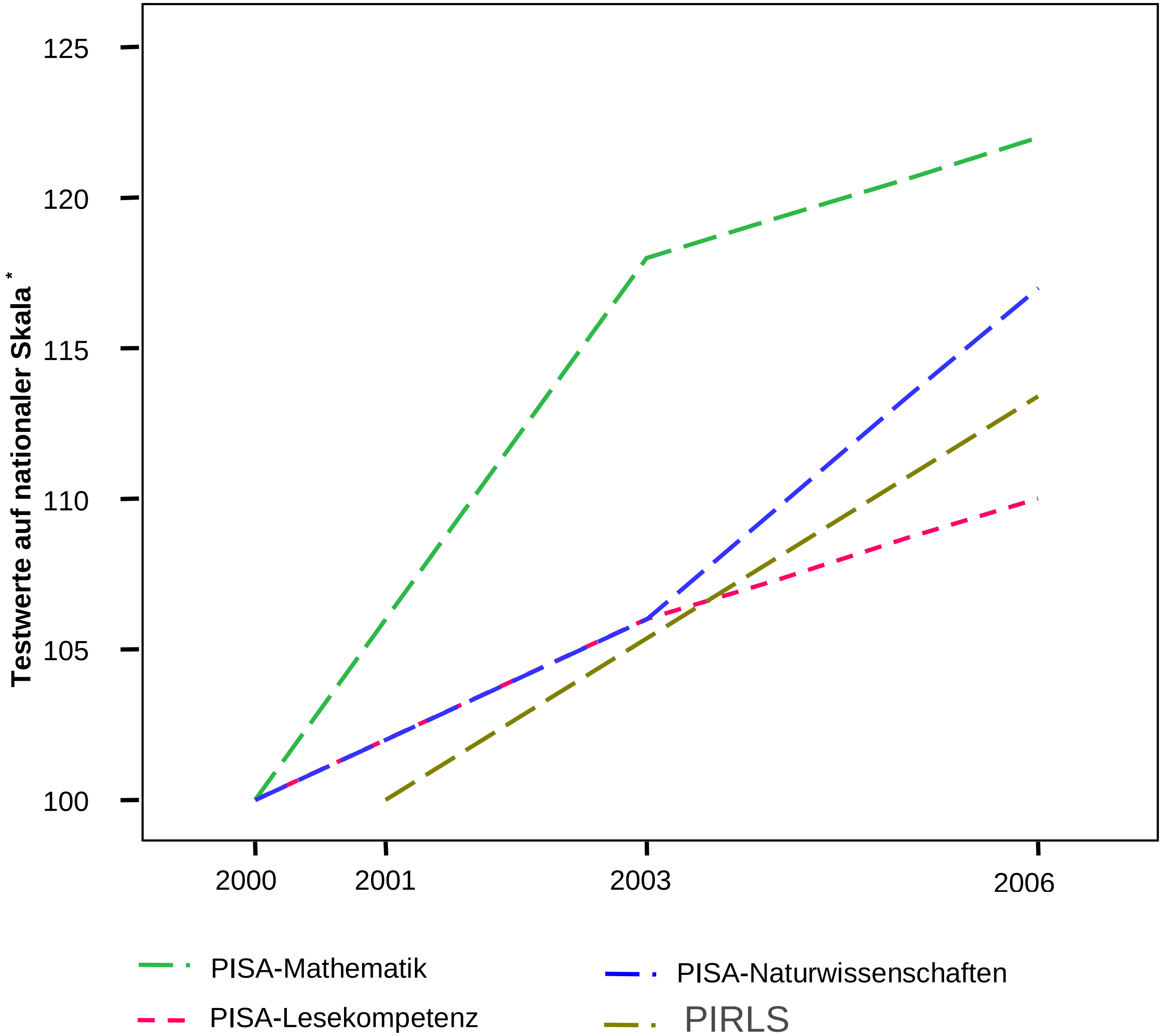

Result (?): Student achievement 2006-2009 (PISA)

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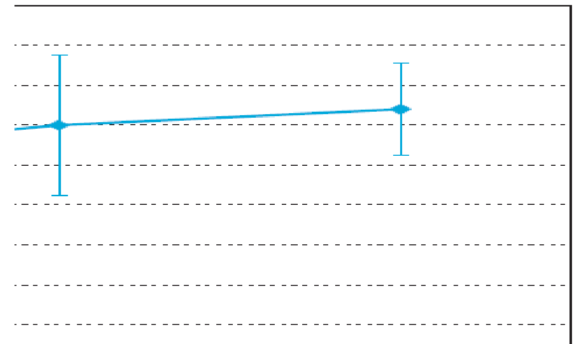
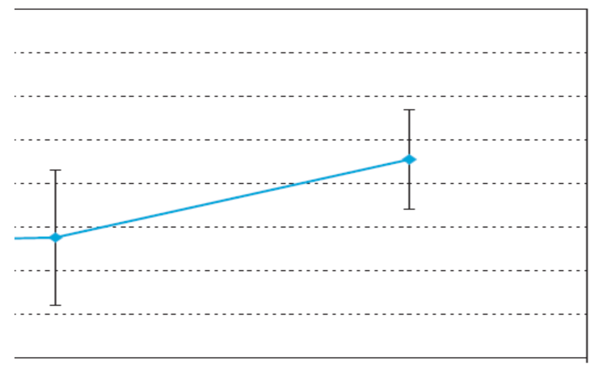
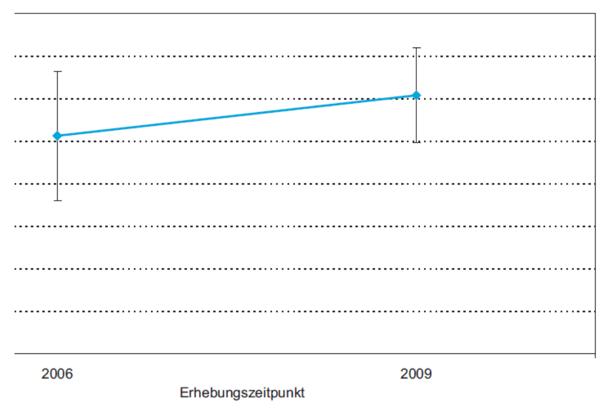
Reading



Mathematics



Science



Lessons to be learned

- Policy makers, politicians, and the public are activated through „shocking“ findings.
- OECD/ PISA may be better than IEA in „shocking“ politics, because it is associated with economic strength, competition, and power.
- Change does not come from „shock“ – rather, it must be based on an understanding of quality aspects in teaching and learning.
- IEA should focus on strength in research, addressing quality issues in teaching and learning, and providing explanatory models.
- Advanced research needs sophisticated designs and methods, e.g.
  - sophisticated scaling, analysis of demand factors, DIF analysis
  - theory-based assessment of teaching quality (Video ??)
  - longitudinal designs (enhancements).