Quality of Schools and Teaching

Eckhard Klieme
Deutsches Institut für Internationale Pädagogische Forschung

DIPF
Educational Research
and Educational Information

IEA General Assembly, Lisbon, October 9, 2013

Outline

1. Current challenges of international large scale assessment
2. School quality:
   (a) A model of 5 essential supports (Bryk et al., 2010)
   (b) Analyses using TIMSS and PIRLS data (Martin et al.,2013)
3. Teaching Quality:
   (a) IEA studies: From SIMS to TIMSS Video
   (b) A model of 3 basic dimensions
   (c) Understanding cultural profiles
   (d) Exploring cognitive and non-cognitive effects
4. Some suggestions for research strategies in IEA

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Challenge for international surveys:

Using Large Scale Assessments to inform policy makers and professionals - beyond achievement.

(i) Describing professional practices and school context variables *known to be effective*

(ii) Understanding relationship with outcomes *within the survey*.

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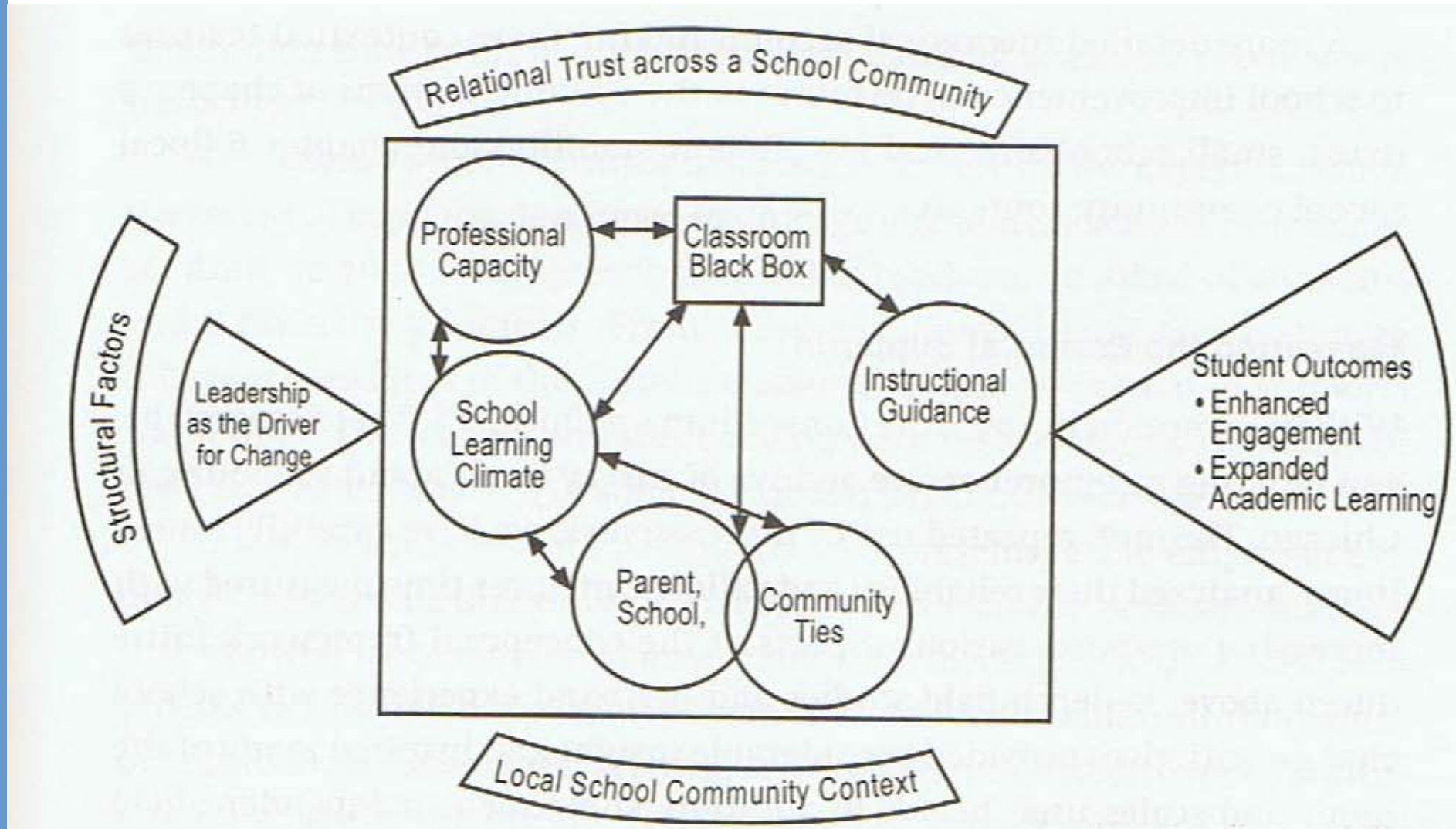
Bryk et al. (2010): Organizing Schools for Improvement



Leadership

(a) Inclusive, facilitative leadership
(b) Instructional leadership
(c) Operations management

Professional capacity

(a) Human resources
(b) Professional development
(c) Professional dispositions
(d) Professional community

Parent-community ties

(a) Knowledge of Students Culture
(b) Ties to the Community
(c) Use of Community Resources
(d) Teacher Outreach to Parents
(e) Parent Involvement in the School

Student-centered Learning climate

(a) Safety and order

(b) Teachers' academic press and personalism

My math teacher…

- encourages me to do extra work when I don't understand something.
- expects me to do my best all the time.
- expects me to complete my homework every night.
- thinks that it is very important that I do well in math.

- Most of my teachers really listen to what I have to say.
- Teachers really care about students.
- I feel like my teachers don't know me very well.
- In class I often feel "put down" by my teachers.

(c) Supportive peer norms

Instructional Guidance

(a) curriculum alignment

(b) intellectual emphasis and pedagogical methods

(Applications emphasis)

About how often do you use each of the following instructional strategies? (Example from Mathematics)

- Have students produce written material longer than 1000 words (4 pages).
- Assign projects of at least one week's duration.
- Develop technical or scientific writing skills.
- Have students debate ideas
- Have students do experiments or observations.
- Have students brainstorm ideas for written work.
- Have students play math games.
- Work with objects like rulers, counting blocks, or geometric shapes.

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Effective Schools in Reading, Mathematics, and Science at the Fourth Grade

Michael O. Martin, Pierre Foy, Ina V.S. Mullis, and Laura M. O'Dwyer[1]

Boston College

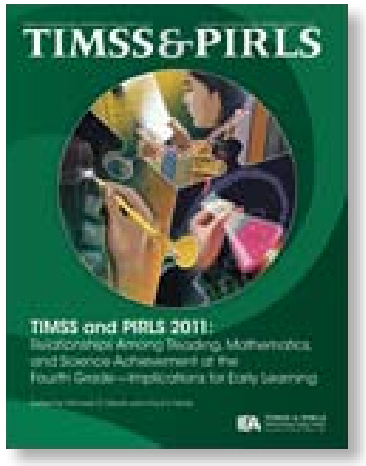

Exhibit 3.1: Model of Effective Schools

Strongly supported by the research, this study maintains a firm conviction that effective schools:

- Are Safe and Orderly
- Support Academic Success
- Have adequate facilities and equipment
- Are staffed with well-prepared teachers
- Have well-resourced classrooms
- Provide effective instruction

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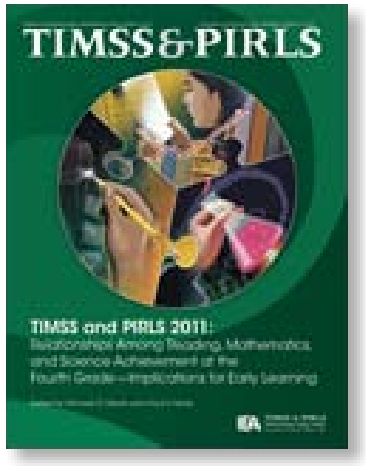

Missing from 5 Essential Supports:

Leadership, Professional Capacity (mostly), Parent-Community Ties, Instructional Guidance (mostly)

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Are Safe and Orderly
Support Academic Success
Have adequate facilities and equipment
Are staffed with well-prepared teachers
Have well-resourced classrooms
Provide effective instruction

School Instruction

Selecting school effectiveness measures of classroom instruction was more challenging, because the TIMSS and PIRLS 2011 background data and context questionnaire scales about teacher quality and instructional engagement are less well developed than the data about school climate and resources. However, two indicators of instructional effectiveness are included in the school effectiveness models. The school effectiveness measures of school instructional quality are as follows:

- Early curricular emphasis on higher order reading processes; and
- Students engaged in reading, mathematics, and science lessons.
    - I know what my teachers expect me to do;
    - I think of things not related to the lesson (reverse coded);
    - My teacher is easy to understand;
    - I am interested in what my teacher says; and
    - My teachers gives my interesting things to do.

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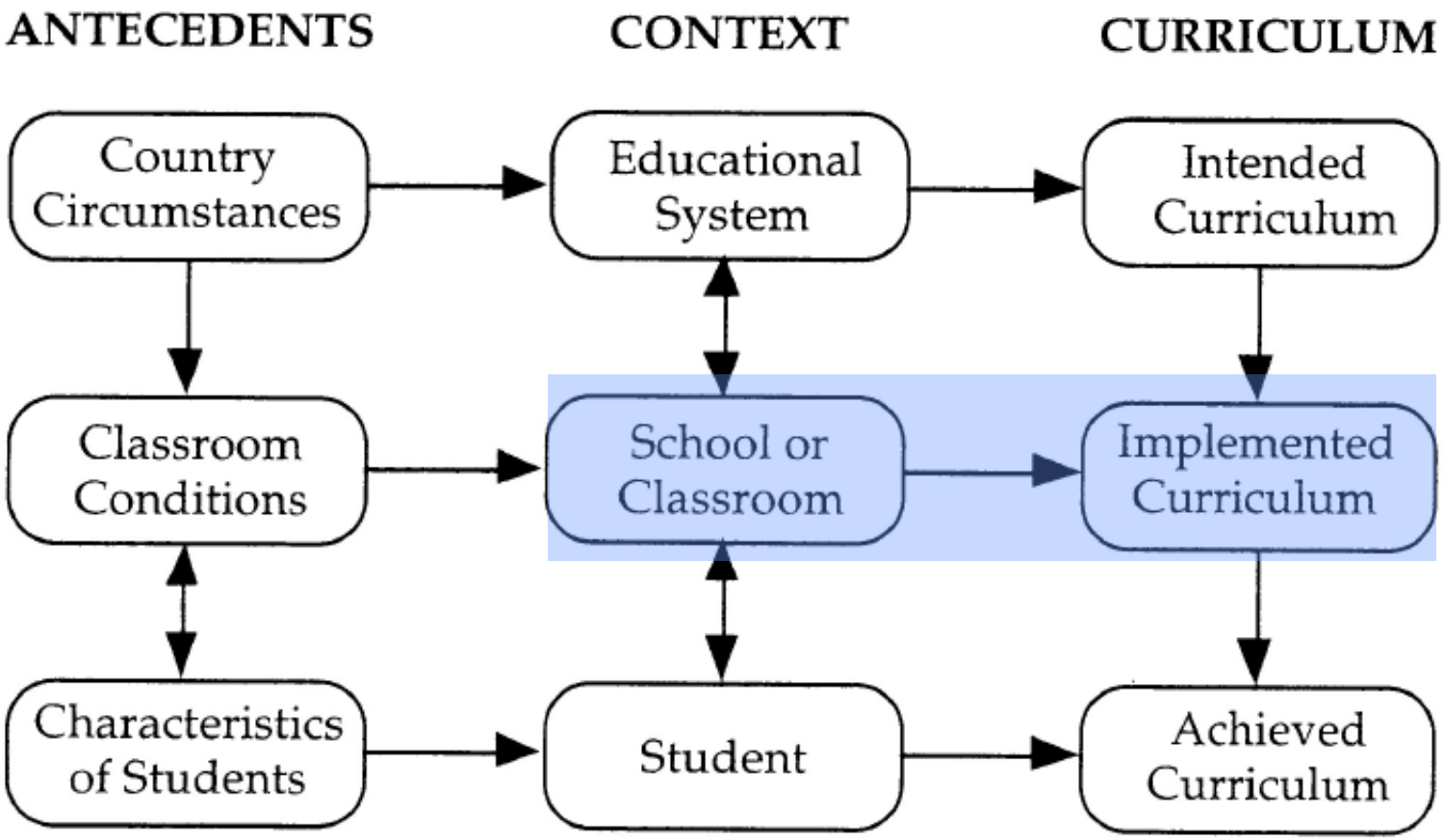
Conceptual Background (IEA, 1971)

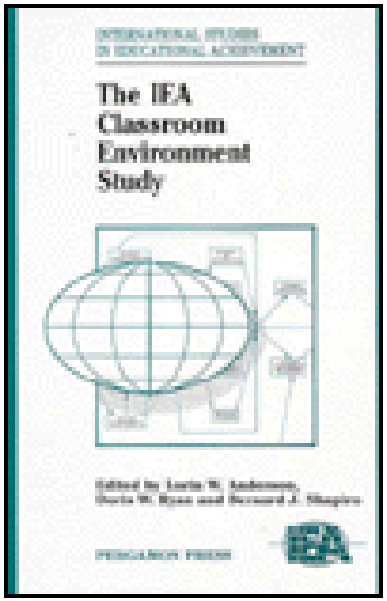


1970-71/1976


The IEA
Six Subject Survey:
An Empirical Study
of Education in
Twenty-One Countries

„Conducting classes in English was moderately associated with student achievement at the upper secondary school level and weakly associated with achievement at the 14-year-old level.”

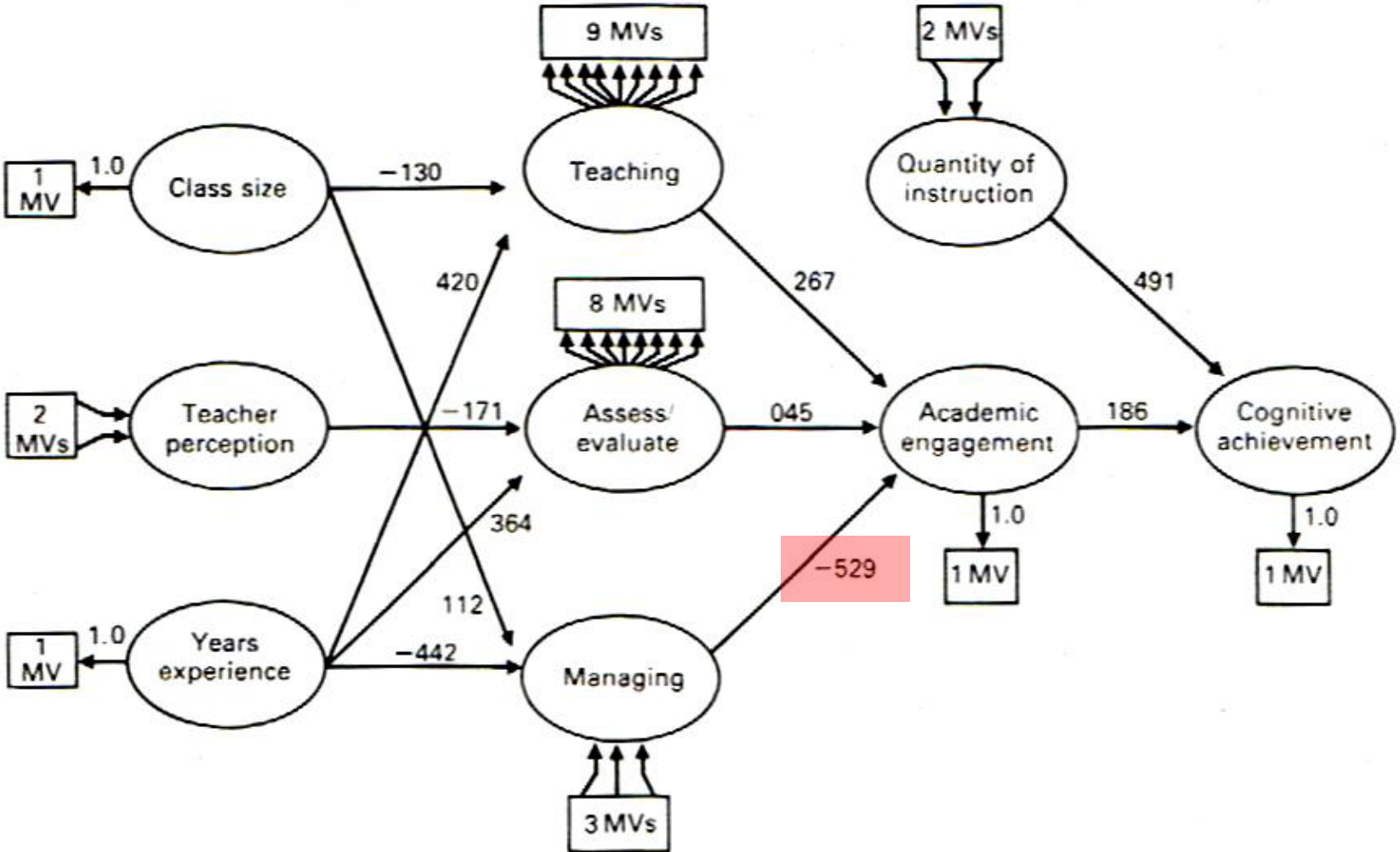
1970-71/1976 1981-1983/1989



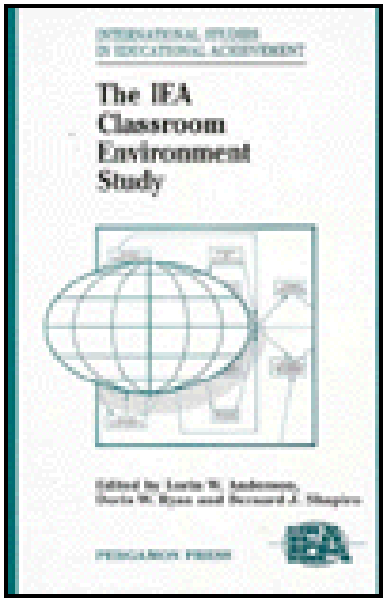
“Teacher behaviors were more consistently associated with students' academic engagement than with their final achievement. Thus, what teachers did in the classroom appeared to be more highly related to what students did than to what they learned.”

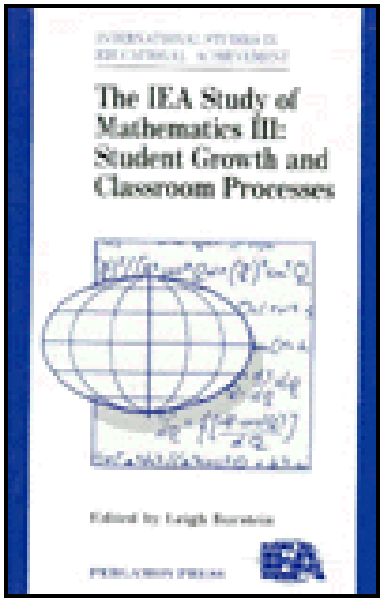
IEA Classroom Environment Study

Anderson et al. 1989



1970-71/1976 **1981-1983/1989** **1980-82/1993**





„The picture changes dramatically, however, once controls for entering performance are introduced …. Almost all of the … differences disappear“ (p 275)

„The only classroom or school variable to be significantly related to achievement growth (controlling for other student and schooling variables) in more than one system was opportunity to learn the content represented on the test (OTL). Even for OTL the results are spotty and inconsistent.“(320)

Opportunity to learn
(Schmidt & McKnight 1995; Schmidt & Maier 2009)

- Content Coverage
- Content Exposure Variables:

  considering time and depth of teaching
- Content Emphasis Variables:

  e.g., lower vs. higher order skills

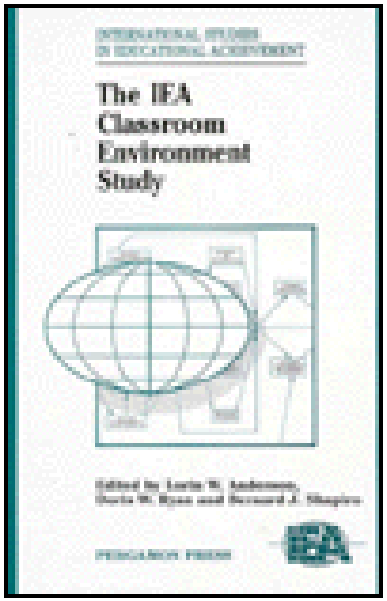
TIMSS 2011 TQ
Content Coverage & Exposure

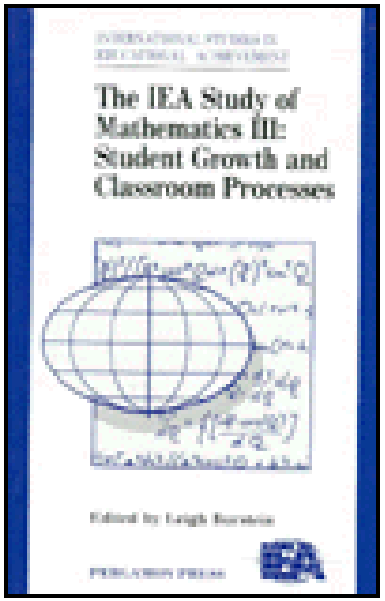
The following list includes the main topics addressed by the TIMSS mathematics test. Choose the response that best describes when the students in this class have been taught each topic. If a topic was in the curriculum before the <eighth grade>, please choose "Mostly taught before this year." If a topic was taught half this year but not yet completed, please choose "Mostly taught this year." If a topic is not in the curriculum, please choose "Not yet taught or just introduced."

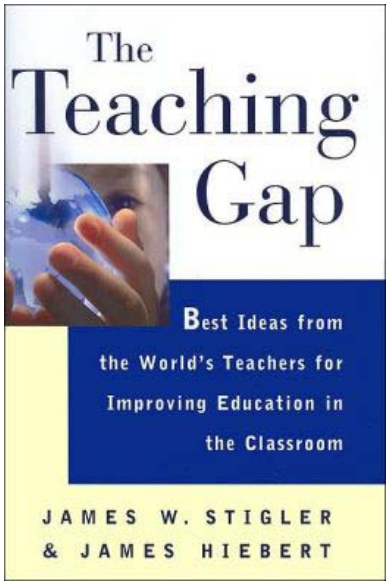
*Check **one** circle for each line.*

	Mostly taught before this year	Mostly taught this year	Not yet taught or just introduced
A. Number			
a) Computing, estimating, or approximating with whole numbers	○	○	○
b) Concepts of fractions and computing with fractions	○	○	○
c) Concepts of decimals and computing with decimals	○	○	○
d) Representing, comparing, ordering, and computing with integers	○	○	○
e) Problem solving involving percents and proportions	○	○	○

1970-71/1976 **1981-1983/1989** **1980-82/1993** **1995/1999**



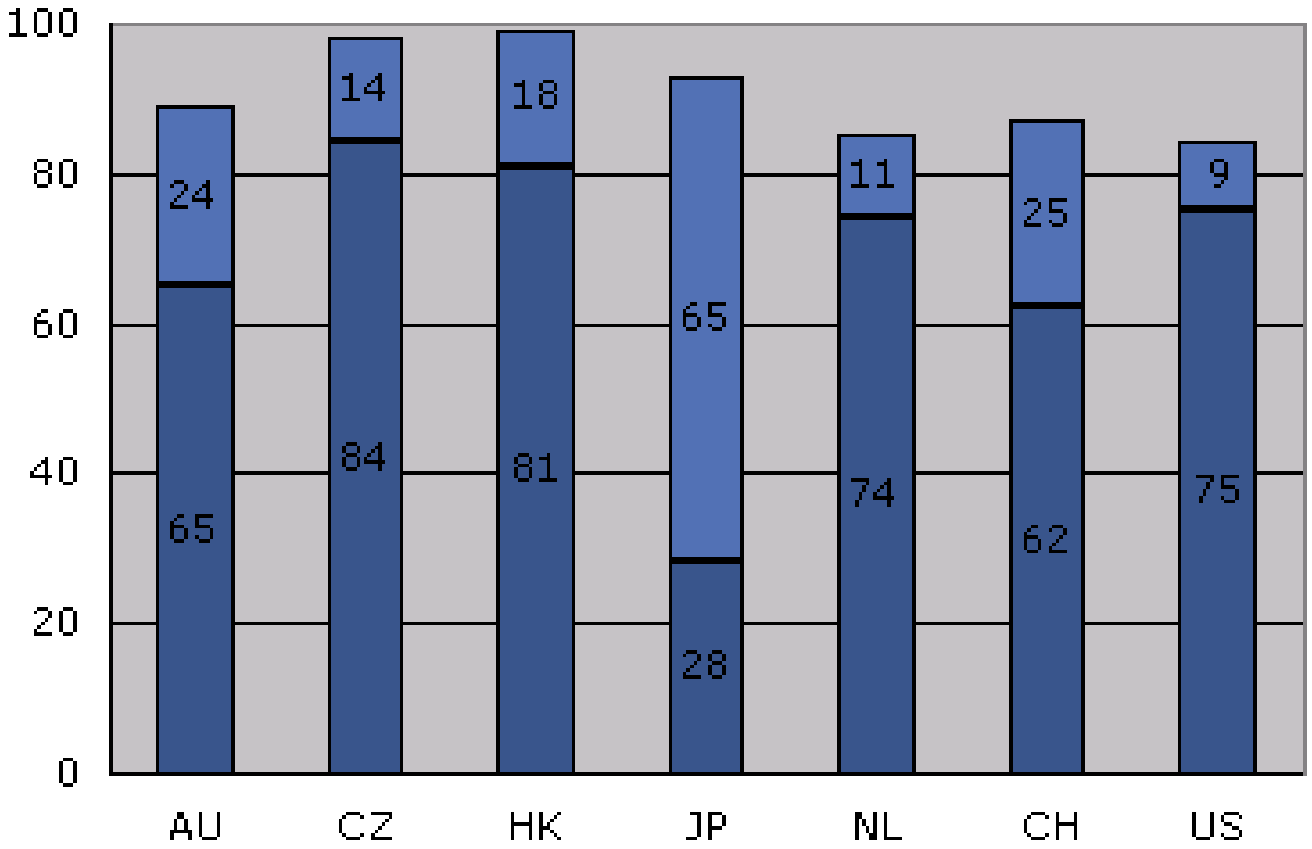




Scripts = generalized knowledge about an event that resides in the heads of participants.
These scripts guide behavior and also tell participants what to expect.
…learned through observation and participation.
Within a culture, these scrips are widely shared, and therefore they are hard to see. (p. 85)

Teaching as „cultural activity“ ! (Stigler)

Percent of teaching time used for challenging tasks vs. practicing (TIMSS Video Study)



Focus on Germany – Longitudinal Extension

2nd order factors of classroom practice

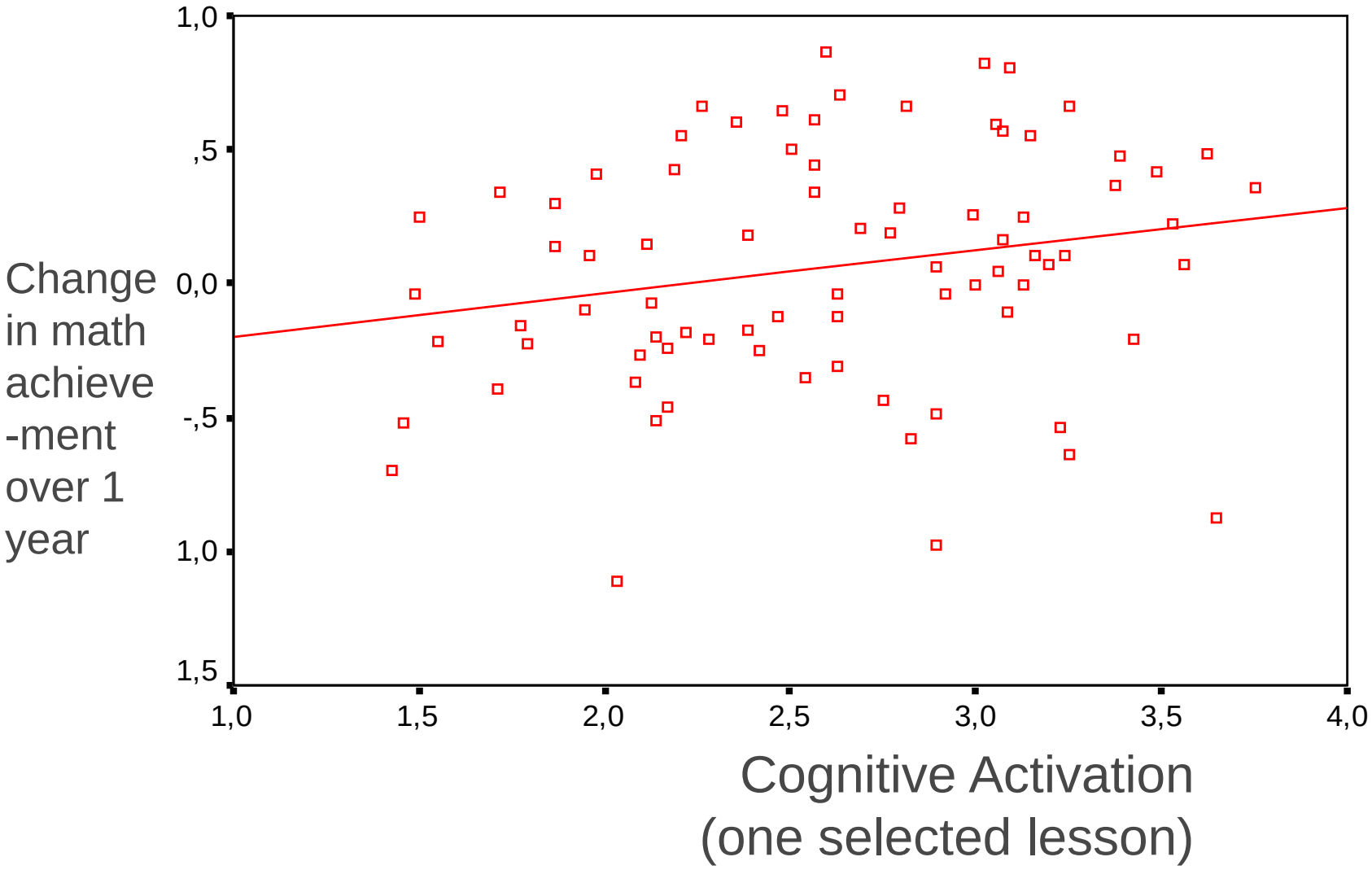
based on high-inference video-ratings (Clausen,Klieme & Baumert 2002

(TIMSS-Video 1994 Germany: national sample, 100 + 86 lessons)

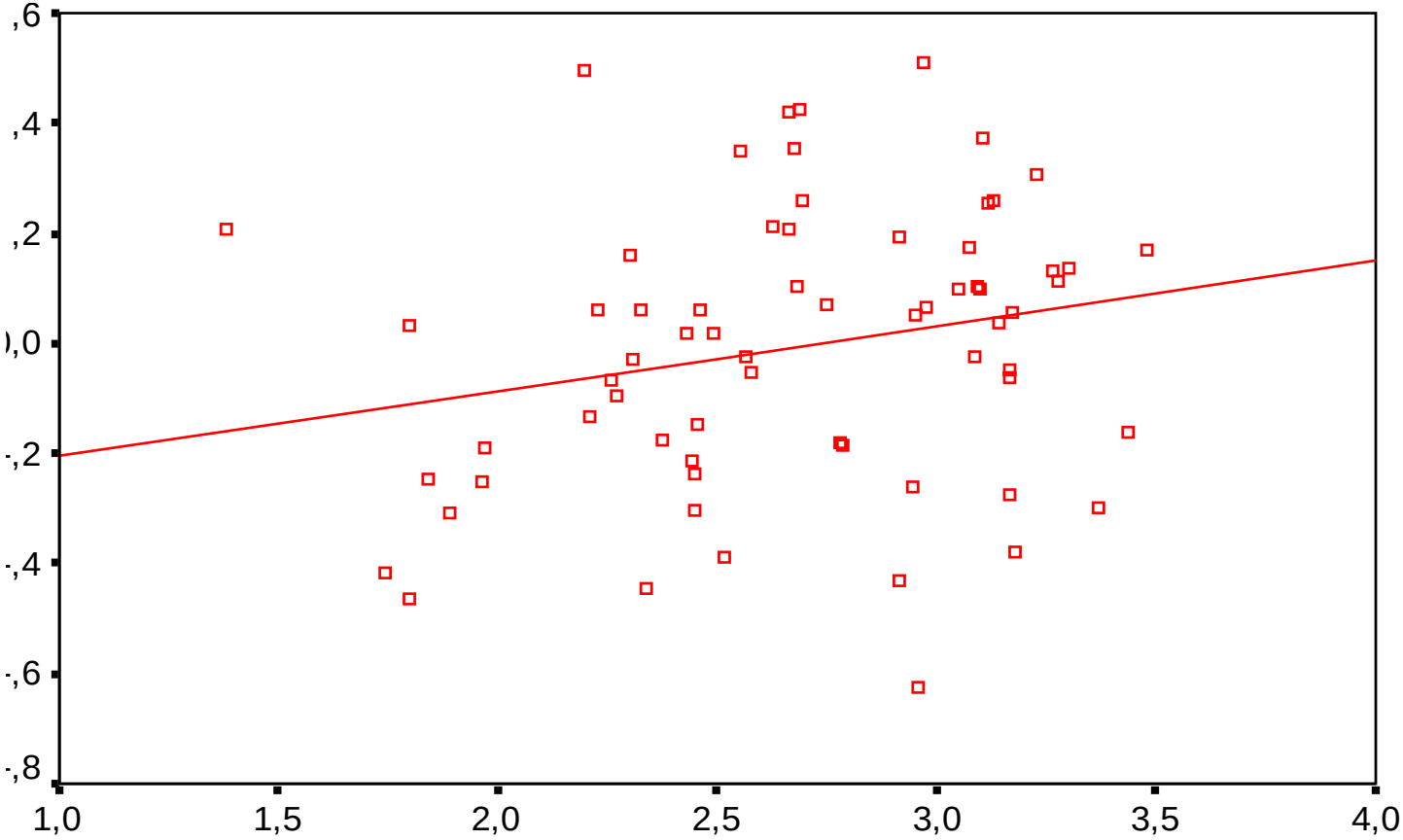
Structure and Classroom Management	Supportive climate	Cognitive Activation
Effective treatment of interruptions „teacher intervenes immediately, before disturbance may evolve“ Clarity of rules Interruptions (-) Waste of time (-) Monitoring Time on task Teacher Unreliability (-) **Clarity and structuredness 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 (-)

Cognitive Activation predicts achivement growth

Unterrichtsqualität und Leistungsentwicklung



Supportive Climate predicts motivational development



Change in math interest over 1 year

Supportice Climate (one selected lesson)

Quality dimensions („Deep structure“ of enacted curriculum)

Pianta & Hamre (2009): CLASS framework

- Classroom organization
- Emotional support
- Instructional support

Tschannen-Moran, M. & Woolfolk Hoy, A. (2001):

Ohio teacher efficacy scales (OSTES)

- Efficacy for classroom management
- Efficacy for student engagement
- Efficacy for instructional strategies

Borrowing from psychological research

Process-Product-Research; Behavioral learning theory

→ **Classroom Management, Clarity & Structure**

Humanistic pedagogy and psychology;

Self determination Theory (Deci & Ryan)

→**Supportive climate & Structured learning environment**

Cognitive Theory (e.g. Brown 1997, Mayer 2004);

concepts from (moderate) constructivism

→ **Cognitive Activation & Deep Content**

DESI Study (German National language Survey)
Klieme et al. (2008)
Student Questionnaires

Construct	Item Example	Alpha
Structure	At the end of a lesson, the teacher summarizes main issues	.79
Support	My teacher advises me how to improve.	.86
Cognitive Activation	My Teacher stresses that our writing should be gramatically correct	.89

DESI Study
(German National language Survey)

Klieme, Steinert & Hochweber (2010)

Hochweber, Steinert & Klieme (in press)

Standardized effects (controlling for individual and school-level context)
In ninth grade (440 classrooms, 11.000 students)

	German		**English**	
	Achievement	Interest	Achievement	Interest
Cognitive Activation	.242	.073	.150	.001
Structure	-,147	.188	-.069	.113
Support	.050	.239	.030	.303

For German, effects remain significant if intake is controlled for.

Consequences for LSA

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1. The notion of OTL should be revisited. What makes education effective is the quality of teaching and learning, not (only) the subject matter per se.

2. The quality of teaching can be validly assessed by students, teachers, and/or observers. There is even evidence that at least „structure/classroom climate“ and „support“ can be measured cross-culturally (scalar invariance).

3. LSA can be used to **describe** teaching and learning, its **variation** and **distribution** (→ equity ?) based on
(a) subject matter coverage (OTL in the traditional sense)
(b) quality dimensions (structure, support, cognitive activation)
(c) specific practices („treatments“).

4. Large Scale assessment data can be used to **model the relationships** with student attainment, cognitive skills, and non-cognitive outcomes.
The explanatory power (for quality dimensions) or causal interpretation (for treatments) depends on the availability of relevant control variables (=approximation for pre-knowledge).

5. International LSA can be used to test the universality vs culture-specificity of teaching quality and effectiveness. (→ Research aim of IEA !!!)

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How often do you do these things in your mathematics lessons?

*Fill in **one** circle for each line*

		Every or almost every lesson	About half the lessons	Some lessons	Never
a)	We practice adding, subtracting, multiplying, and dividing without using a calculator	①	②	③	④
b)	We work on fractions and decimals	①	②	③	④
c)	We interpret data in tables, charts, or graphs	①	②	③	④
d)	We write equations and functions to represent relationships	①	②	③	④
e)	We work together in small groups	①	②	③	④
f)	We relate what we are learning in mathematics to our daily lives	①	②	③	④
g)	We explain our answers	①	②	③	④
h)	We decide on our own procedures for solving complex problems	①	②	③	④
i)	We review our homework	①	②	③	④
j)	We listen to the teacher give a lecture-style presentation	①	②	③	④
k)	We work problems on our own	①	②	③	④
l)	We begin our homework in class	①	②	③	④
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n)	We use calculators	①	②	③	④

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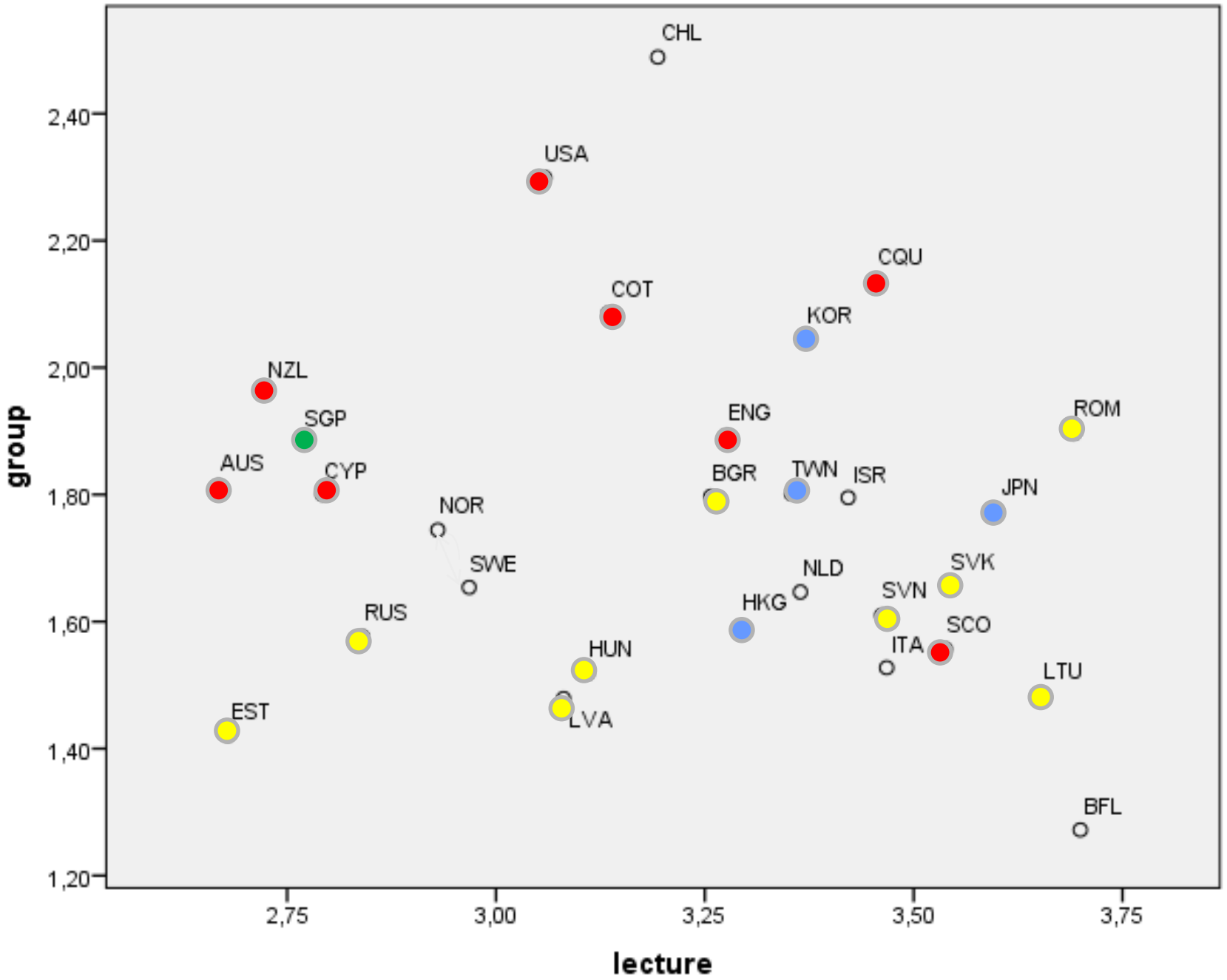
Practices:

- group work (e)
- lecturing (j)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lecture

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Predictor	Dependent: Math. Achievement	
Student:		
N of books	9.42 ***	
Classroom:		
N of Books	54.22 ***	
Science Ach		
Group work	-14.53 ***	
Moderation: Country level Math Ach		

Predictor	Dependent: Math. Achievement	
Student:		
N of books	9.42 ***	4.01 ***
Science Ach		0.48 ***
Classroom:		
N of Books	54.22 ***	8.21 ***
Science Ach		0.92 ***
Group work	-14.53 ***	-1.44
Moderation: Country level Math Ach		-.12 ***

Predictor	Dependent: Math. Achievement		Lecturing
Student:			
N of books	9.42 ***	4.01 ***	4.01 ***
Science Ach		0.48 ***	0.48 ***
Classroom:			
N of Books	54.22 ***	8.21 ***	8.60 ***
Science Ach		0.92 ***	0.91 ***
Lecturing			4.06 ***
Group work	-14.53 ***	-1.44	
Moderation: Country level Math Ach		-.12 ***	0.05 ***

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Teaching quality:

- cognitive activation (g, h)

How much do you agree with these statements about your school?

*Fill in **one** circle for each line*

		Agree a lot	Agree a little	Disagree a little	Disagree a lot
a)	I like being in school	①	②	③	④
b)	I think that students in my school try to do their best	①	②	③	④
c)	I think that teachers in my school care about the students	①	②	③	④
d)	I think that teachers in my school want students to do their best	①	②	③	④

Teaching quality:
- support

Summary of findings (TIMSS 03)

- **Group work** seemed to be negatively linked with mathematics achievement. However, by using a control for academic ability, we see that this effect only holds in high achieving countries.

- **„Cognitive activation“** had a positive effect both on cognitive and affective outcomes in mathematics across countries. (Although there was considerable variation in slopes between countries.)

- **„Support“** had a positive effect on students‘ valuing mathematics – but only in countries that generally had a supportive culture.

- If **science achievement** (as a proxy for general academic ability) is controlled for, the positive effect of „cognitive activation“ on mathematics achievement still exists.

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Some suggestions for research stratgies in IEA (1)

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The study design and the context assessment mostly determine the explanatory power of LSA.

Stakeholders should understand that context assessment needs more effort (and response time !).

Strong theoretical frameworks are available.

Refresh the concept of OTL to include quality factors: „Implemented curriculum“ is more than content matter: it is the „enacted instructional regime“ (Raudenbush).

Develop innovative measures: rating scales based on generalized statements and frequency of practices; probably: observational methods, artifacts.

Some suggestions for research stratgies in IEA (2)

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The IEA design principles (classroom based, multi-subject, curriculum-related) offer a good foundation. Try add-ons (at least for subgroups of countries): additional context scales, improved control variables (incl. a general reasoning test), multiple classrooms within schools, longitudinal add-ons (short term for teaching effects, medium-term for achievement growth, long-term for school cahnge, very long term for predictive validation). Adjust test design accordingly.

Develop theory and modeling techniques for the system level (trend).

Let research drive IEA studies, not just policy making !

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Thank you for your attention !

klieme@dipf.de

Challenges in international surveys:

(i) Describing professional practices and school context variables *known to be effective*

(ii) Understanding relationship with outcomes *within the survey*.

- Linking to strong theories of school /teaching effectiveness (→ new questionnaire scales ?)
- Distinguishing between classroom and school level (→ design ?!)
- Understanding the impact of system and culture
- Understanding the potential and the limits of cross-sectional data
- Measuring and explaining change on different levels (→ design ?!)

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Predictor	Dependent: Valueing Math
Student:	
Classroom:	
Cogn. Activation	.20 ***
Moderation: Country level Cogn. Activation	.07
Support	.21
Moderation: Country level Support	.23 **

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Predictor	Dependent: Valueing Math	Dependent: Math Achievement
Student:		
Classroom:		
Cogn. Activation	.20 ***	42.93 ***
Moderation: Country level Cogn. Activation	.07	1.25
Support	.21	11.51
Moderation: Country level Support	.23 **	-43.64

Predictor	Dependent: Valueing Math	Dependent: Math Achievement	Dependent: Math Achievement
Student: Science Ach			.498 ***
Classroom: Science Ach			.964 ***
Cogn. Activation	.20 ***	42.93 ***	11.37 ***
Moderation: Country level Cogn. Actvation	.07	1.25	7.36
Support	.21	11.51	-3.14
Moderation: Country level Support	.23 **	-43.64	-14.95