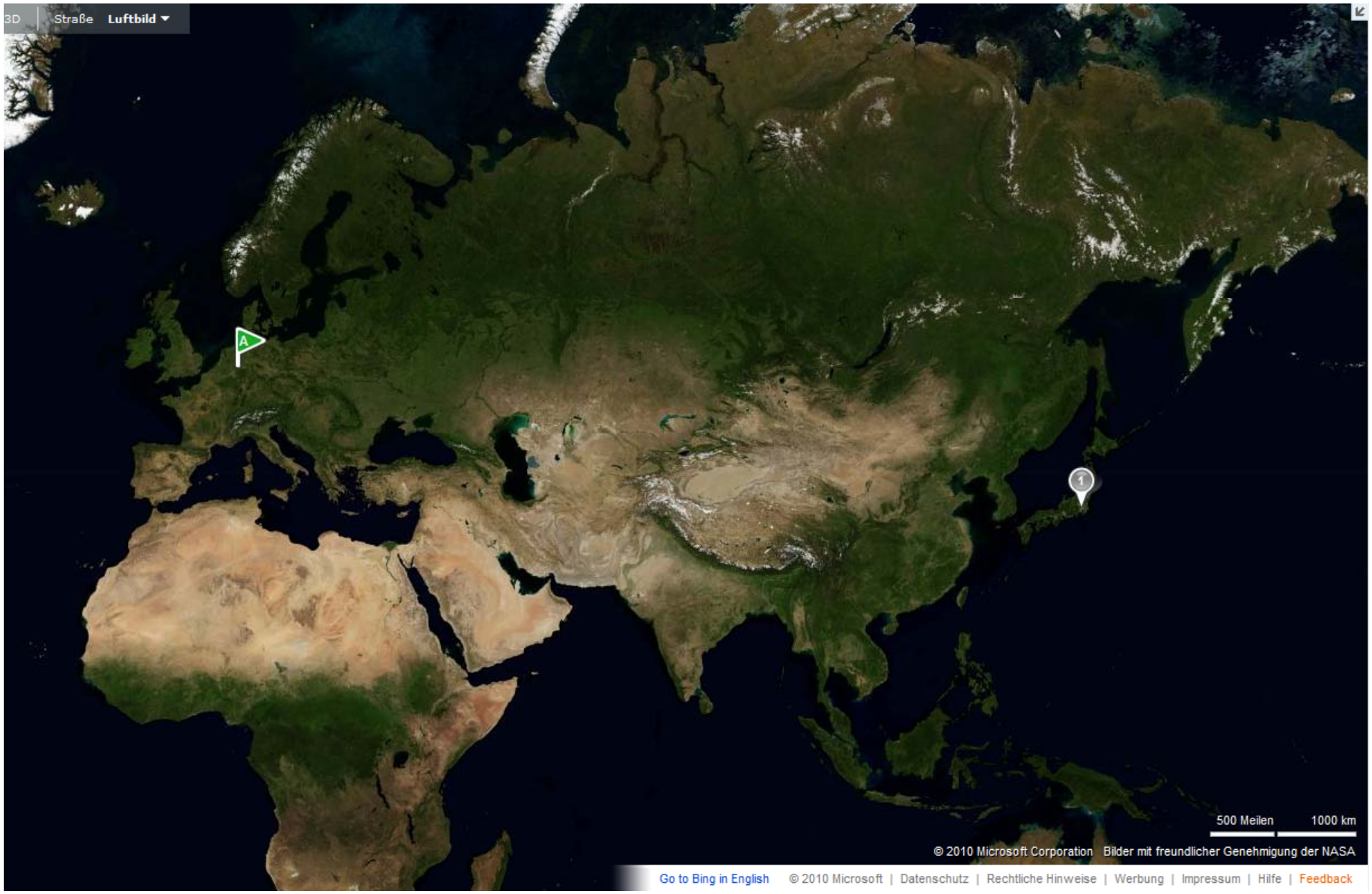
FROM **TRADITIONAL** TO **OUTCOME-BASED** MEDICAL EDUCATION

RESULTS OF A **RANDOMIZED CONTROLLED TRIAL** AT THE RUHR-UNIVERSITY BOCHUM, GERMANY

Thorsten Schäfer

Study Dean, Centre for Medical Education


3D
Straße
Luftbild
A
1
500 Meilen
1000 km
© 2010 Microsoft Corporation Bilder mit freundlicher Genehmigung der NASA
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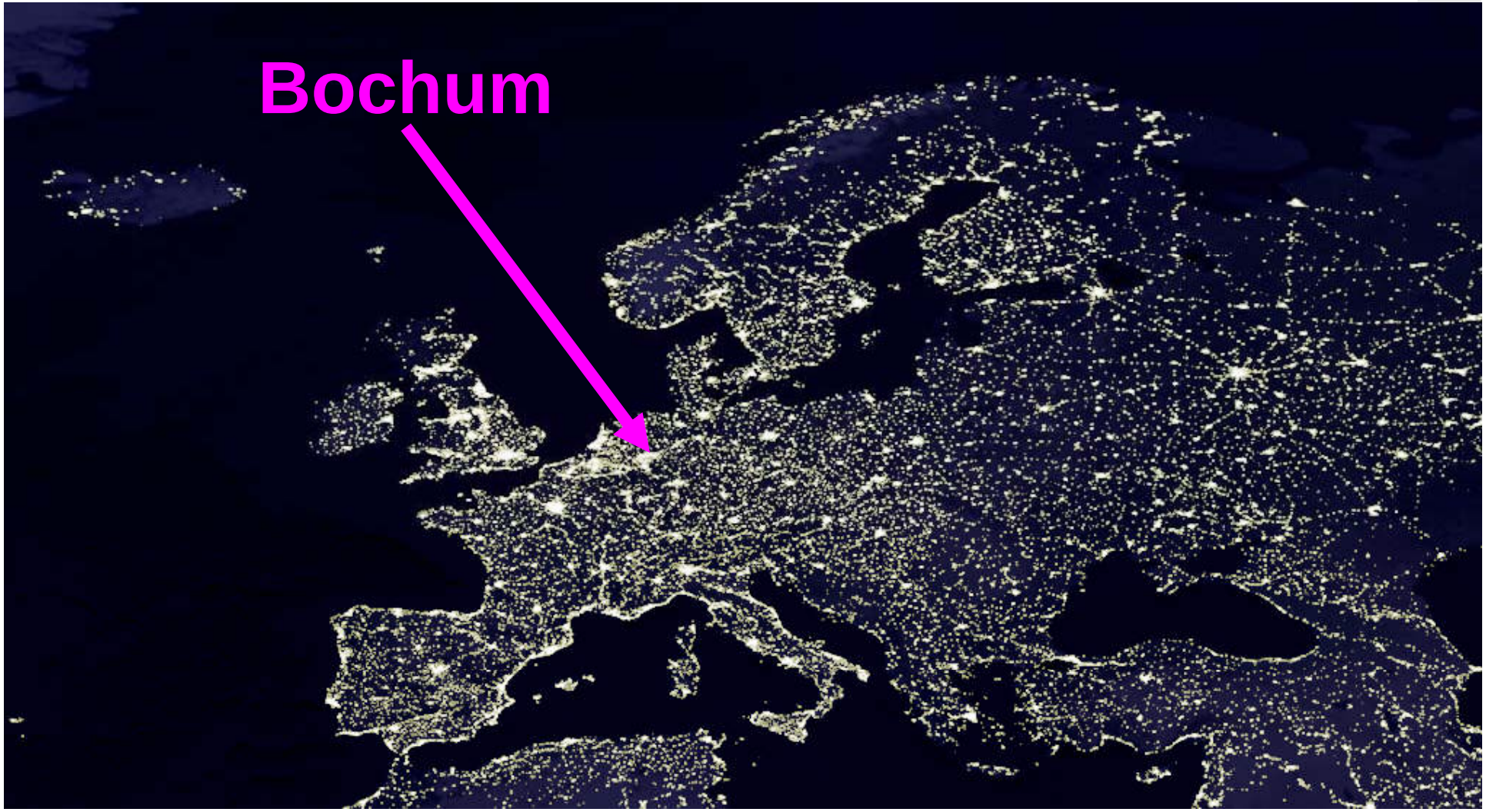
Europe @ Night



Ruhr-University Bochum Facts

- **Degree Programmes: 150**
- 55 Bachelor, 81 Master, 4 State exam / Ministry, 10 Other

- **Budget 2009 (incl. medicine, without clinics)**
- about EUR 423 m EUR,
- therefrom external funding: 92.5 m EUR

- **Students**
- **Total: 31994** (Women: 48%) Term 2009/10

- **Employees (31.12.2009)**
- **Total: 5200**
  - 393 Professors, 22 in Clinics;
  - 40Juniorprofessors, 4 in Clinics
  - 2.440 Non-professorial academic staff;
  - 2.323 Non-academic staff

- **Facilities**
- 20 Faculties
- 10 Central Academic Facilities (ZWEs)
- 7 Affiliated Institutes

- **Coordinated Research Programmes**
- 9 Collaborative Research Centres (SFBs and SFB/Transregio)
- 4 Collaborative Research Centres - Cooperations
- 6 (+15 cooperations) Research Units
- 3 (+2 cooperations) Research Training Groups
- 5 Graduate School,15 Junior Research Groups

- **International Partnerships** and Special Co-operation Agreements: more than 350

Impressions: Campus and Hospital

Facts

The University Hospital

- 10 hospitals
  - at 6 locations
- 3.500 beds
- 200 medical practices

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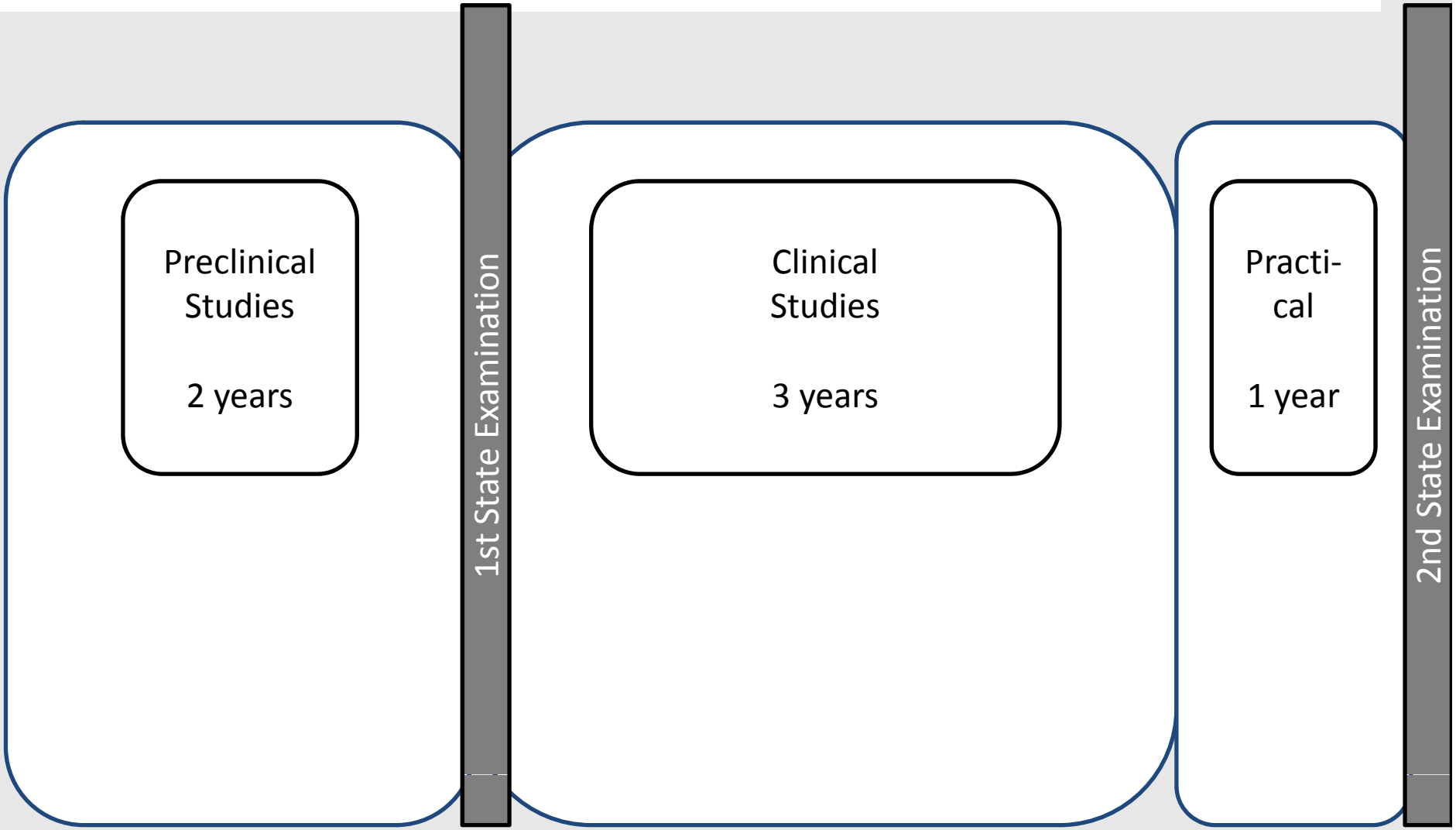
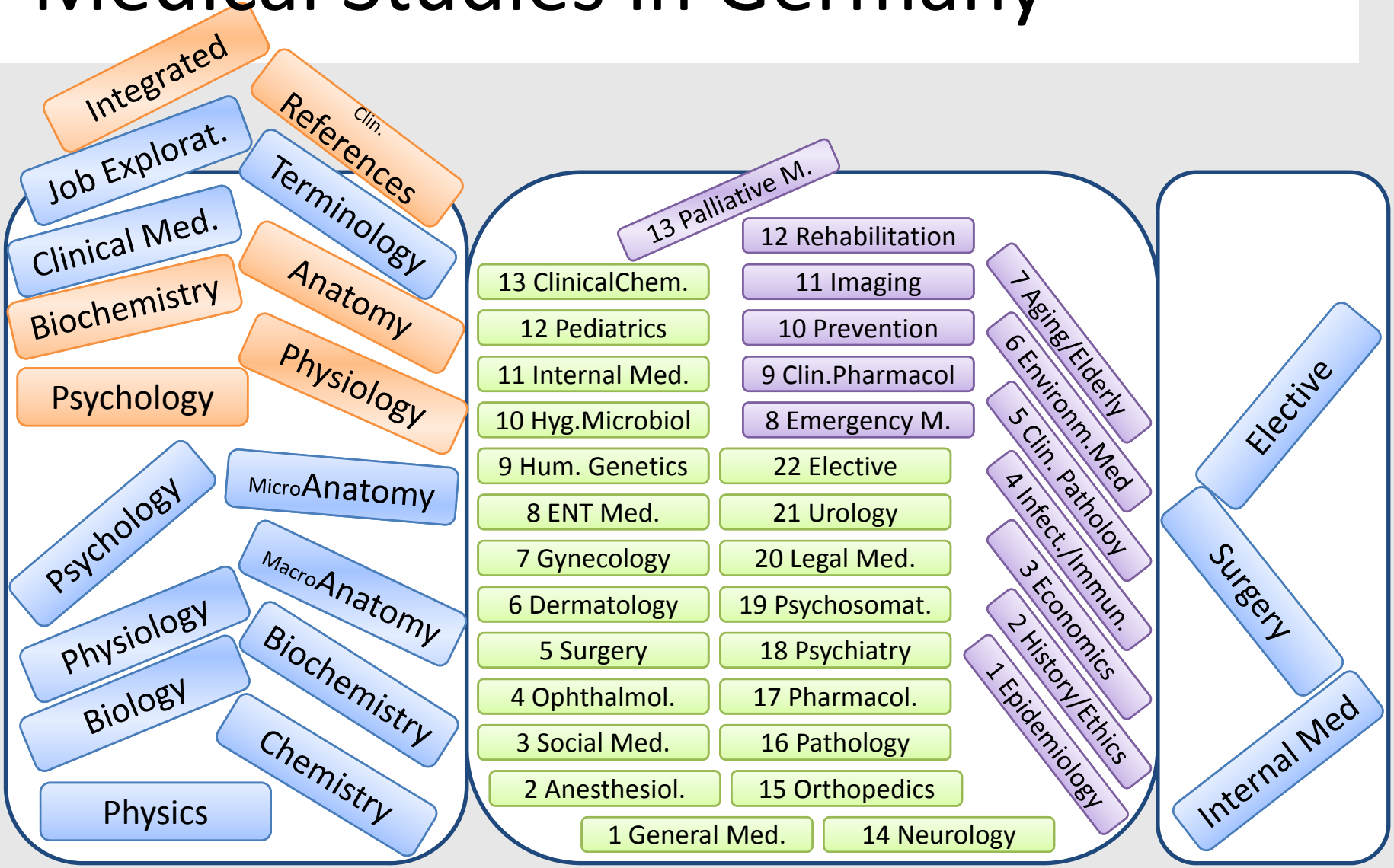
Medical Studies in Germany



practical | seminar | disciplines | Cross-sectional

RUB

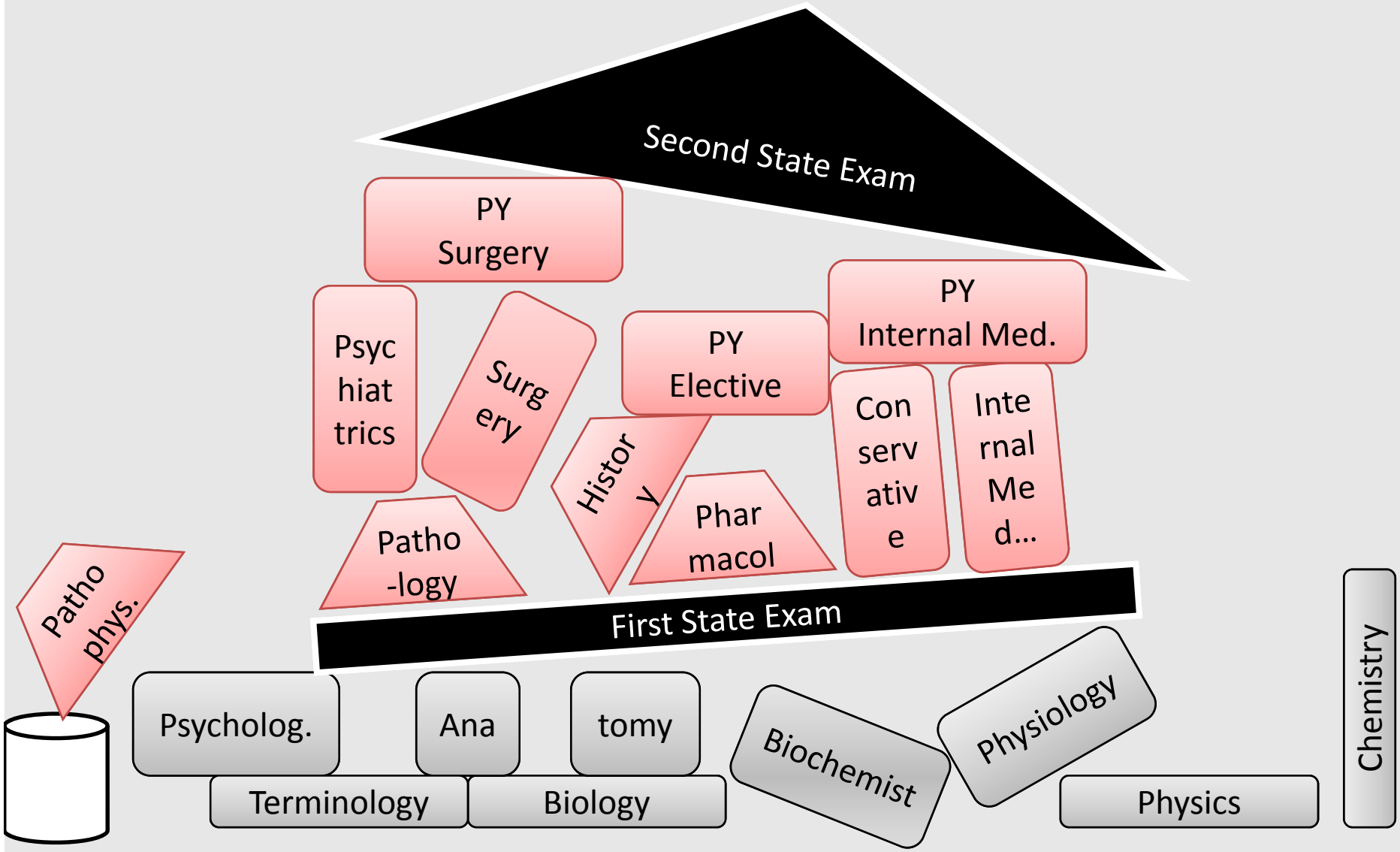
Medical Studies in Germany



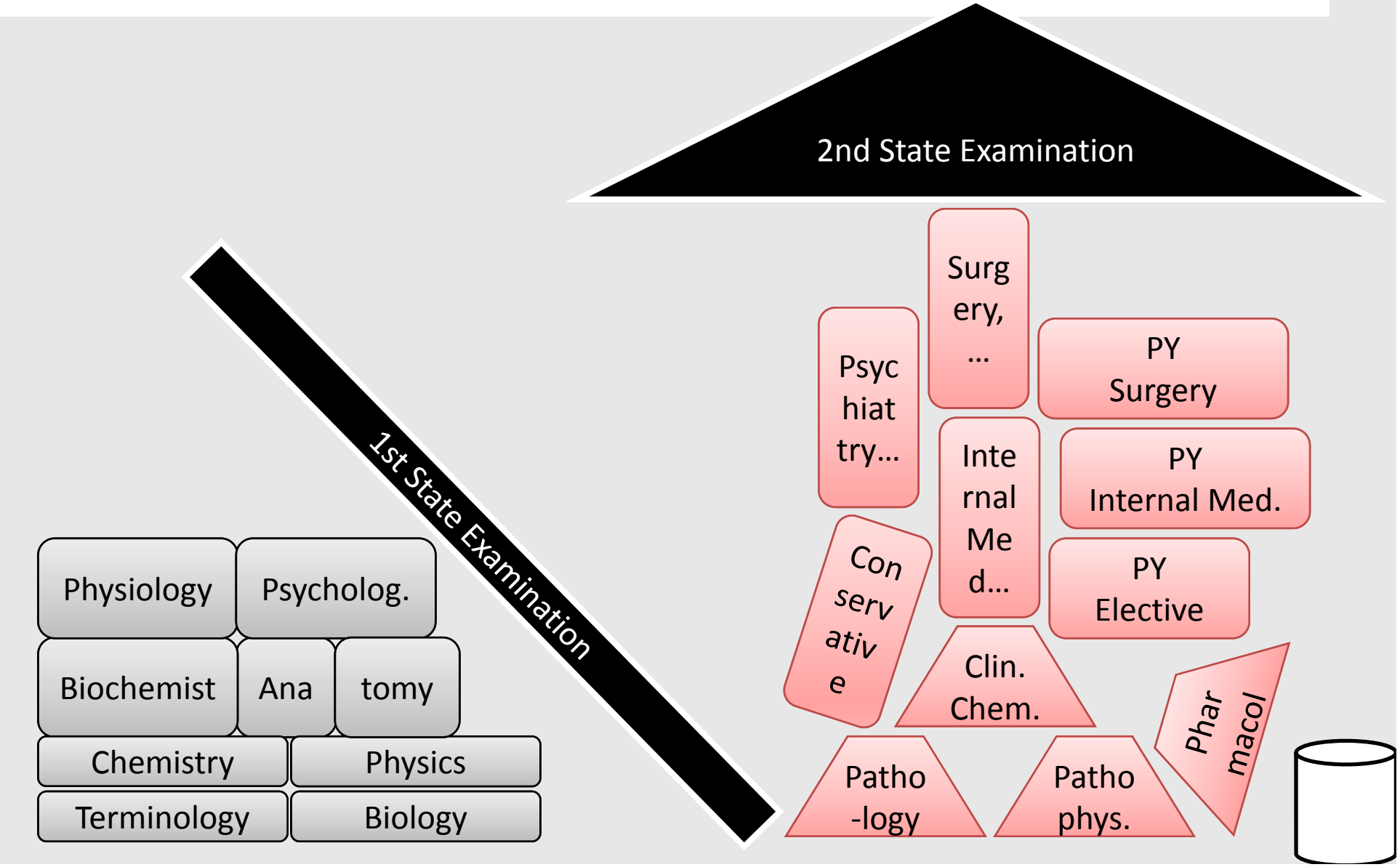
The Medical Curriculum

The Medical Curriculum Idea

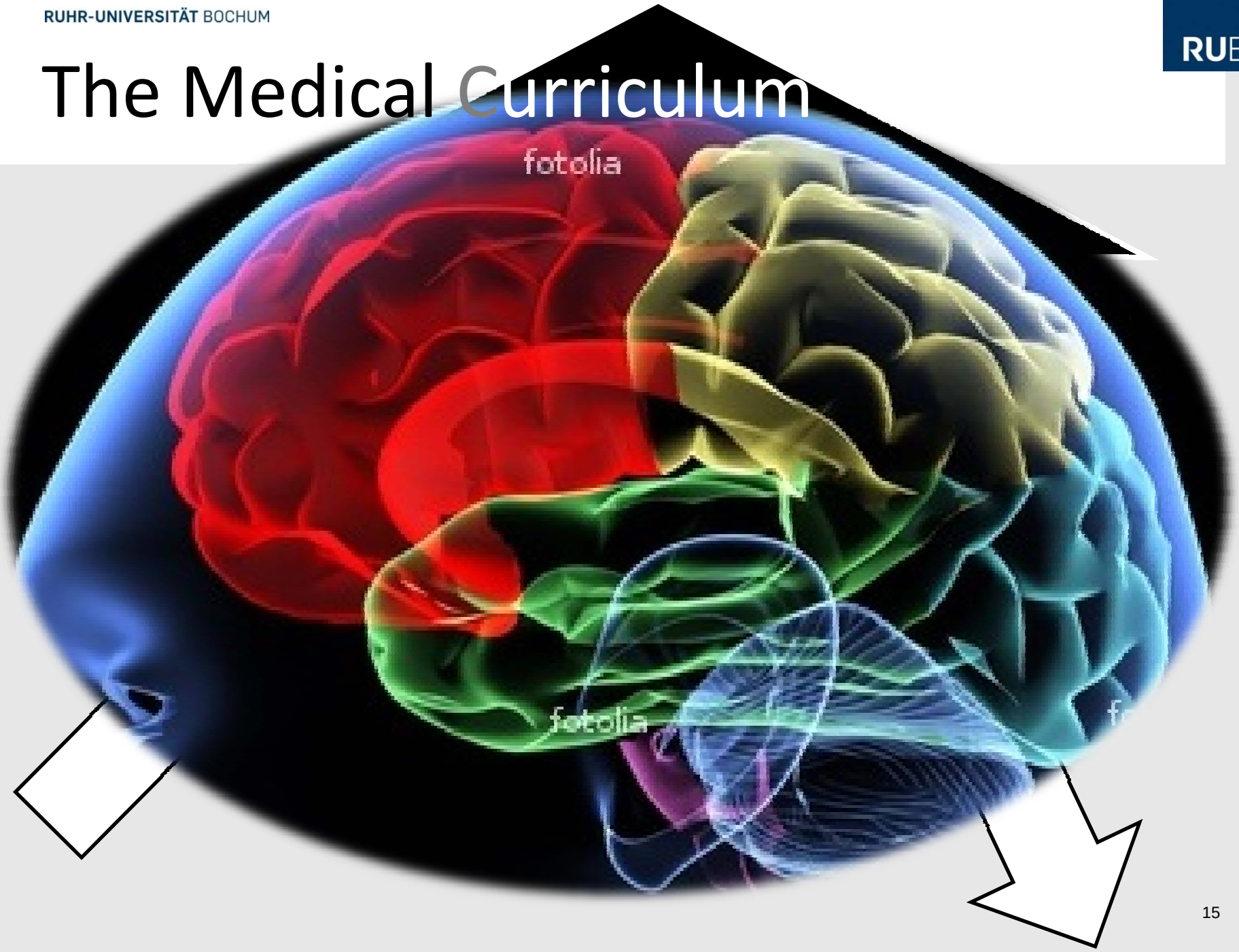
The Medical Curriculum, Reality



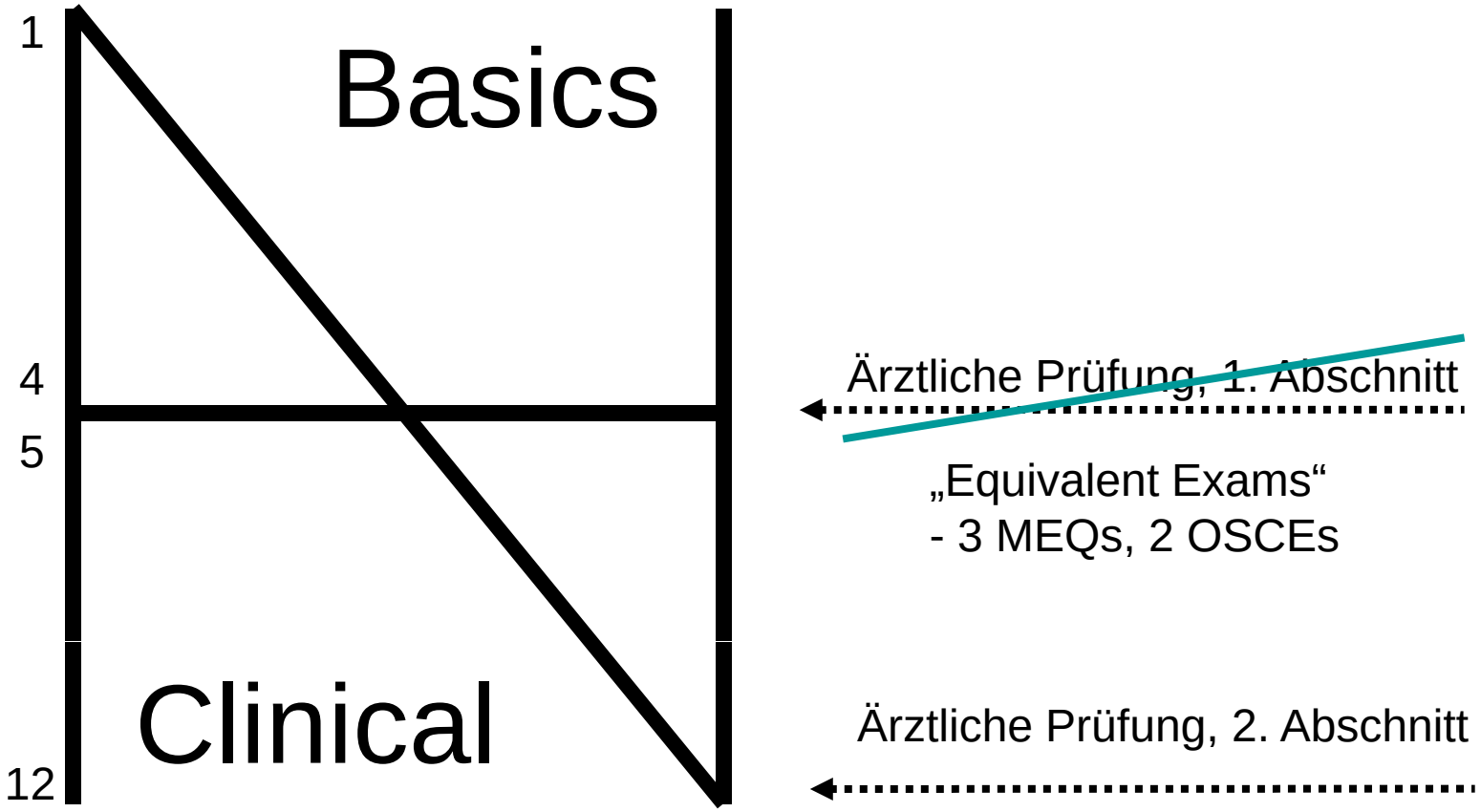
The Medical Curriculum, Reality2



The Medical Curriculum



Changes: „from H to N“



FEATURES OF A
MODELL CURRICULUM

- **Replacement of the first state exam**
  - **by equivalent tests**
- **Different timing** of trainings in nursing, first aid and elective clerkships
- **Modification** of the Practical Year
- **Inclusion** of non-university hospitals and ambulatory care facilities in medical education

Research Question

- Is there a **difference** in the progress of **basic science** and **clinical knowledge** of students in a **traditional** (T) versus an integrated, **problem-based** (P) curriculum?
- Hypotheses:
  - T > P in basic sciences
  - P > T in clinical knowledge

The Curricula

Traditional

- Discipline-based
- Teacher-centered
- Main Lectures
- Seminars
  - Written exams (MCQ)
- Practical Courses
  - Oral exams

Integrated Curriculum

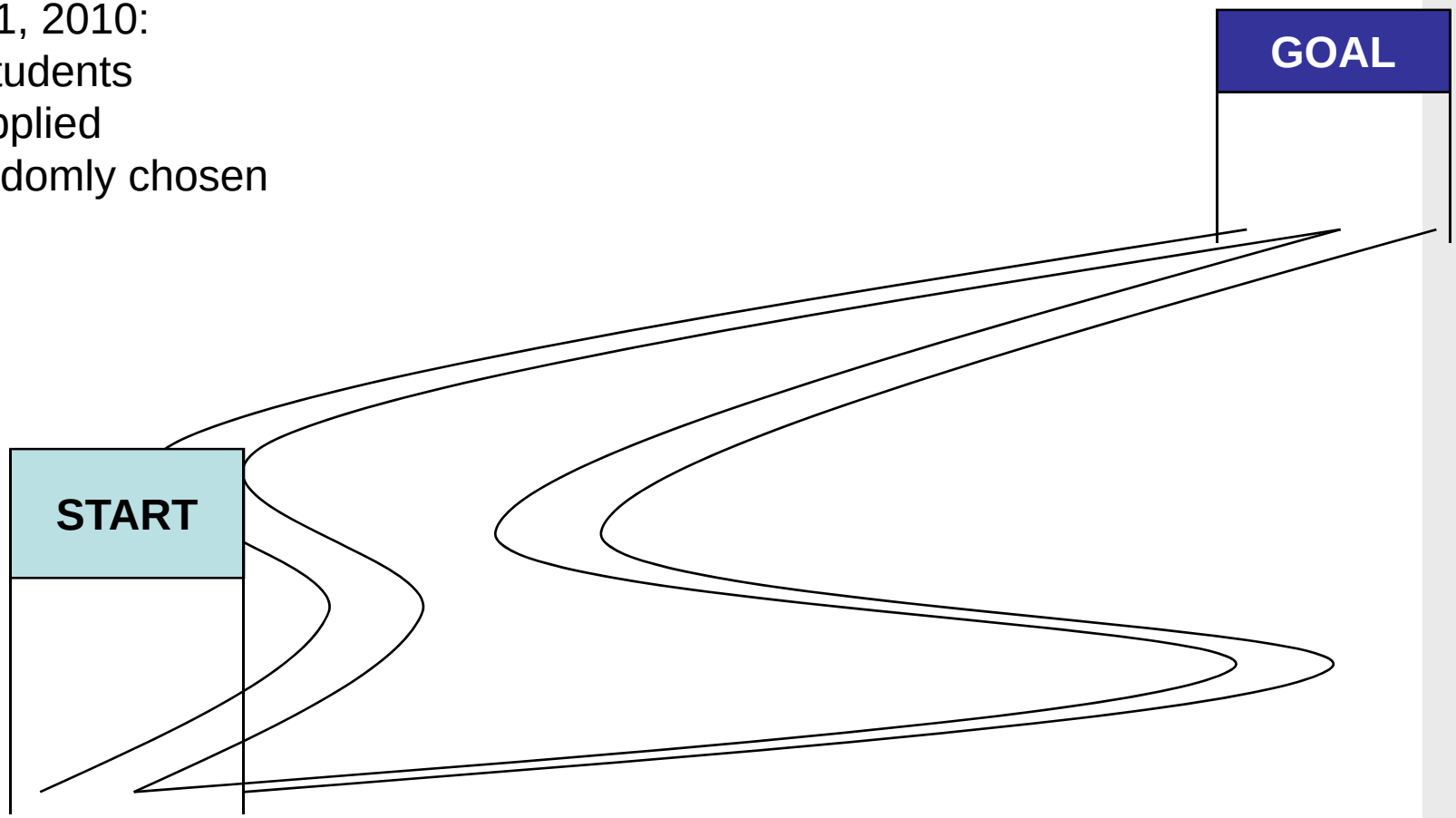
- Problem-based
- Student-centered
- Self-directed learning
- Seminars
  - Formative feedback
- Practical Courses
  - Clinical integration

Lots of changes…

- **Theme-based Curriculum**
- **Interdisciplinary Modules**
- Bochum **Catalogue of Learning Items**
- Medically Relevant **Learning Objectives**
- **Problem-based Learning**
- **GM Internship Program**
- **Focus on**
  - Communication Skills,
  - Health Economics,
  - Medical Ethics

Medical Studies: 2 Ways

Oct. 01, 2010:
302 Students
105 applied
42 randomly chosen



Core-Curriculum ***Modellstudiengang Medizin***
- Dezember 2005-

Organ Systems, multi-disciplinary

Woche	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Vorl.freie Zeit
1	Orient.	Die Zelle			Bewegung							Atmung			*SMKH	*EH	AM-Hospitation
2	* KP	Endokrinologie			Herz / Kreislauf				Flüssigkeit / Niere				MEQ/MCQ 1 OSCE 1				AM-Hospitation
3	Blut und Immunsystem						Stoffwechsel / Verdauung				Nervensystem						
4	Sinnesorgane / Haut						Psyche / Erleben			Sexualität / Fortpflanzung			MEQ/MCQ 2 OSCE 2				AM-Hospitation
5	Schwangerschaft und Perinatalzeit				Kindheit und Adoleszenz				Mittleres und Höheres Lebensalter					MEQ/MCQ 3 / Integrierte Prüfung I			AM-Hospitation
6	Herz- Kreislauferkrankungen; Erkrankungen der Nieren						Tumorerkrankungen						Anästhesiologie und Notfallmedizin				
7	Stoffwechsel- und endokrinologische Erkrankungen						Unfall und Verletzungen, degenerative Erkrankungen des Bewegungsapparates				Erkrankungen des respiratorischen Systems (obere und untere Atemwege)						
8	Infektionen, Entzündungen und Autoimmunerkrankungen								BP Chirurgie		BP Innere		Integrierte Prüfung II				AM-Hospitation
9	Erkrankungen des zentralen und peripheren Nervensystems und der Sinnesorgane					Psychiatrische und psychosomatische Erkankungen				Erkrankungen von Haut und Geschlechtsorganen							
10	Hereditäre und perinatale Erkrankungen				BP Allgemein-medizin		BP Pädiatrie		BP Gynäkologie		Wahlfach		Integrierte Prüfung III				
11	Praktisches Jahr																
12																	

Stränge I - III

Block Orientierung
System
Sonderblöcke und ambulant-medizinische Hospitation
auf Lebensabschnitte bezogene Module
auf Krankheitsbilder bezogene Module
klinische Blockpraktika
Stränge
Prüfungen

* KP = Krankenpflege
* EH = Erste Hilfe
* SMKH = Sozialmedizin und Krankenhaushygiene

Stundenplan 2. Semester • SS 2006 (unter Vorbehalt)

	Montag	Dienstag	Mittwoch	Donnerstag	Freitag
8.00-09.00 09.00-10.00	Seminar Biochemie / Molekularbiologie I * ***in Gruppen gem. Aushang*** oder Seminar Physiologie I * ***in Gruppen gem. Aushang***	Seminar Biochemie / Molekularbiologie I * ***in Gruppen gem. Aushang*** oder Seminar Physiologie I * ***in Gruppen gem. Aushang***	Seminar der Med. Psychologie u. der Med. Soziologie II * ***in Gruppen gem. Aushang***	Kursus der mikros- kopischen Anatomie ** ***in Gruppen gem. Aushang*** oder Seminar Physiologie I * ***in Gruppen gem. Aushang***	Kursus der mikros- kopischen Anatomie ** ***in Gruppen gem. Aushang*** oder Seminar Biochemie I * ***in Gruppen gem. Aushang***
10.00-11.00	Vorlesung Med. Psychologie und der Med. Soziologie II	Vorlesung Anatomie II	Vorlesung Anatomie II	Vorlesung Anatomie II	Vorlesung Anatomie II
11.00-12.00	Vorlesung Biochemie I	Vorlesung Biochemie I	Vorlesung Biochemie I	Vorlesung Biochemie I	Vorlesung Biochemie I
12.00-13.00	Vorlesung Physiologie I	Vorlesung Physiologie I	Vorlesung Physiologie I	Vorlesung Physiologie I	Vorlesung Physiologie I
13.00-14.00					
14.00-15.00 15.00-16.00 16.00-17.00 17.00-18.00		Praktikum der Biochemie / Molekularbiologie I ** ***in Gruppen gem. Aushang*** ab 8. Vorlesungswoche 14.00 bis 20.00 Uhr	Kursus der mikros- kopischen Anatomie ** ***in Gruppen gem. Aushang***	Kursus der mikros- kopischen Anatomie ** ***in Gruppen gem. Aushang*** bis 16.00 Uhr oder Praktikum der Biochemie / Molekularbiologie I ** ***in Gruppen gem. Aushang*** ab 8. Vorlesungswoche 14.00 bis 20.00 Uhr	Stand: 08.2005

* inkl. integriertem Seminar mit Einbeziehung klinischer Fächer

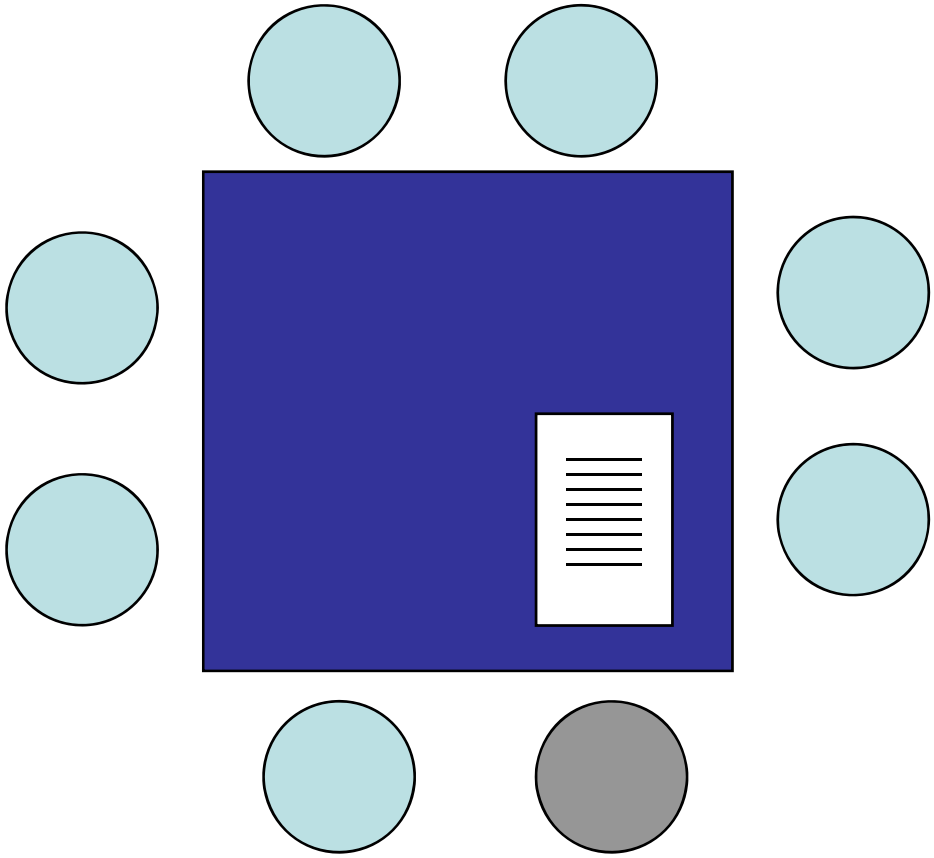
** inkl. begleitendem Seminar mit klinischem Bezug

Musterstundenplan 1. Studienjahr Modellstudiengang

	Montag	Dienstag	Mittwoch	Donnerstag	Freitag
08.00-09.00	POL-Kleingruppen Fall der Woche Step 1-5	Seminar Klinisch-theoretische Grundlagen	Seminar Klinisch-theoretische Grundlagen	Praktikum Grundlagen	
09.00-10.00					
10.00-11.00					
11.00-12.00					
12.00-13.00					
13.00 – 14.00					
14.00-15.00			Praktische Übung		POL-Kleingruppen Fall der Woche Step 7
15.00-16.00	Strang: Ethik *14-tägig*	Strang: Ärztl. Interaktion *14-tägig*		Strang: Gesundheitsök. *14-tägig*	
16.00-17.00					
17.00-18.00					

No lectures, but time for self-directed learning

Problem-based Learning



1. Understanding
2. Topics of Interest
3. Brainstorming
4. Hypotheses, Sorting
5. **Learning Objectives**
6. **Selfdirected Learning**
7. **Discussion of Results**
8. Feedback

Instrument: Progress Test in Medicine

200-item **Multiple-Choice-Test**

- 66 items basic sciences: (32 physiology, 26 anatomy)

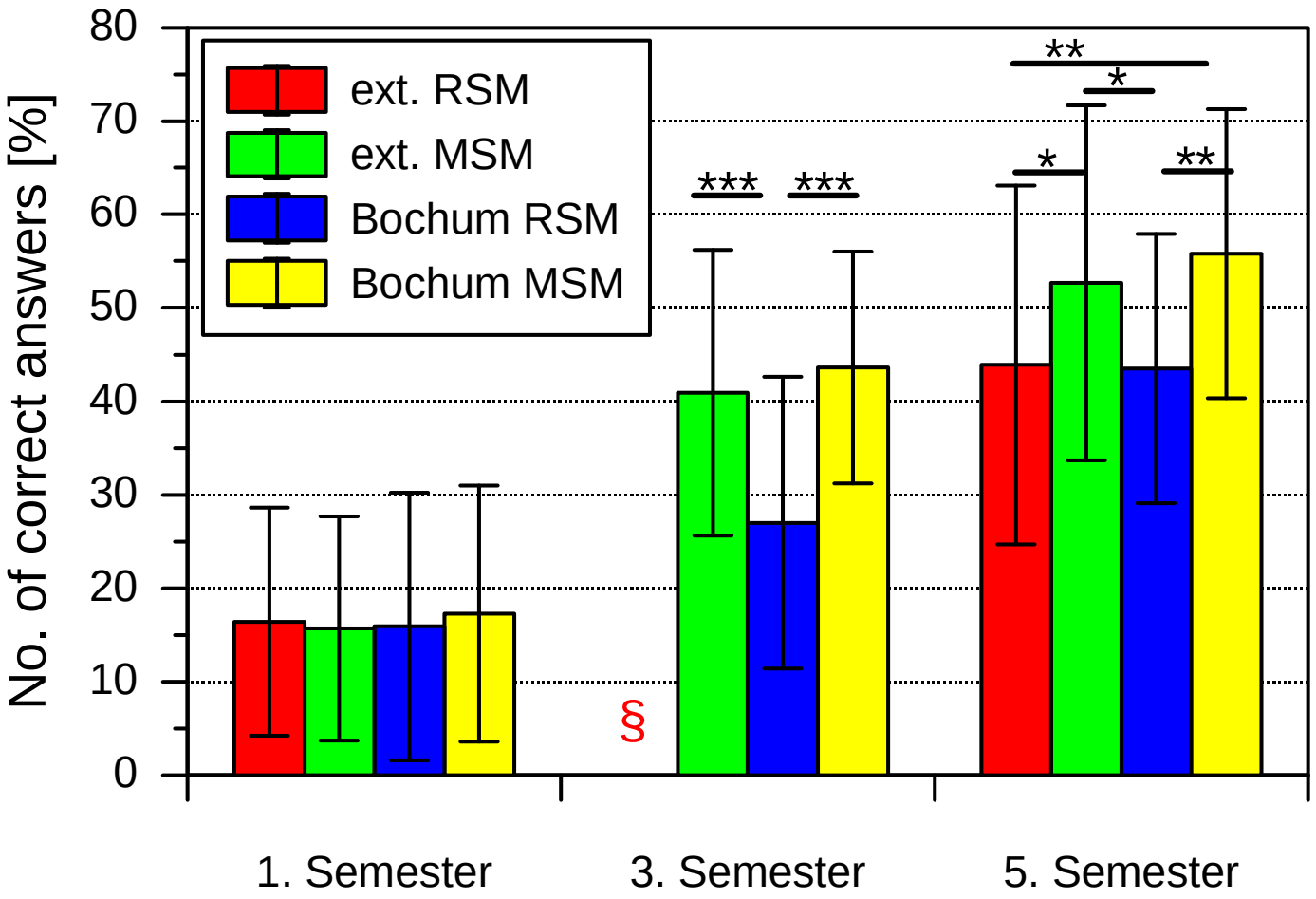
- Level: **End** of studies
- At the beginning of **each** semester to all students
- Developed at the Charité and Uni W/H and used by 7 universities

Study Design: RCT

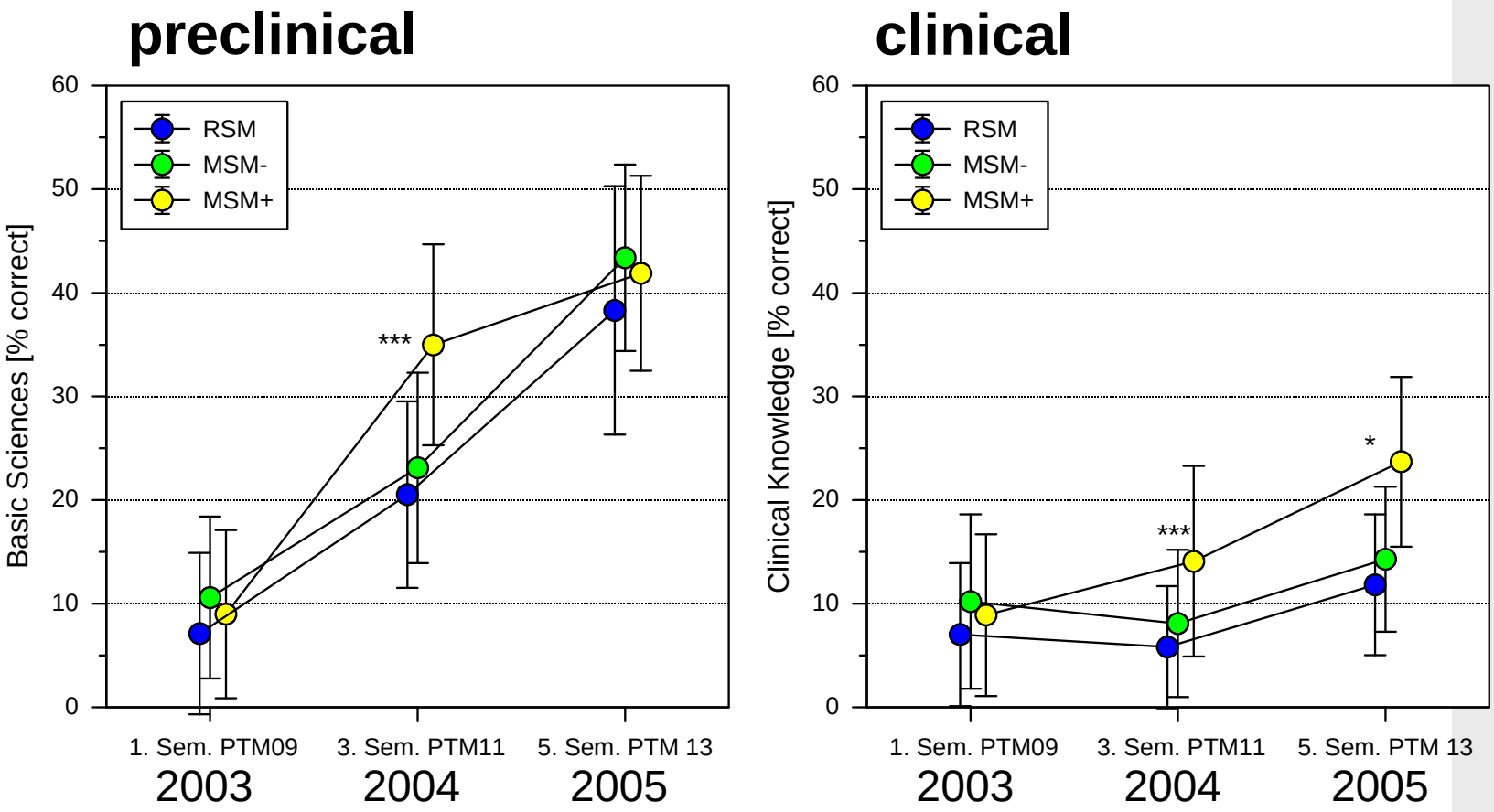
- **Randomized controlled trial**
- N = 868 students in 3 cohorts
  - 251 applied for the new PBL-curriculum
    - 122 were **randomly** selected
    - 129 were assigned to the traditional curr. (**Control group**)
  - 617 remaining students: traditional curr.
- Statistics: ANOVA, post-hoc Bonferroni

External Comparison:

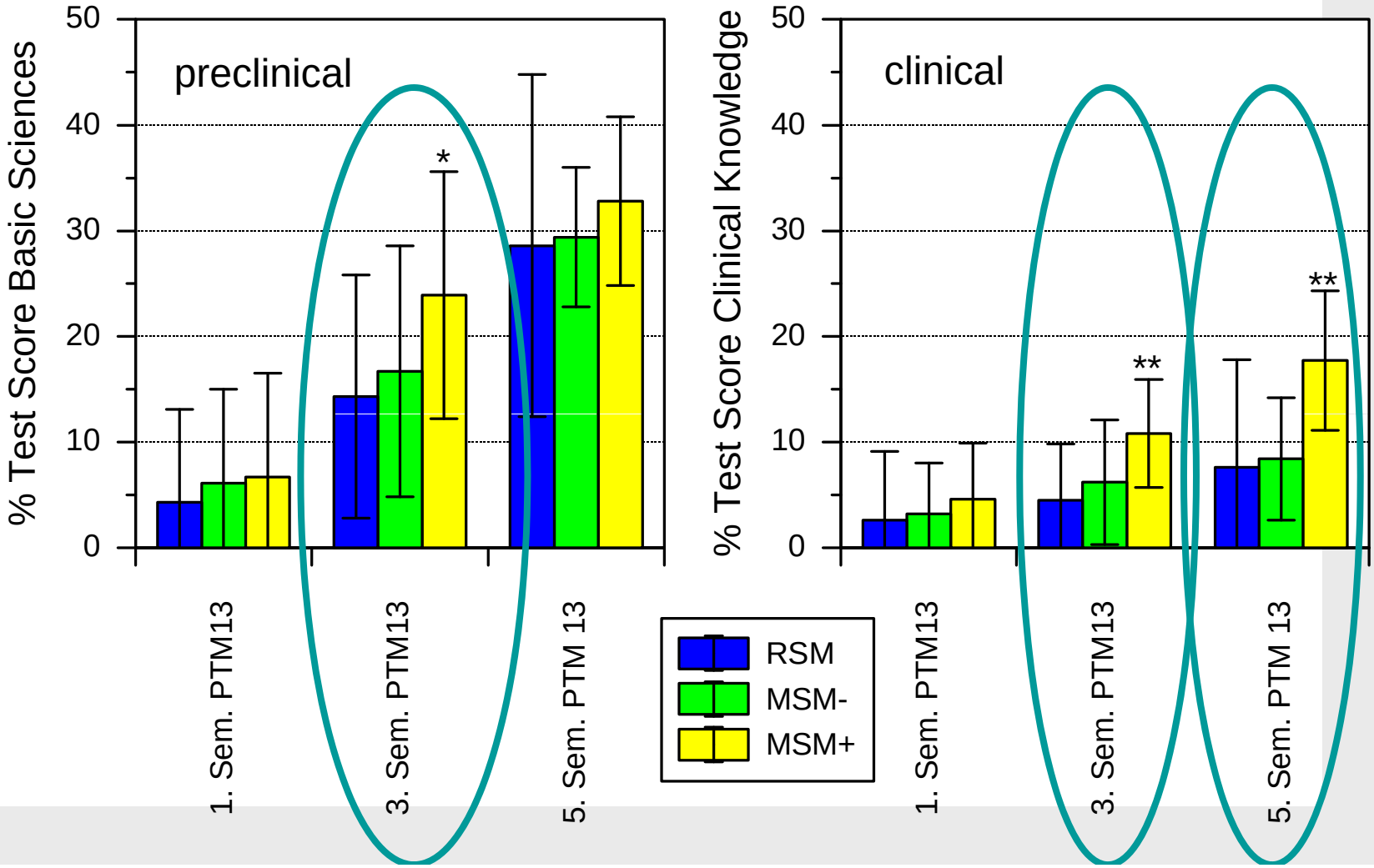
Inter-University Comparison of Total Scores



Longitudinal Observation: Traditional – Problem-based

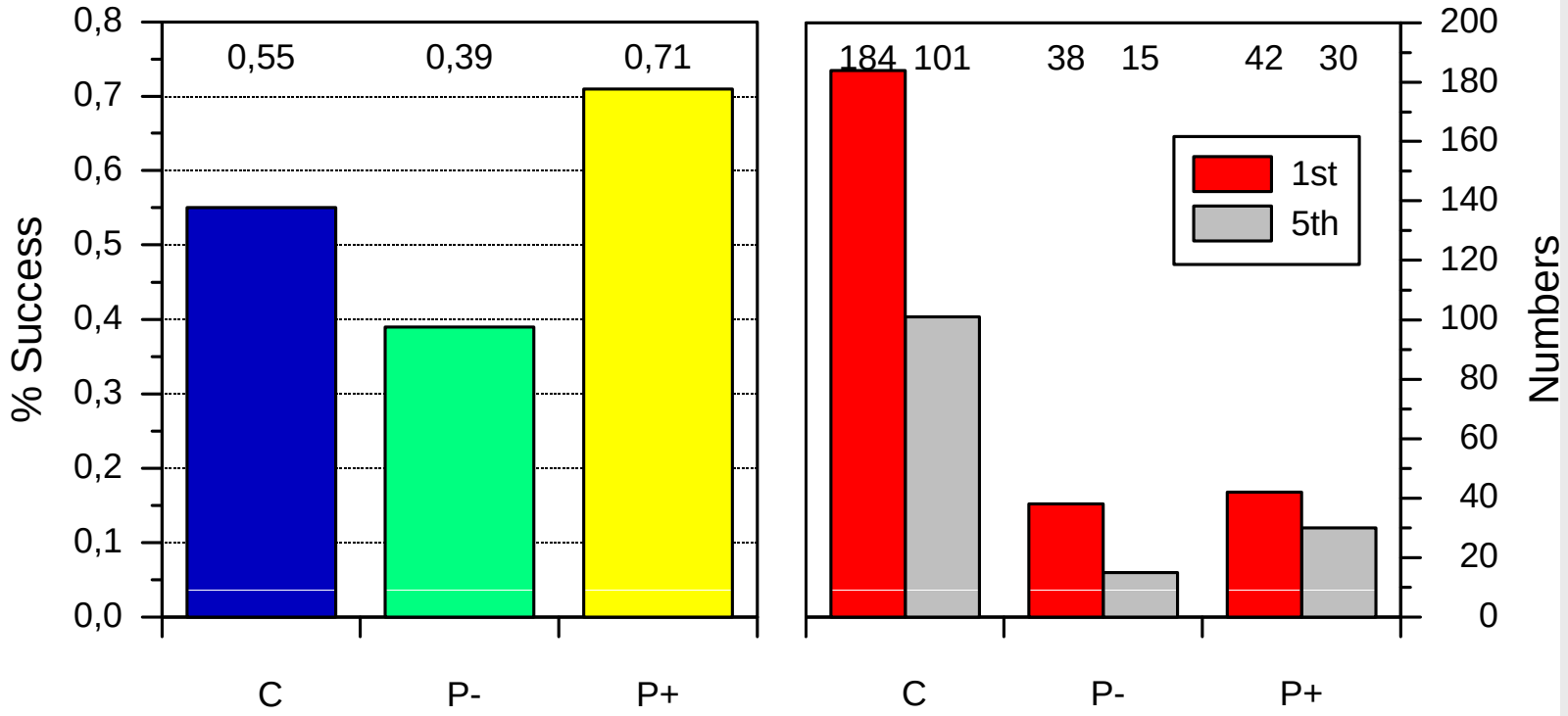


Cross Sectional Analysis 2005



Number of Successful Students

within Shortest Time



71 % in MSM+ versus
39 % in MSM- and
55 % in RSM

Summary

Equal achievements in **basic sciences** after 2 years (higher after 1 year in PBL)

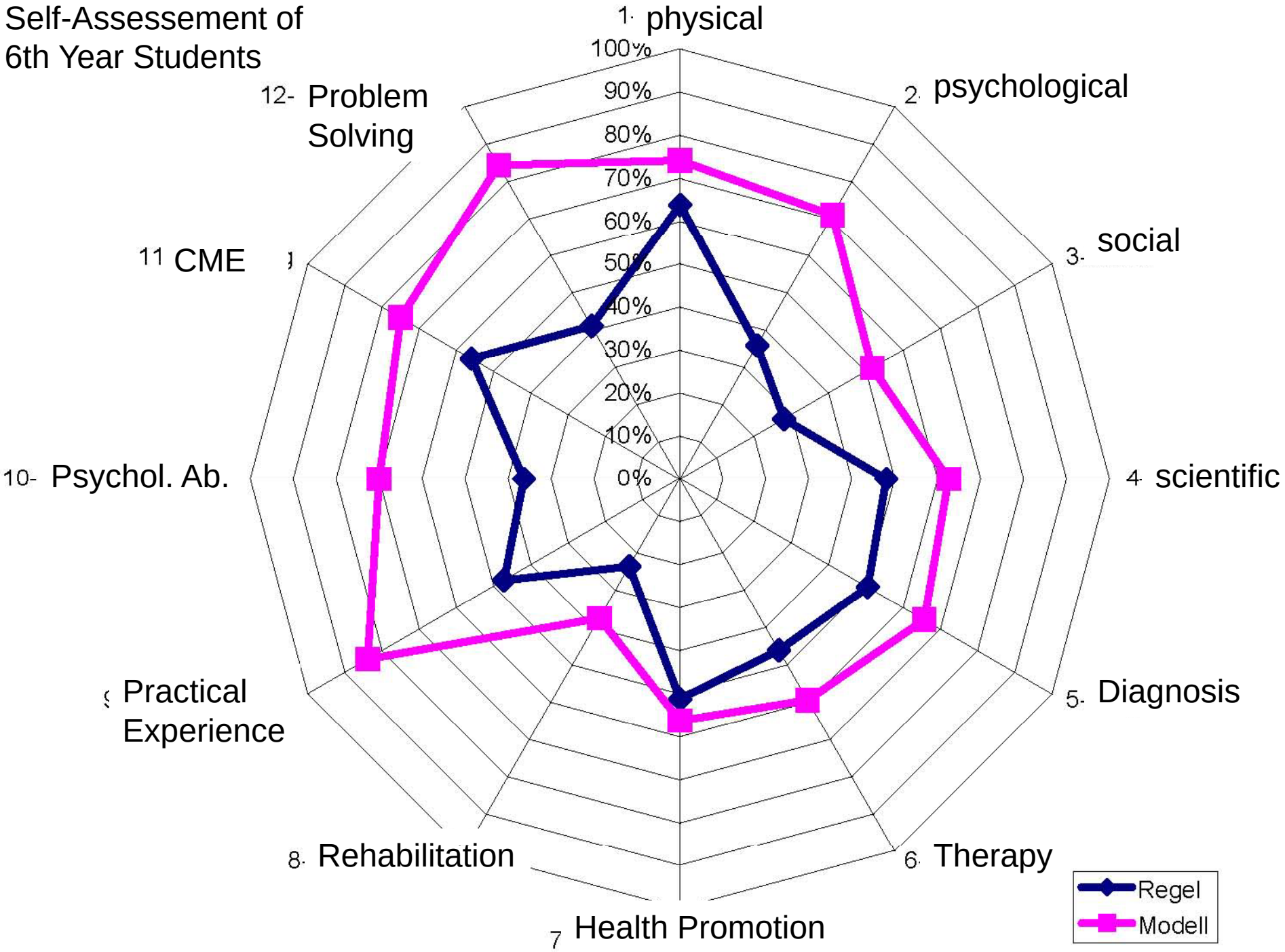
Higher number of **successful** students in the PBL-curriculum

Higher scores in **clinical** items in the PBL-curriculum

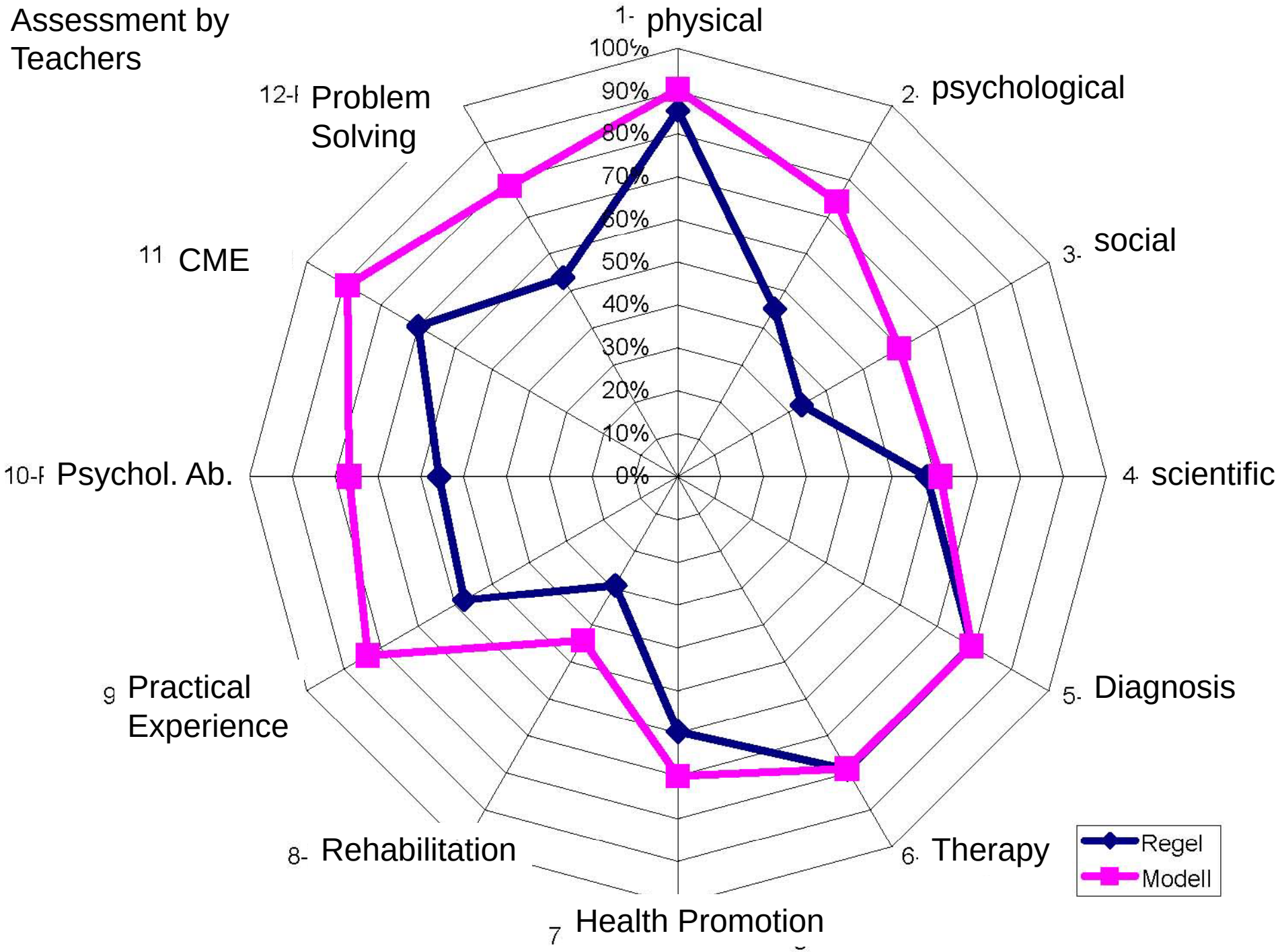
Further Educational Goals

	In my opinion, my medical studies have enabled me…
Item 1:	to make **the physical situation** of my patients base of my medical practice.
Item 2:	to make **the psychological situation** of my patients base of my medical practice.
Item 3:	to make **the social situation** of my patients base of my medical practice.
Item 4:	to **think** and **work** in a **scientific way**.
Item 5:	with general **knowledge** and **skills** in the field of **diagnostics**.
Item 6:	with general **knowledge** and **skills** in the field of **therapy**.
Item 7:	with general **knowledge** and **skills** in the field of **health promotion and prevention**.
Item 8:	with general **knowledge** and **skills** in the field of **rehabilitation**.
Item 9:	with **practical experience** in dealing with patients, including the interdisciplinary approach to disease.
Item 10:	with **mental skills** necessary for the primary care of patients.
Item 11:	to conduct **independent, continuous training**, using modern information sources.
Item 12:	to own **decisions** and **solving problems**.

Self-Assessement of
6th Year Students

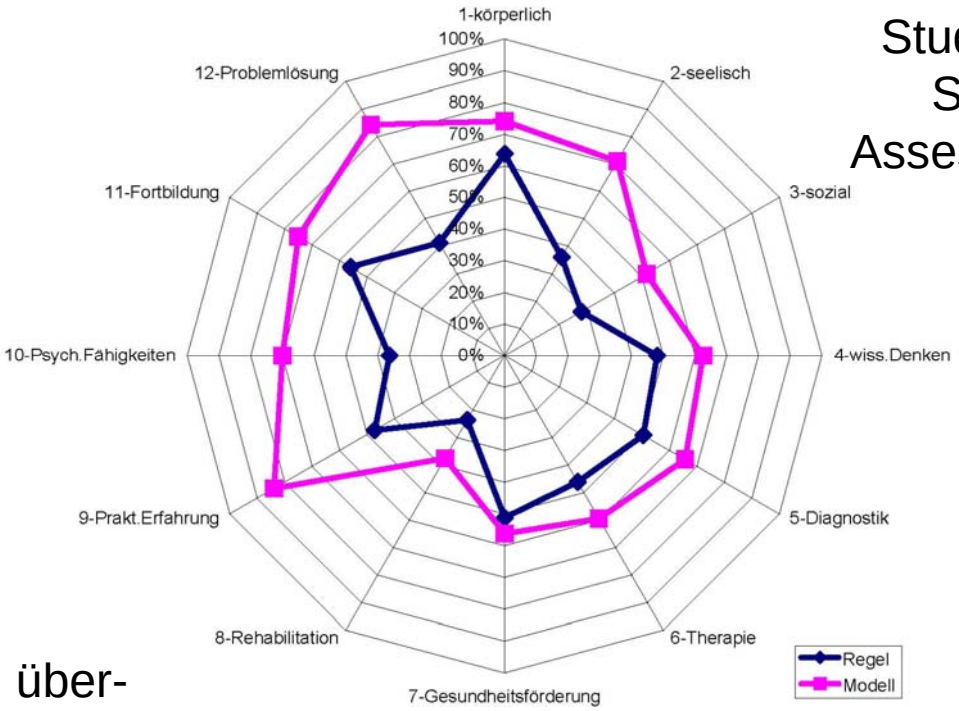


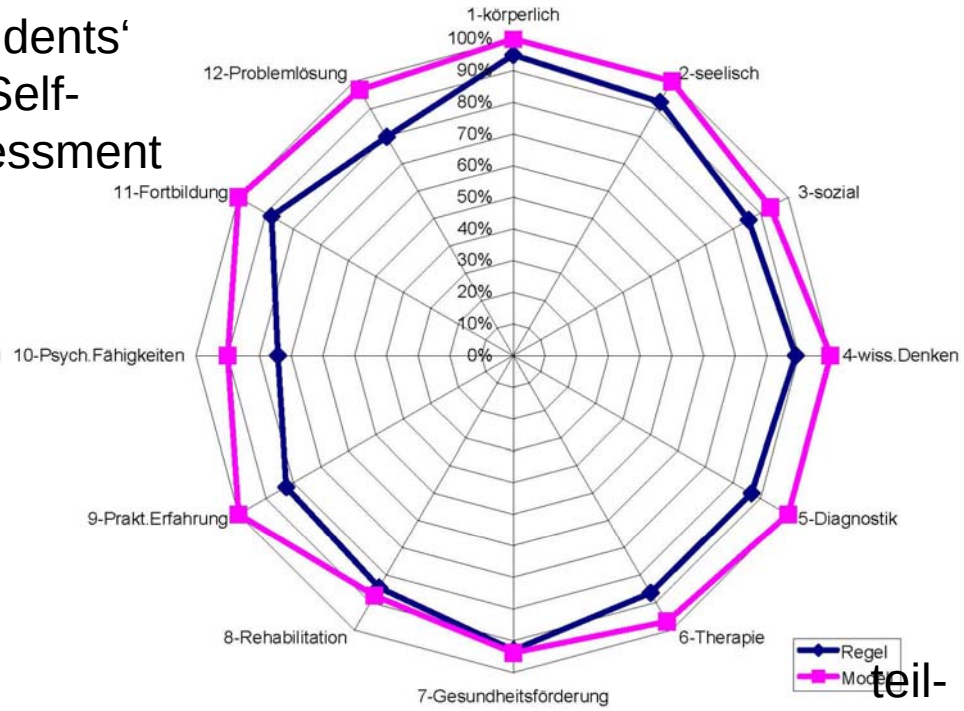
Assessment by Teachers



Students' Self-Assessment

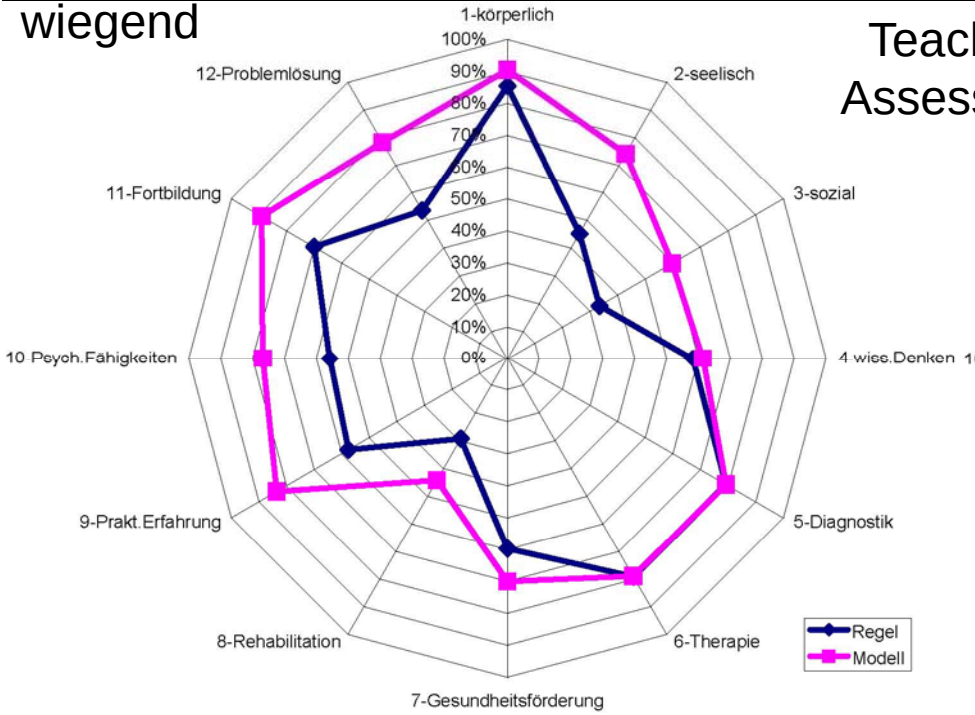
über-wiegend

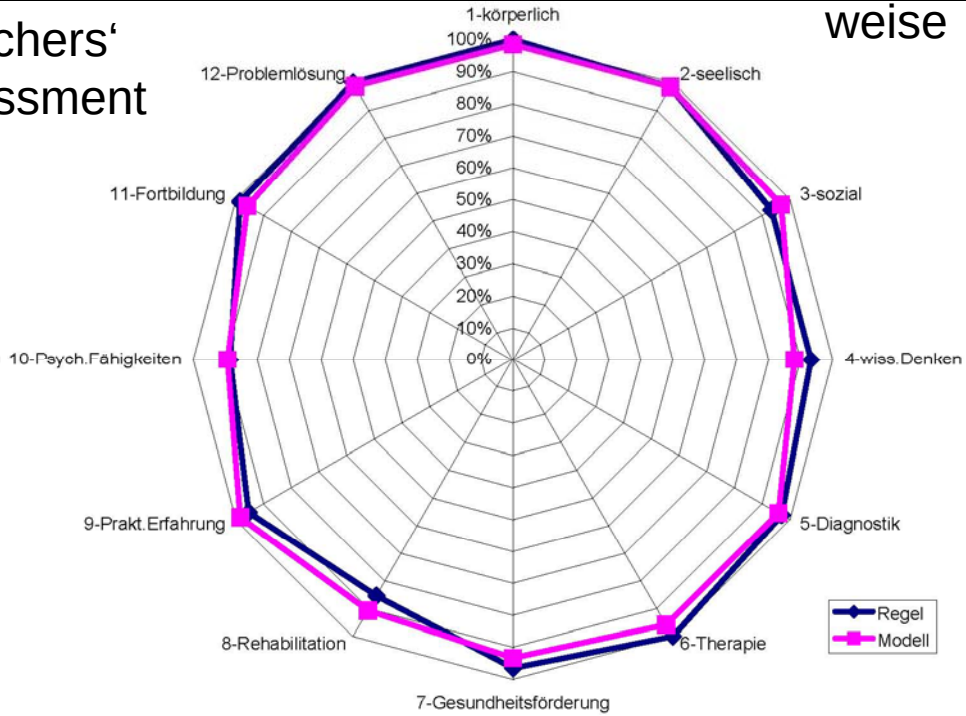




teil-weise

Teachers' Assessment





	Studierende RSM				Studierende MSM			
	trifft voll zu	trifft überwiegend zu	trifft teilweise zu	trifft überhaupt nicht zu	trifft voll zu	trifft überwiegend zu	trifft teilweise zu	trifft überhaupt nicht zu
1 - körperlich⁰	13,4%	63,9%	95,0%	5,0%	6,5%	74,2%	100,0%	0,0%
2 - seelisch* **	6,7%	35,8%	92,5%	7,5%	16,1%	71,0%	100,0%	0,0%
3 - sozial*	5,1%	28,0%	85,6%	14,4%	0,0%	51,6%	93,5%	6,5%
4 - wiss. Denken⁰	18,1%	48,0%	89,0%	11,0%	9,4%	62,5%	100,0%	0,0%
5 - Diagnostik⁰	12,6%	50,4%	86,6%	13,4%	6,3%	65,6%	100,0%	0,0%
6 - Therapie⁰	6,3%	46,0%	86,5%	13,5%	0,0%	59,4%	96,9%	3,1%
7 - Gesundheitsförderung⁰	10,2%	51,2%	92,9%	7,1%	6,3%	56,3%	93,8%	6,3%
8 - Rehabilitation⁰	4,9%	23,6%	84,6%	15,4%	3,1%	37,5%	87,5%	12,5%
9 - Praktische Erfahrung* **	10,2%	47,2%	82,7%	17,3%	41,9%	83,9%	100,0%	0,0%
10 - Psychische Fähigkeiten **	9,7%	36,3%	74,2%	25,8%	10,0%	70,0%	90,0%	10,0%
11 - Fortbildung⁰	24,0%	56,0%	88,0%	12,0%	25,0%	75,0%	100,0%	0,0%
12 - Problemlösung* **	10,5%	41,1%	79,8%	20,2%	18,8%	84,4%	96,9%	3,1%
1-12 - Durchschnitt	11,0%	44,0%	86,4%	13,6%	11,9%	65,9%	96,5%	3,5%

	Studierende RSM				Studierende MSM			
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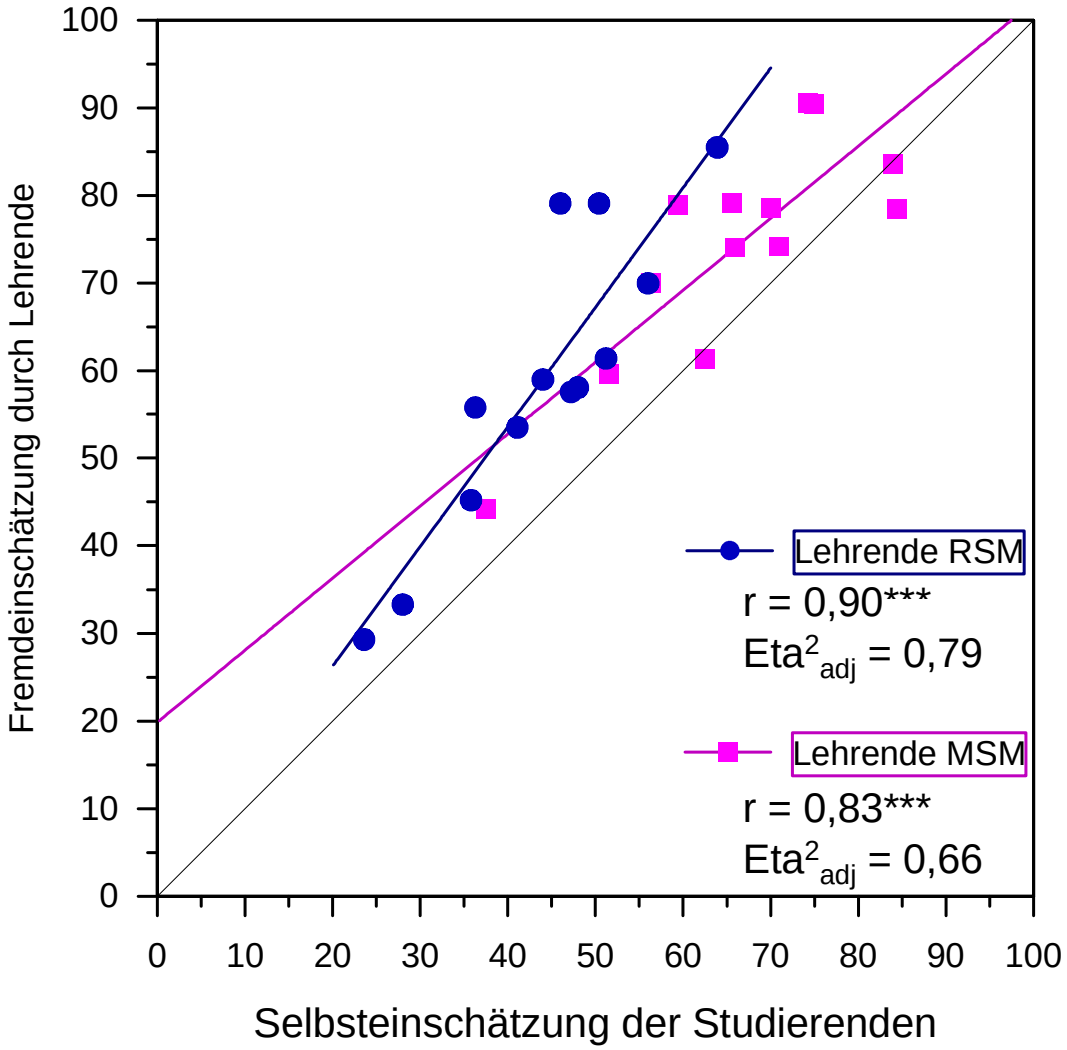
Correlation
Self-Assessment vs. Scores



Conclusions

- Self-assessment and teachers‘ assessment show **high correlations** and similar strengths and weaknesses.
- „**Goals achieved**“ in **practical** experience, **problem** solving skills, as well as **psychological** and **social** aspects.
- Weaknesses in the field of **rehabilitation**.
- The survey is useful for **developing the curriculum.**

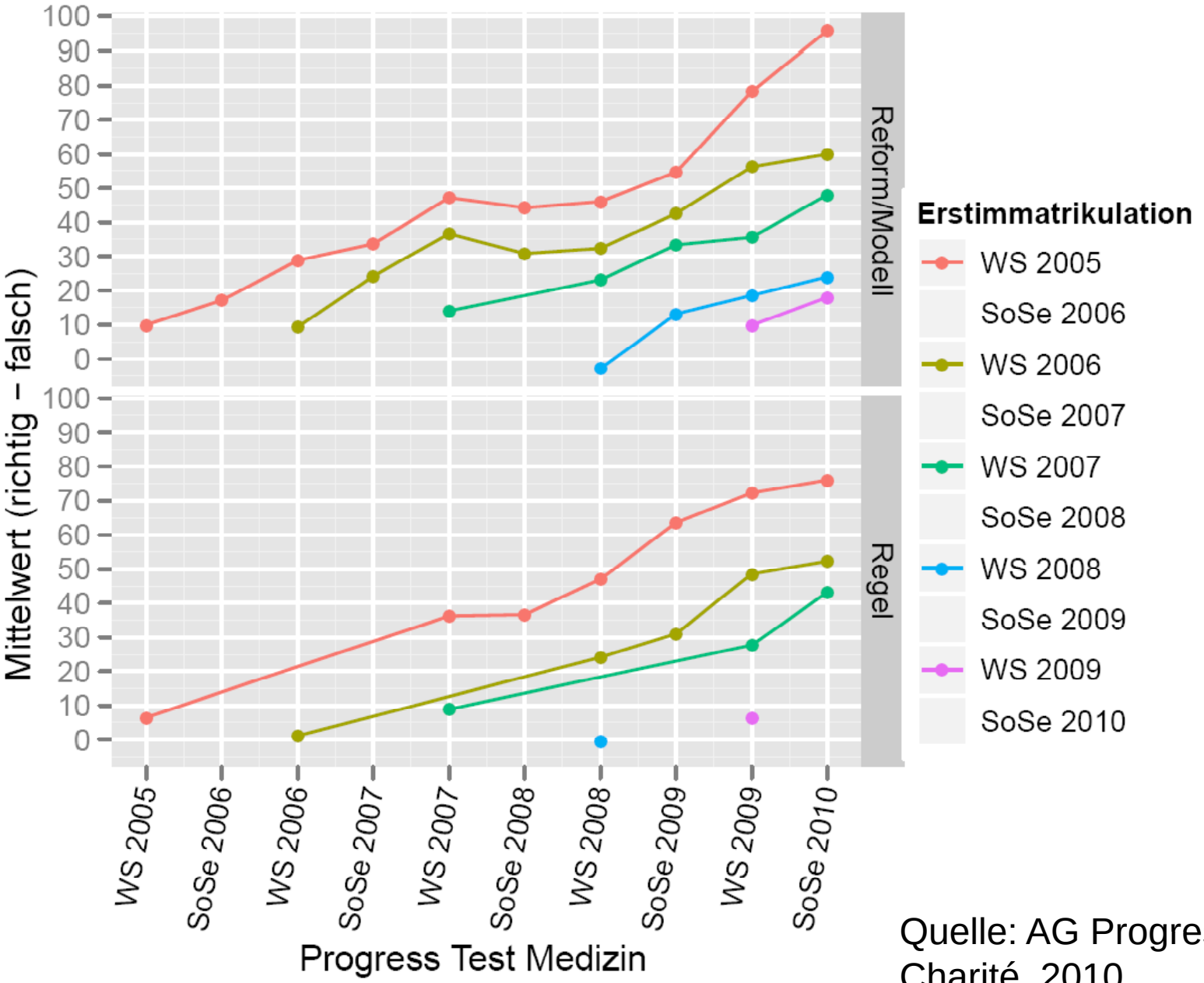
Instrument: Progress Test in Medicine

200-item **Multiple-Choice-Test**

- 66 items basic sciences: (32 physiology, 26 anatomy)

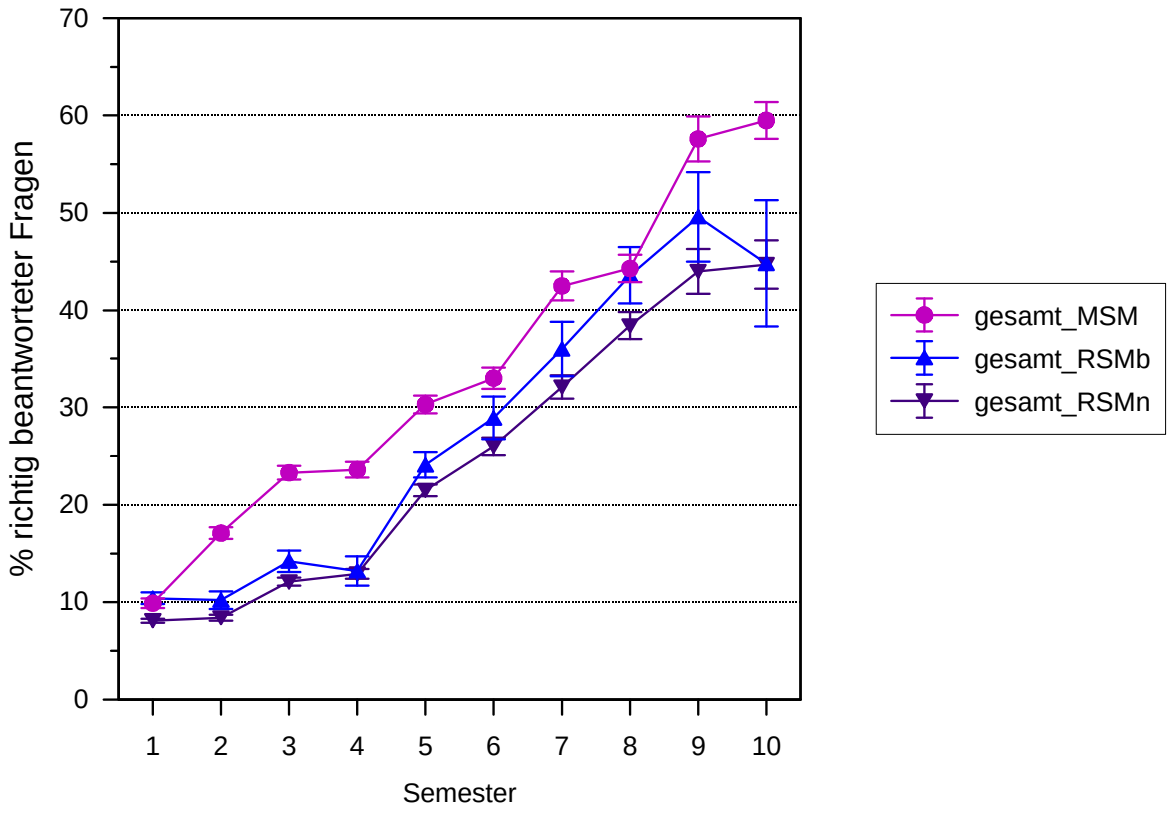
- Level: **End** of studies
- At the beginning of **each** semester to all students
- Developed at the Charité and Uni W/H and used by 7 universities

„Latest News“

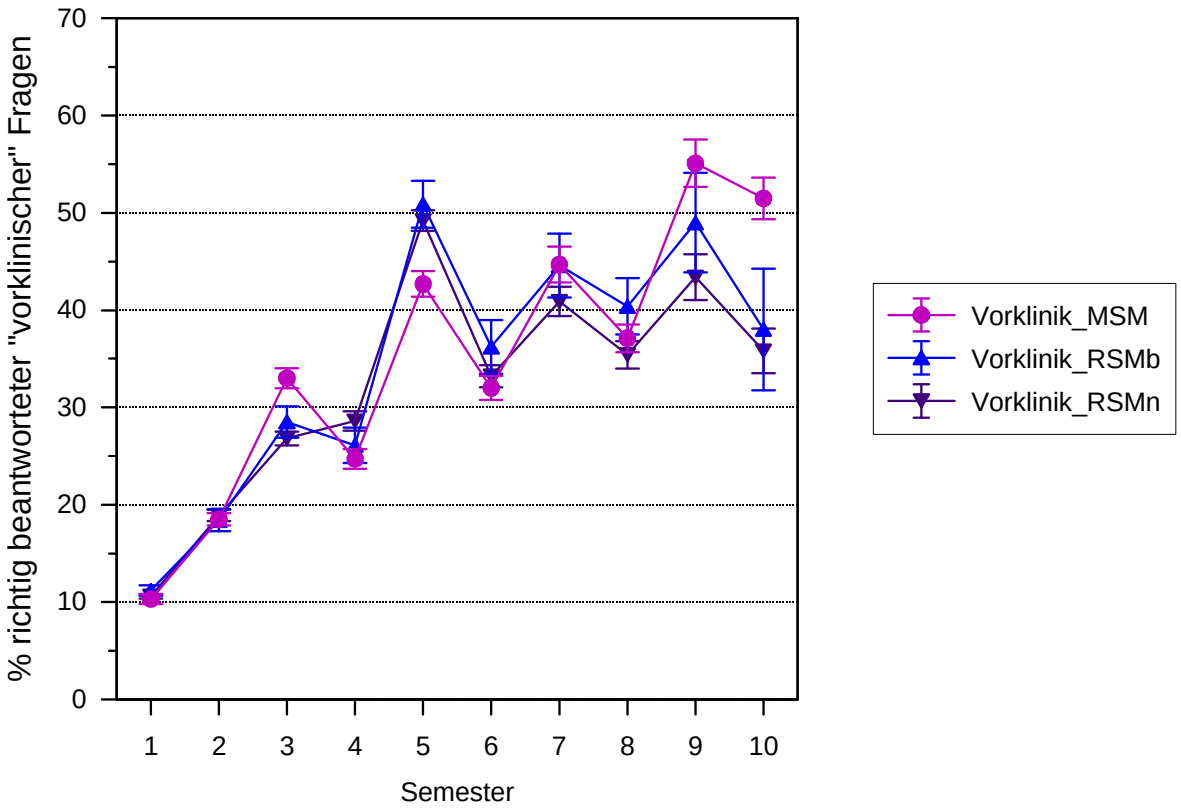


Quelle: AG Progress-Test Charité, 2010

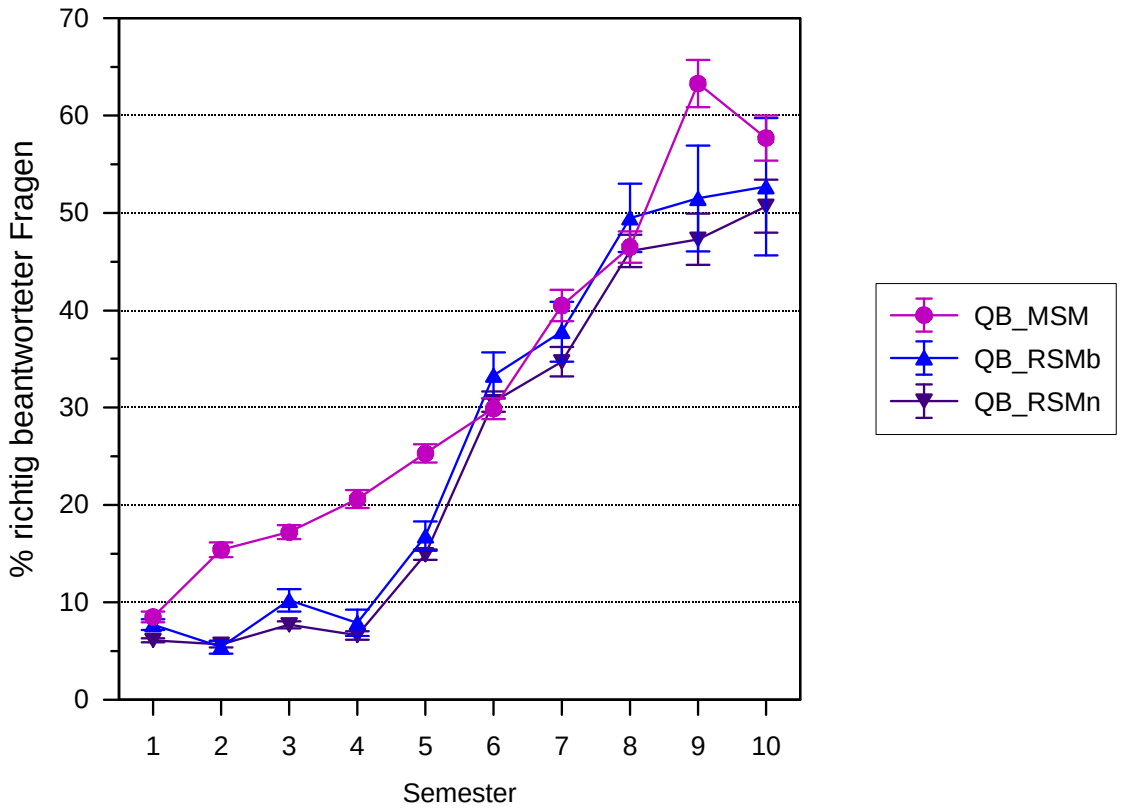
Progress-Test Medicine (PTM)



PTM – Preclinical Questions

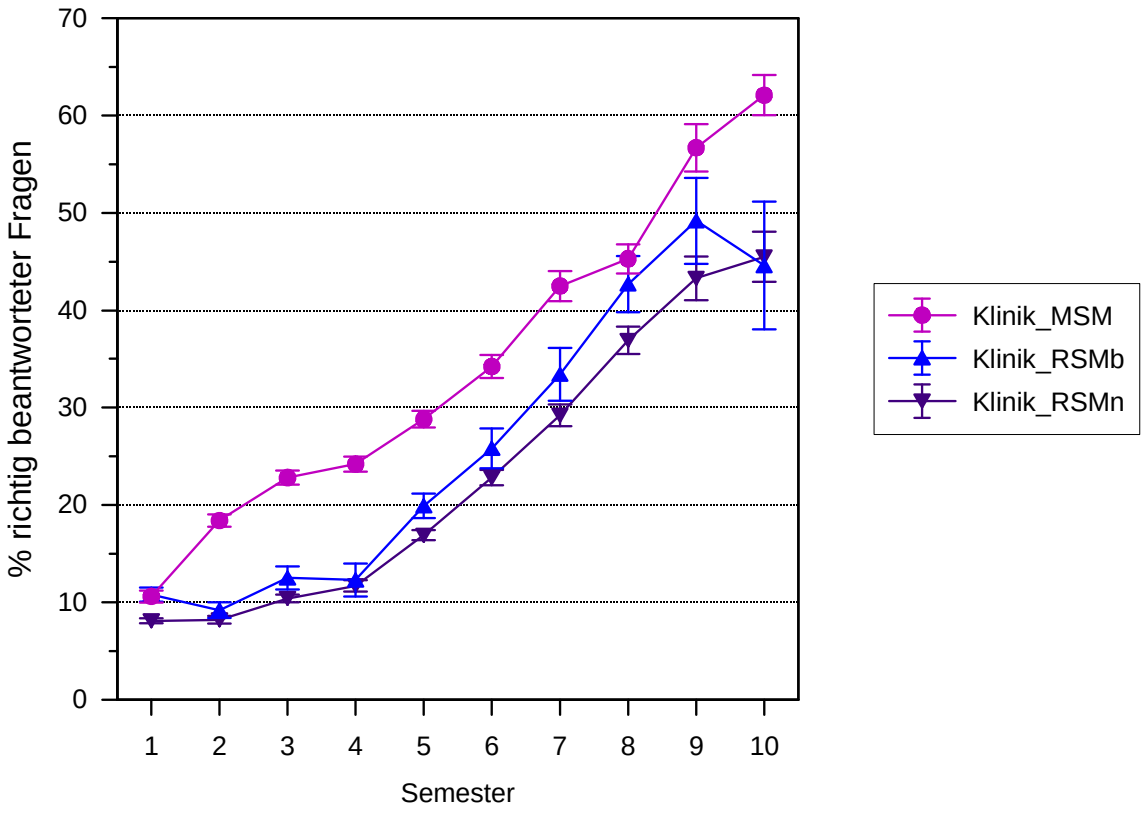


PTM – Cross Sectional

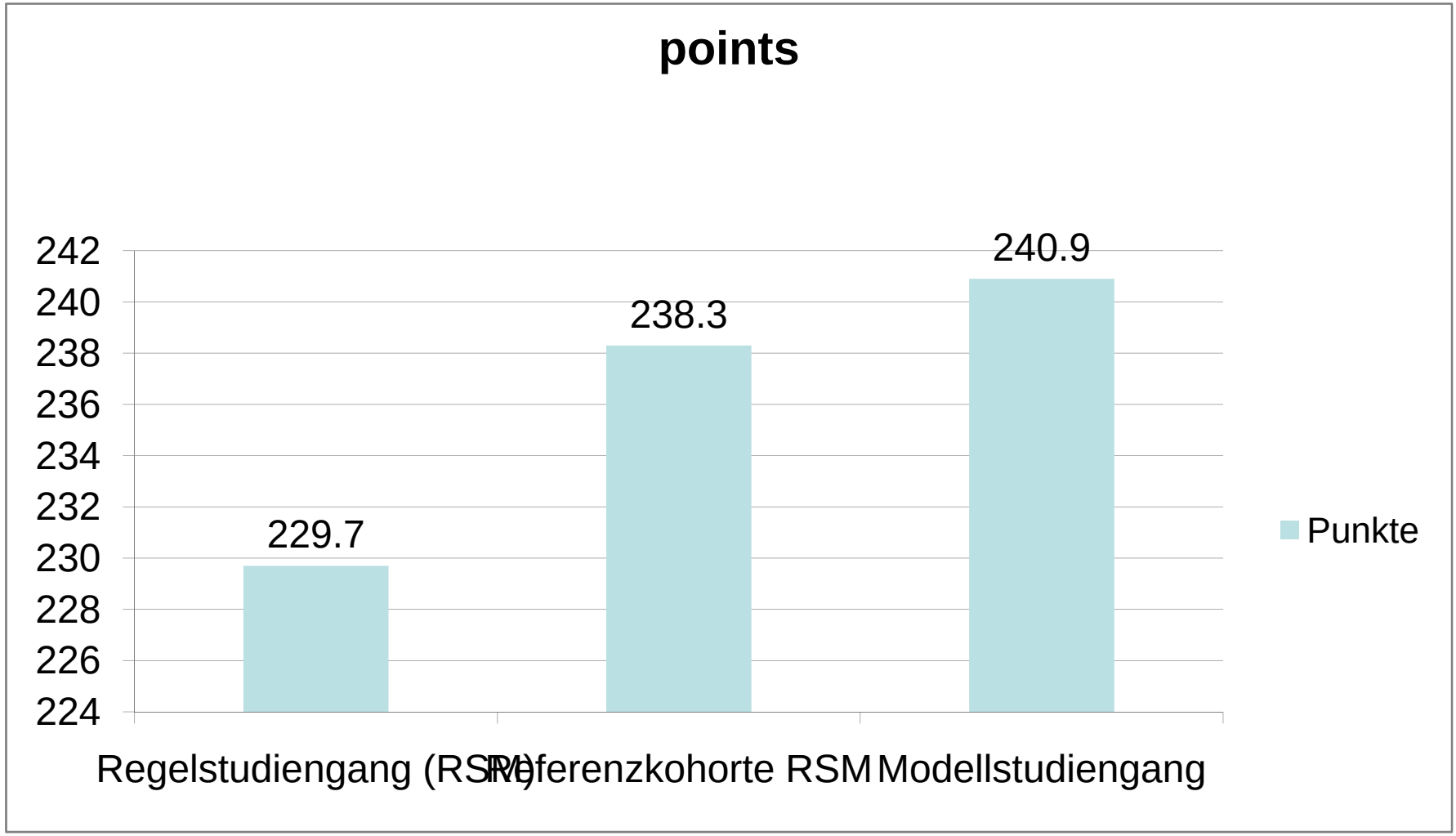


Clinical Pathology, Pharmacology, Radiology, Biometrics, Ethics,…

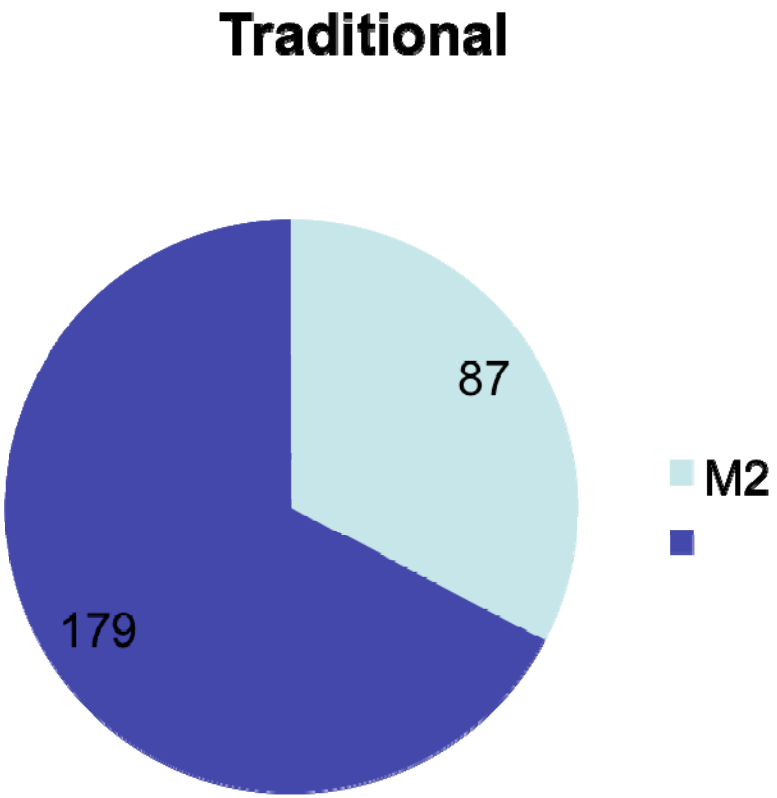
PTM - Clinical



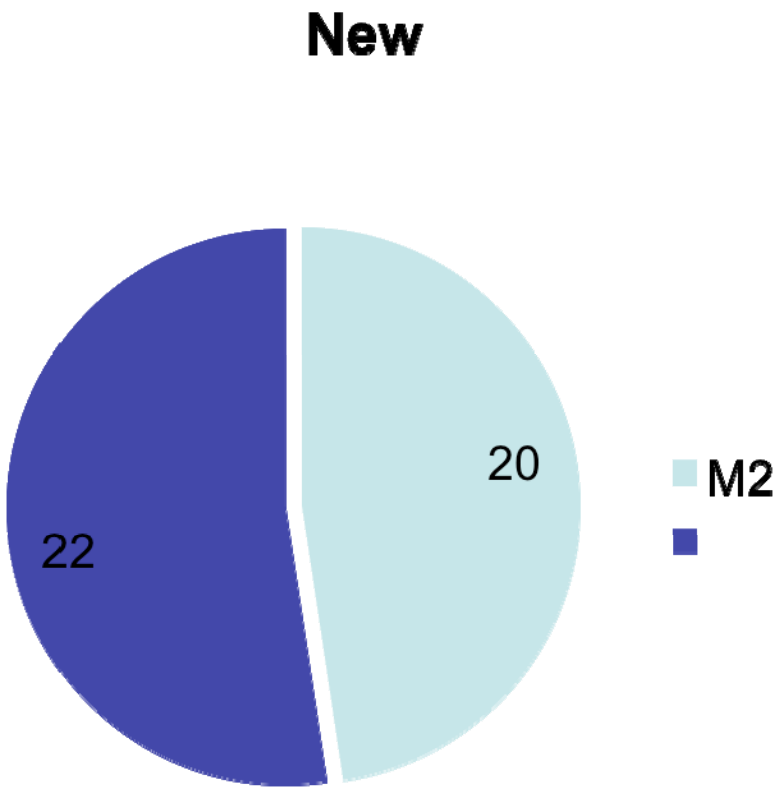
Scores in the State Exam (09)



Proportion of „Fast Students“



32,7 %



47,6 %

Alumni-Survey

- **Positive**
- Group dynamics
- Interaction training
- Early contact with patients
- Context learning
- Support

- **Negative**
- Perceived missing basics in pharmacology, pathology, anatomy
- Compulsory attendance

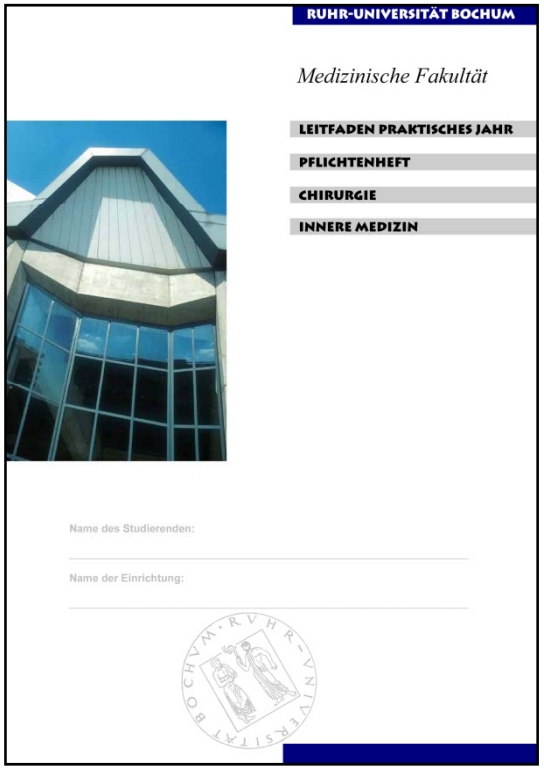
Summary:
New Curriculum

- **Higher efficiency**: more graduates, with same levels of scores
- **Basic** science knowledge: same achievements, higher scores at end of studies
- **Clinical** and „**soft**“ skills: higher scores

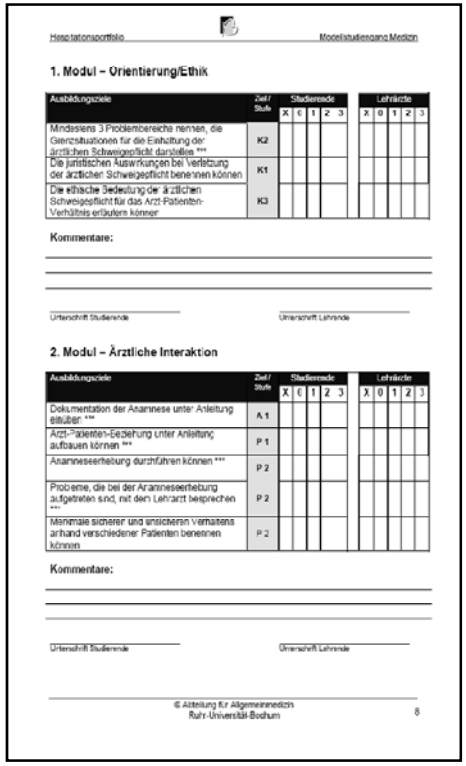
The Future

- **Combination** of the two tracks
  - Scientific and practical
  - Interdisciplinary and theme-oriented
  - Problem-based

Quality Management



Common Goals, Guide-Lines, Specifications



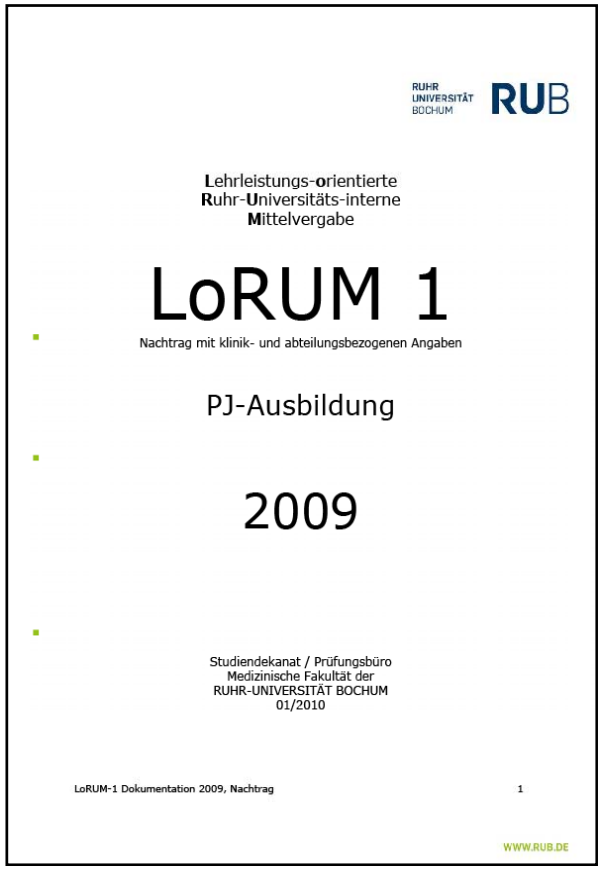
Operationalized Learning Objectives

Medical Teachers‘ Training Program

Skills-Labs

Blended Learning, eTutors, U-Tutors, curricular Teaching

Performance-based Allocation of Funds



RUHR UNIVERSITÄT BOCHUM RUB

Lehrleistungs-**o**rientierte
Ruhr-**U**niversitäts-interne
Mittelvergabe

LoRUM 1

Nachtrag mit klinik- und abteilungsbezogenen Angaben

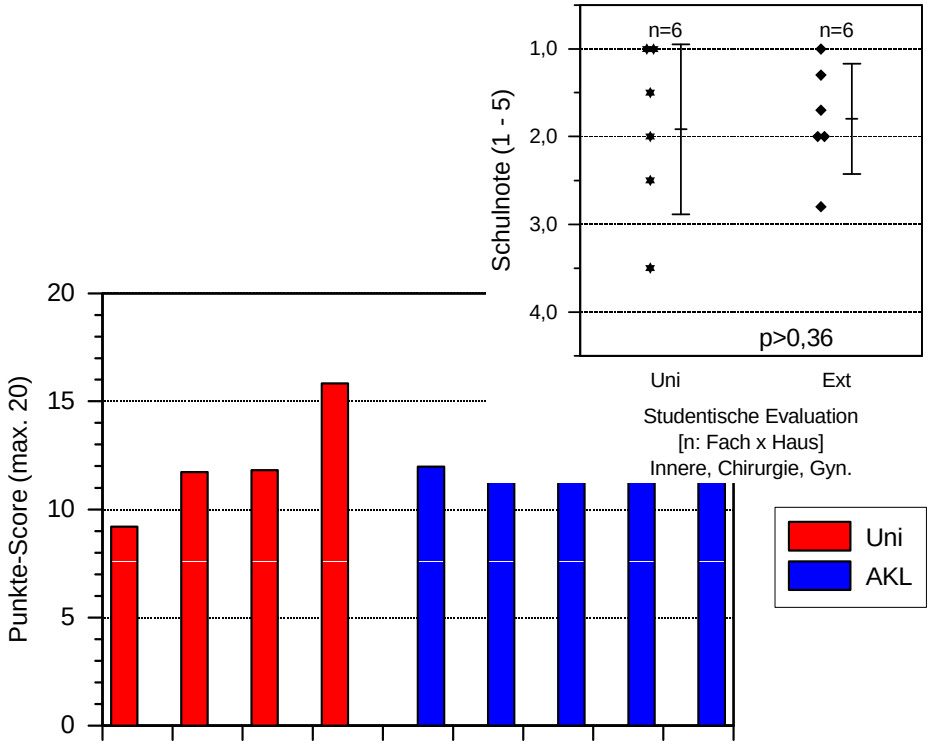
PJ-Ausbildung

2009

Studiendekanat / Prüfungsbüro
Medizinische Fakultät der
RUHR-UNIVERSITÄT BOCHUM
01/2010

LoRUM-1 Dokumentation 2009, Nachtrag 1

WWW.RUB.DE



Studentische Evaluation, Sommer 2009, PJ Innere Medizin
Mittelwerte der Häuser

FROM **TRADITIONAL** TO **OUTCOME-BASED** MEDICAL EDUCATION

RESULTS OF A **RANDOMIZED CONTROLLED TRIAL** AT THE RUHR-UNIVERSITY BOCHUM, GERMANY

Thorsten Schäfer

Study Dean, Centre for Medical Education