Teaching the basic principles of science in medical education

–

Development and evaluation of a two week introductory course

Nico Vonneilich*, Hans-Hermann Dubben, Levente Kriston, Andreas H. Guse, Olaf von dem Knesebeck

*Department of Medical Sociology and Health Economics, University Medical Center Hamburg-Eppendorf (UKE)

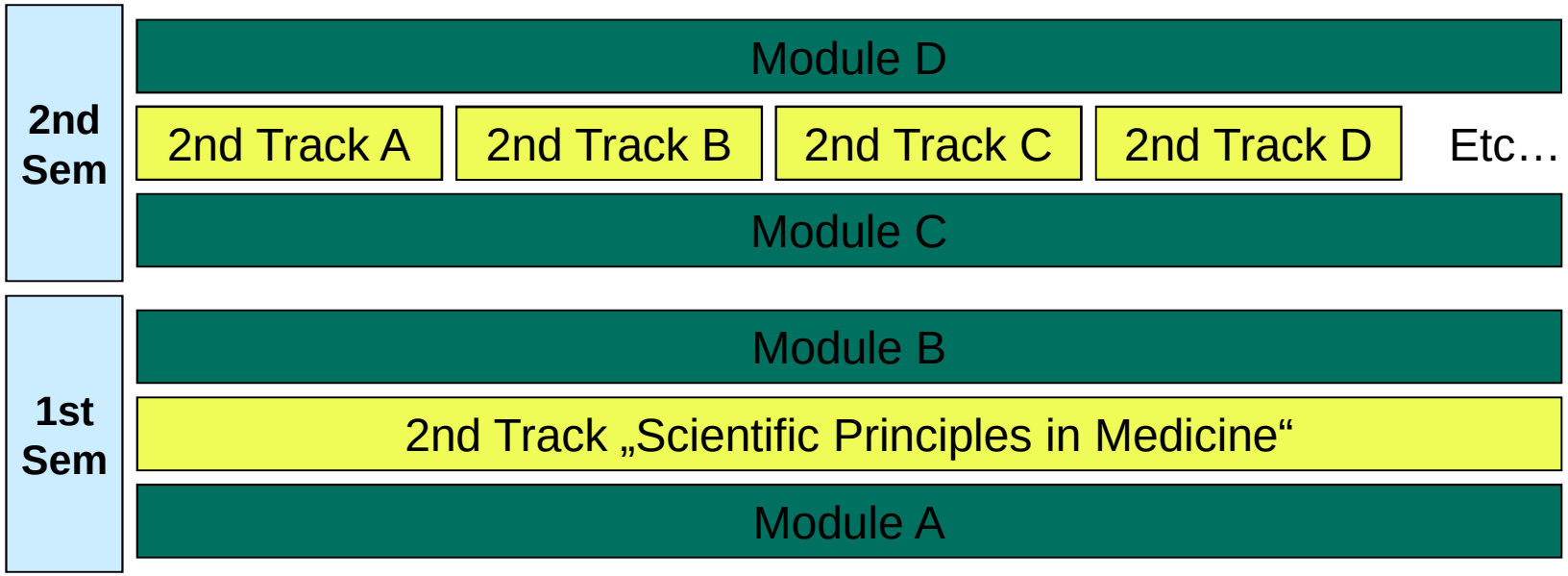
Contact:
n.vonneilich@uke.de
Tel. 0049 (0)40 7410 54869

Why?

- Teaching the basic principles of science and their relevance for medicine
- Evidence based medicine is becoming more important
- New study programme of Medicine „iMed“ in Hamburg with one specific focus on science and scientific skills
  - mandatory thesis
  - encouraging students to engage in medical research
  - improving the quality of medical dissertations
  - setting standards for all forthcoming courses and classes

iMed in Hamburg

- New study programme involves “2nd Tracks” as compulsory elective complement to basic studies (2x2 weeks per year), opportunity for specilisation
- 2nd Tracks finish with a thesis in the 10th Semester



How?

- Colleagues from different Departments were involved
  - Biochemistry, Anatomy, Tumorbiology, Medical Psychology, Medical Sociology, General Medicine etc.
- Development of lectures and courses for the new curriculum
- Final curriculum included:
  - 7 Lectures
  - 6 Courses
- 400 students in 20 cohorts (20 students/cohort)
- 1 tutor per cohort for all courses

Major goals of the 2nd Track „Scientific Principles in Medicine“

Students…

- … are able to differentiate phases of the scientific process.
- … know different media for publication of scientific work.
- … know basic rules and ideas of presenting scientific results.
- … know different study types.
- … are able to read and critically appraise scientific publications.
- … are able to explain basic ideas of evidence based medicine (EbM).

Lectures

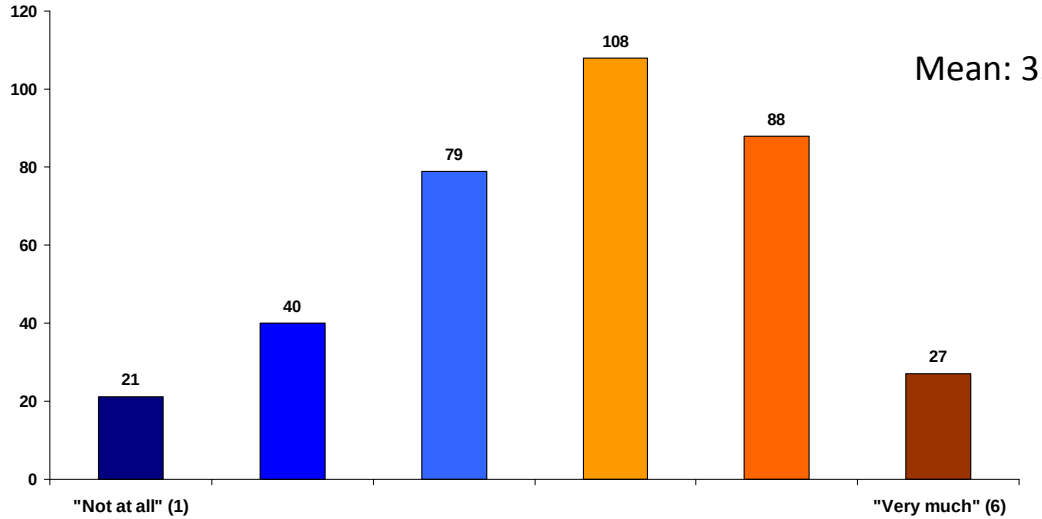
- Scientific theory and the research process
- Epidemiologic Studies
- Clinical Trials and Evidence based Medicine (EbM)
- Ethics in Medicine
- Ethics in Science
- Images and symbols in medicine
- Presentation of all forthcoming 2nd Tracks

Courses

- Scientific Presentation I + II (possibility of video-feedback)
- Academic literature I + II *(in cooperation with the university library)*
- Reading scientific papers
- Ethics in Science and Medicine

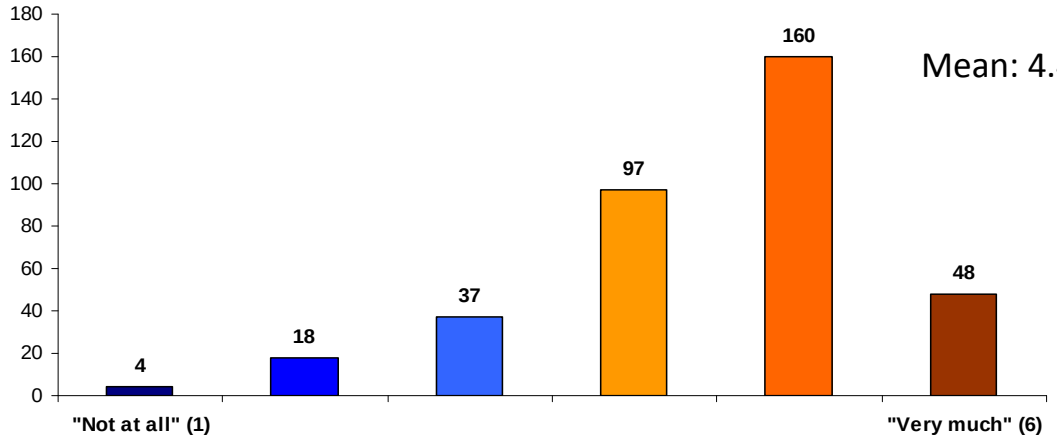
Quantitative Evaluation

This 2nd Track fostered my interest in scientific work



Mean: 3.78

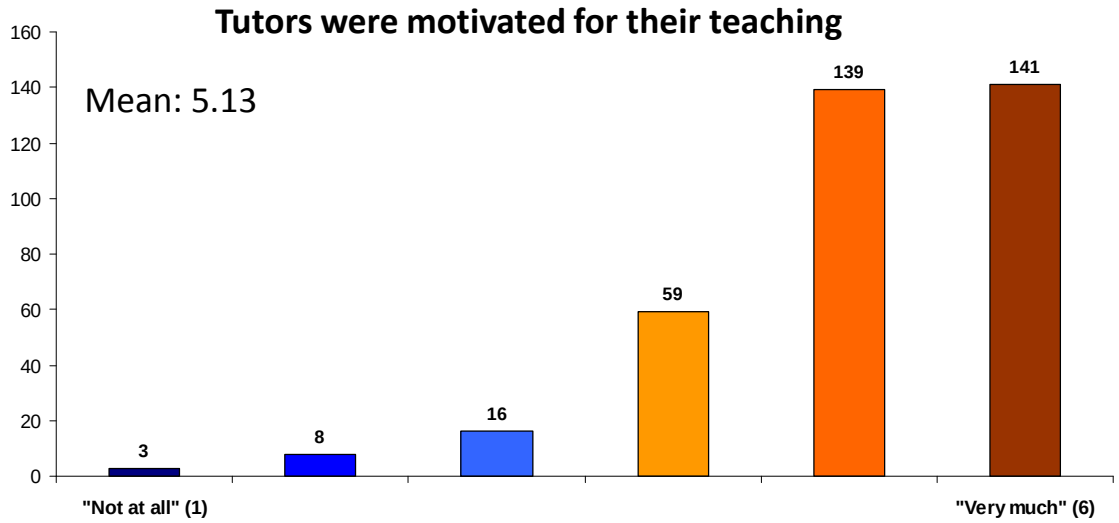
The 2nd Track was a good introduction to the principles of scientific work

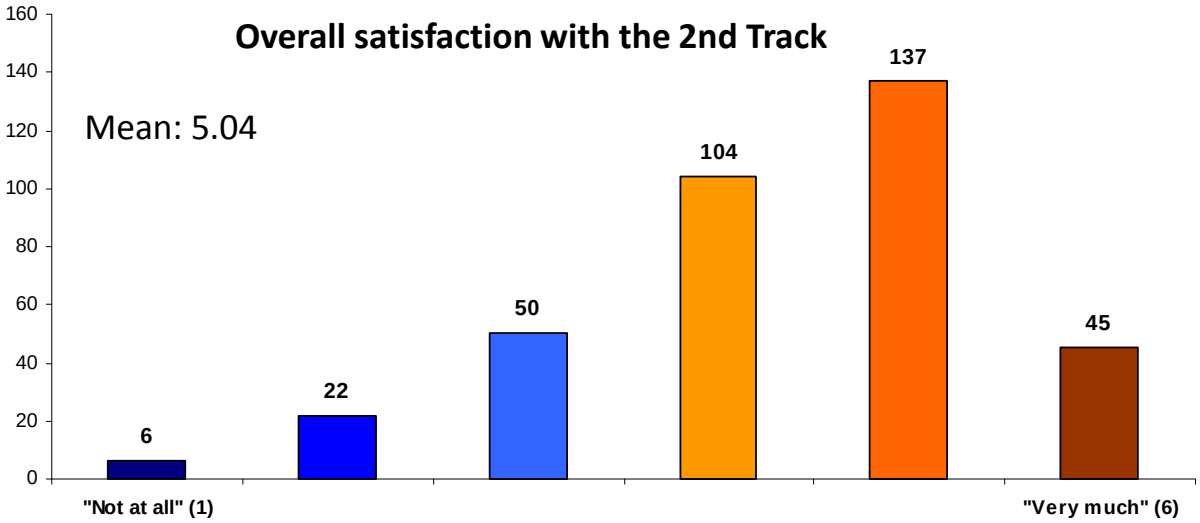


Mean: 4.47

N=366

Quantitative Evaluation





N=366

Qualitative Evaluation

- Student reactions (N)
  - Positive:
    - Tutors were very motivated (27)
    - Lectures were very interesting (15)
    - Students were being taken seriously (12)
    - The structure of the 2nd Track (11)
    - Topics of the courses were interesting (9)
  - Negative
    - Courses and lectures were too long (30)
    - Methods for presenting were known (14)
    - Makes more sense at the end of the course of studies (10)
  - Proposals
    - Stronger reference to medical practice (17)
    - Courses on presentation can be omitted (9)

Qualitative Evaluation

- Tutors
  - Course on Scientific Presentation should not be mandatory
  - More time for discussing scientific papers
    → *journal club* instead of a final student presentation
  - Only few students wanted video-feedback
  - Good working atmosphere in the courses

Final Exam

- Graded exam was requested by examination authorities
- Multiple Choice Exam (MC)
- 20 questions / 20 points
- Time: 45 minutes
- 12 points to pass

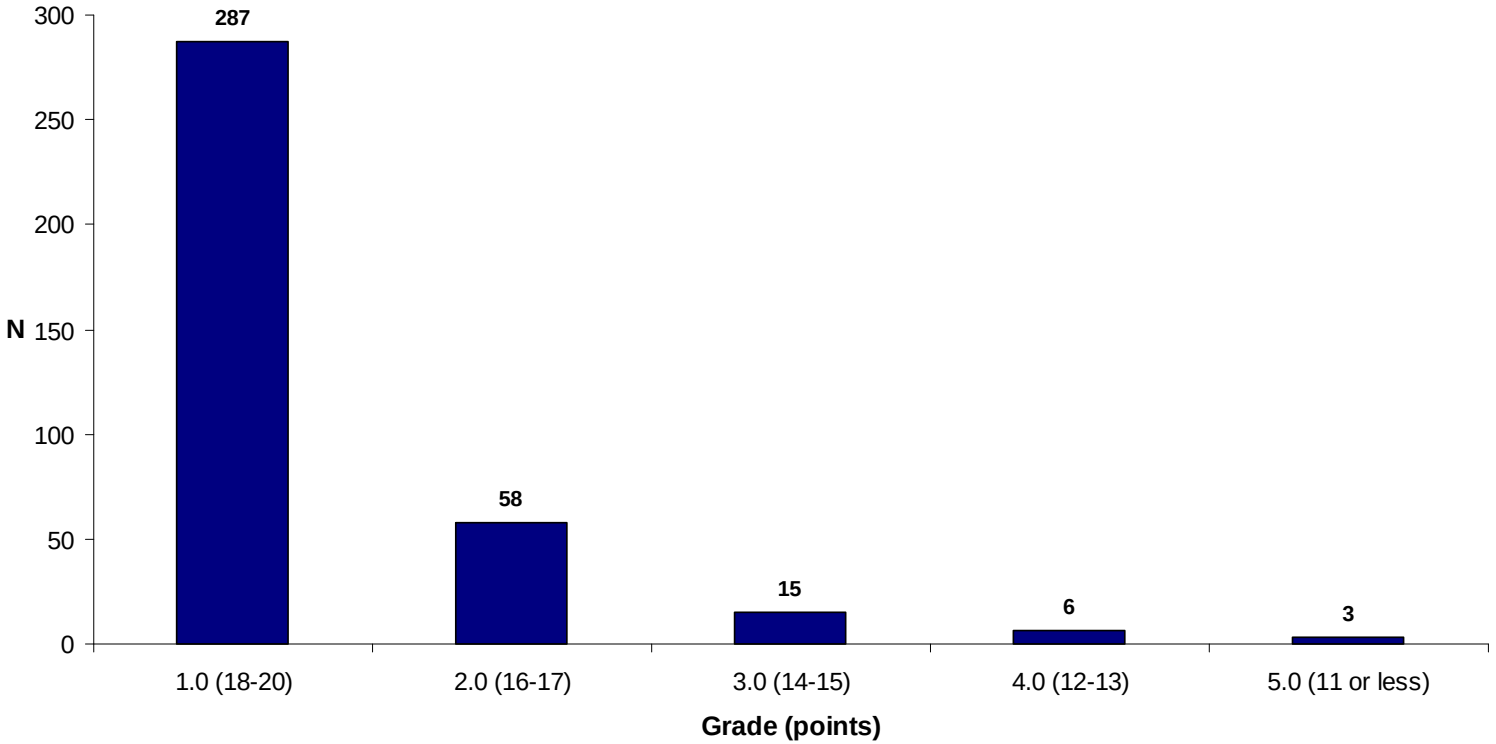
  → aim: low failure rate

Final Exam

Examples

- Which of the following sources has the highest level of evidence from the perspective of Evidence based Medicine?
  - Consensus of experts
  - The majority opinion of scientists
  - Scholarly knowledge of medicine
  - Results of a meta-analysis of RCTs
  - Doctor‘s intuition

Final Exam


300
250
200
N 150
100
50
0
287
58
15
6
3
1.0 (18-20)
2.0 (16-17)
3.0 (14-15)
4.0 (12-13)
5.0 (11 or less)
Grade (points)

Discussion

- 400 students…
  - …have different backgrounds and knowledge
  - …showed high overall satisfaction
- 20 Tutors from different departments
  - …have different background and knowledge
  - …have different views on science in medicine
  - …showed high overall satisfaction
  - Interdisciplinarity can be fruitful as it enhances future cooperations
- Corrections:
  - No mandatory course on presentation-skills
  - Tutors and students voted for the introduction of a „journal club“

Thank you for your attention!

Contact:
n.vonneilich@uke.de
Tel. 0049 (0)40 7410 54869

Lectures

- Scientific theory and the research process
  - Topics: elementary attributes of science, relevant terms and definitions (falsification, causality, induction, deduction), research process
- Epidemiologic Studies
  - Topics: what is epidemiology, cohort study, case-control study, intervention study (RCTs), the pros and cons of the different study types, confounding
- Clinical Trials and Evidence based Medicine (EbM)
  - Topics: randomisation, bias, blinding, EbM, levels of evidence

Lectures

- Ethics in Medicine
  - Topics: What is ethic, ethical aporia in medicine, ethics commission, declaration of helsinki, informed consent
- Ethics in Science
  - Topics: good scientific practice, falsification, fabrication, plagiarism, potential pitfalls in scientific studies
- Images and symbols in medicine
  - Topics: images as information in medicine, models and symbols, production of reality, interpretation of images
- Presentation of all forthcoming 2nd Tracks
  - Exhibition of future 2nd Tracks
  - 14 different Tracks: „Intercultural Medicine“, „Moleculare Medicine“, „Practical Medicine in Gynakology“ etc.

Courses

- Academic Literature I
  - Topics: what is a scientific text, different scientific sources of information, why do we quote, how do we quote
- Academic Literature II
  - Topics: where do I find scientific information, how do I find it, introduction to scientific databases *(in cooperation with the university library)*
- Reading
  - Topics: structure of scientific articles, critical reading, publications in science, problems in the publication of RCTs, publication bias

Courses

- Presentation I
  - Topics: Do‘s and Don‘ts of a presentation, structure of scientific presentations, visualization,
- Presentation II
  - Topics: students present a scientific paper, optional video feedback
- Ethics
  - Topics: discussion of several critical thesis, relating to the lectures on Ethics in Science and Medicine
    - Example: *It is not medicine when de research.*

A two-week timetable

	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	L:Introduction	L: Theory in Science	L: Epidemiologic Studies	L: Clinical Trials/EbM	
	L: Images in Medicine				C: Reading
	C: Scientific Research 1	C: Presentation I	C: Scientific Research II		
Week 2	L: Ethics in Science and Medicin	L: Presentation of all 2nd Tracks		C: Presentation II	Exam
	C: Ethics				