Transforming Traditional to Interactive Teaching

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Outline

◆ Background for the Change Process

◆ Methods PI / JiTT / Tutorials (McDermott)

◆ Our way

◆ Impacts
Background

- started with traditional lectures
  - like we were taught

- were unsatisfied with results
  - share similar attitudes → teaching team

- 2012 started changing to JiTT/PI/tutorials
  - learned from Christian Kautz, Peter Riegler, Cynthia Heiner

A dream …

Students
... arrive prepared to the lessons
... work continuously and actively during the lessons

Instructor
... knows students’ difficulties
### Methods

#### Peer Instruction (PI): Procedure

**Concept Question**
- individual, anonymous answer

**Peer Discussion Phase**
- Discussion in peer-groups
- teacher listens to find misconcepts
- ensure correct comprehension

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#### JITT (Just-In-Time-Teaching): Procedure

**Self-study**
- Study assignment & online pre-quiz

**Classroom presence**
- Lesson tailored to students' quiz answers and questions
- More ambitious online post-quiz
- Taking up of still open questions
**Self-study Phase**

**Instructor:**
- gives
  - learning objectives
  - study assignment
  - literature recommendations

**Students:**
- prepare self-study-unit (i.e. connect to subject)
- do online-quiz

**Preparation of ‘lecture’ „Just-in-time“**

**Instructor:**
- Evaluates answers of quiz (statistics)
  - abundance of missing right answers
  - abundance of wrong answers
  - answers on ‘question to ask a question’ (with e-mail feedback)
    → students tell what teacher should cover

- Prepares the classroom phase
  - lecturing parts
  - PI-phases
  - interactive phases
Classroom-presence Phase

Instructor:
- visualize central theme
- fast presenting the highlights, traditional lecturing part
  - *interwoven*: addressing students’ difficulties with the subject:
    - “I saw, many had problems with …“
- addressing questions and answers from students (from quiz & live):
- working through parts of the online-quiz

Students:
- Interacting with teacher: questioning and answering
- Peer Instruction discussions

⇒ much more lively teaching (20/40 instead of 2/40 voices in the room)

Our Way

Example of Choreography

Our Way

Obstacles and Solutions

- No affordable “Ready-made-materials” available like ‘Mastering Physics’
  - we develop our materials ourselves
  - materials are well adapted to (special) courses
    - we discover new misconcepts and wrong thinking
- There are formal restrictions about midterms and bonus systems
  - 3, 5 or 10 % bonus to end-of-term exams sufficient for high student motivation
- Only discussing student problems is not sufficient
  - presentation of chapter highlights interwoven with problems much better.
  - self-reliance and independency of students can be developed

⇒ successful results
Important Framing the active classroom

Important communication to students before & during teaching:

- Why study assignments?

- Use ‘lecture’ time more efficiently to…
  - … clarify understanding problems
  - … gain time for PI-questions
  - … activate students

- good ‘lecture’ preparation
  = good exam preparation

 ➔ i.e. learning to study


Framing Learning ≠ Comfort

- Learning Zone Model (Michl 2009)
  - Learning = Growing beyond Comfort Zone
    - but avoiding panic zone

Impacts
Examples of our findings

- FCI gain doubles 0.13 → 0.28
  - traditional vs. interactive
- 16% more exams passed at first possible date
  - traditional vs. interactive

Publication (Stanzel, Junker, Schäfle) PTEE-Proceedings Delft 2019
(PTEE= Physics Teaching in Engineering Education) [http://www.sefiphysics.be/conferences/index.html]

Summary

- Interactive Teaching and Learning is
  - .. more fun
  - .. more efficient
- Try it!
  - .. e.g. one interactive unit per month
  - .. asking and listening to the students is essential
  - Adapt to your personality as teacher and to your students
- JiTT saves times and gives room for PI.
- The classroom is your didactical lab! Experiment!

Publication (Graupner, Junker, Stanzel) Proceedings MINT-Symposium Nürnberg 2019
Download Oct 19: [https://www.diz-bayern.de/publikationen/dina-und-tagungsbaende]
Thanks for Joining
Our contacts

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Receiving national teaching award
‘Ars legendi-Fakultätenpreis Physik 2017”
Humboldt University Berlin 30.03.2017
(l.to r. E. Junker, S. Stanzel, C. Schäfle)