

# Teaching Statement \*

<https://lechten.gitlab.io/teaching.html>

Jens Lechtenbörger

Summer Term 2023

## Learning

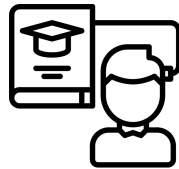


Figure 1: (“Learning” by lastspark under CC BY 3.0 US; cropped from the Noun Project)

A couple of years back I realized that lecturing does not lead to learning, which is not surprising given our knowledge about learning. Let’s have a brief look.

## Brain $\approx$ Muscle

- Learning involves brain’s **long term memory**

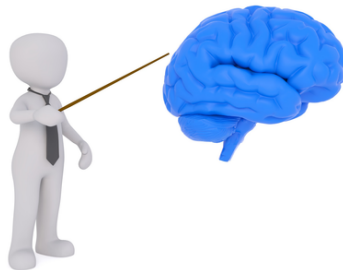


Figure 2: Figure under CC0 1.0

- Long term memory needs **repeated** retrieval and practice

---

\*This PDF document is an inferior version of an OER HTML page; free/libre Org mode source repository.

- Spaced out **over time**
- Effect: Changes in brain’s **neural connections**

- (Learning does **not** happen [solely] in lectures)

(See [Hua19])

Thanks to Nobel laureate Carl Wieman (see [Hua19] for a discussion with him), I like to think of brains as muscles.

The bullet points here emphasize that learning requires changes in our long term memory. Clearly, to remember most of us need repeated retrieval and practice spaced out over time. In response, our brains’ proteins change to form new neural connections. A muscle building up.

While lecturing is a good mental exercise for me, being lectured is unlikely to be a good one for you...

## Deliberate Practice

- Characteristics of **Deliberate Practice** to acquire expert skills ([Eri08], see also [EKT93; 14])



Figure 3: “training” by Nithinan Tatah under CC BY 3.0 US; cropped from the Noun Project

1. Task with **well-defined goal**
2. Individual **motivated** to improve
3. **Feedback** on current performance
4. Ample opportunities for **repetition** and **gradual refinements**

(Traditional lecturing is “teaching by telling”, does not share **any** characteristic of Deliberate Practice)

Here you see characteristics of so-called Deliberate Practice, which is necessary to acquire expert skills across domains.

<Read them>

Research shows that about 10,000 hours of practice are necessary to compete internationally in a variety of domains, independently of what one might think of as “talent”. Note that 10,000 h @ 40 h/wk @ 50 wk/yr translate to about 5 years, the length of your studies maybe.

Thus, considerable effort is necessary for learning, and this effort cannot be found in “teaching by telling”.

## Active Learning

- **Active Learning** increases student performance in science, engineering, and mathematics ([Fre+14])

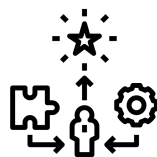


Figure 4: “experience” by Nithinan Tatab under CC BY 3.0 US; cropped from the Noun Project

- Active Learning is an umbrella term for diverse interventions
  - \* Group problem-solving
  - \* Worksheets or tutorials completed during class
  - \* Use of personal response systems with or without peer instruction
  - \* Studio or workshop course designs
- Notice: Above interventions share several characteristics of Deliberate Practice

## Teaching

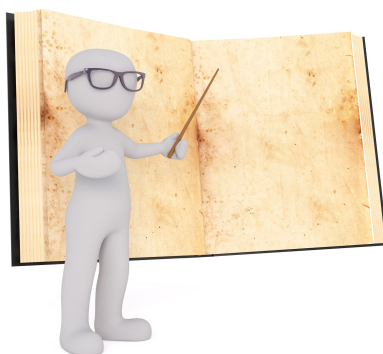


Figure 5: Figure under CC0 1.0

To cut a long story short, I was lecturing for years, and students were generally happy with my lecturing. When I started to integrate quizzes with classroom response systems into my courses, though, I realized that the majority of students did not learn in class what I was hoping them to learn. Although students did not appear to be dissatisfied with this situation, I was frustrated, learned more about learning, and changed my teaching.

Supported by German Stifterverband and the state of North Rhine-Westphalia, I went for Just-in-Time Teaching (JiT) [Lec17], a special type of flipped learning. Since then, I have been experimenting a lot, and student responses have been mixed. Some love my approach, others hate it. Every term I see superb student performances, making me happy, as well as students tuning out, leaving me in doubt. Anyways, I do not plan to go back to lecturing.

Please be reassured that I value constructive criticism. Please do not hesitate to provide suggestions that might improve our shared time here at the university. Yes, we share time here.

## Flipped Approaches

- In-class and at-home events flipped [BV13; Bre+21]
  - Individual computer-based instruction paired with active learning in class



Figure 6: “expert” by pongsakorn under CC BY 3.0 US; cropped from the Noun Project

- \* Individual learning shaped by individual background and preferences
  - \* “Lectures” to discuss questions and work on exercises
- Benefits

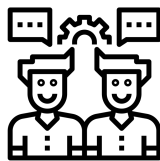


Figure 7: “dialogue” by Template under CC BY 3.0 US; cropped from the Noun Project

- Better preparation of in-class meetings
  - \* Reduced cognitive load during initial instruction
  - \* Greater cognitive capacity in class
- Valuable/limited **shared** time is used more **effectively** for student-instructor interactions

## Research on Flipped Learning

- [Kap+22]: “Fail, flip, fix, and feed – Rethinking flipped learning: A review of meta-analyses and a subsequent meta-analysis”

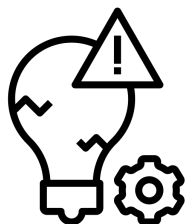


Figure 8: “mistake” by Kamin Ginkaew under CC BY 3.0 US; cropped from the Noun Project

- Arrange process with Fail, Flip, Fix, and Feed
  - \* Fail: Let students try to solve novel problems even if they fail (before instruction)
- Let us try this!

There is a rich body of research providing scientific evidence for the benefits of flipped classroom approaches on student learning, of which one meta-analysis is cited here. That study suggests a specific sequence of phases called Fail, Flip, Fix, and Feed. Importantly, the first phase, Fail, entails letting students try to solve novel problems on their own before being instructed. This is likely to lead to failing attempts, but activates prior knowledge and helps students to diagnose their own learning, stimulating meta-cognitive processes.

Let us try this!

## Notes on Flipping

- Clearly, flipping requires **your** preparation



Figure 9: “Productivity” by Template under CC BY 3.0 US; cropped from the Noun Project

- Some students find that after being prepared, they do not need our class meetings at all
  - \* This is fine
  - \* (In-class discussions might still offer benefits: switch role and learn as instructor, identify misconceptions)
- Other students find that class meetings are a waste of time if they are not prepared
  - \* I agree: If you are not prepared, then it probably makes more sense to use the session time for self-study than to attend the session

## Notes on Active Learning

- Quote by Louis Deslauriers, author of study [Des+19] on actual learning vs feeling of learning:
  - “The effort involved in active learning can be misinterpreted as a sign of poor learning. On the other hand, a superstar lecturer can explain things in such a way as to make students feel like they are learning more than they actually are.”
- Please, do not misinterpret your efforts as signs of poor learning

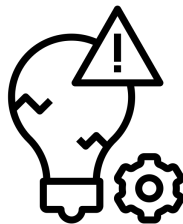


Figure 10: “mistake” by Kamin Ginkaew under CC BY 3.0 US; cropped from the Noun Project

- Please, ask early, in our forum, a shared document, during sessions
  - \* (Q&A on class topics should take place in **shared** spaces, might be anonymous; other topics might require private spaces)

## The Beginning



Figure 11: Figure under CC0 1.0

- Lots of questions
  - Why do you attend sessions?
    - \* On campus or online?
  - Why would you **like** to come to campus?
  - Is everything fine as it is?
  - How **should** learning at a university look like?
- Please share your answers
  - Maybe anonymously in the shared pad for our first session

## Bibliography

- [14] *Course Transformation Guide*. 2014. URL: [http://www.cwsei.ubc.ca/resources/files/CourseTransformationGuide\\_CWSEI\\_CU-SEI.pdf](http://www.cwsei.ubc.ca/resources/files/CourseTransformationGuide_CWSEI_CU-SEI.pdf).

- [Bre+21] Carrie A. Bredow et al. “To Flip or Not to Flip? A Meta-Analysis of the Efficacy of Flipped Learning in Higher Education”. In: *Review of Educational Research* 91.6 (2021). DOI: 10.3102/00346543211019122. URL: <https://doi.org/10.3102/00346543211019122>.
- [BV13] Jacob Lowell Bishop and Matthew A. Verleger. “The flipped classroom: A survey of the research”. In: *ASEE National Conference Proceedings, Atlanta, GA*. Vol. 30. 9. 2013, pp. 1–18. URL: <https://www.asee.org/public/conferences/20/papers/6219/download>.
- [Des+19] Louis Deslauriers et al. “Measuring actual learning versus feeling of learning in response to being actively engaged in the classroom”. In: *Proceedings of the National Academy of Sciences* 116.39 (2019), pp. 19251–19257. DOI: 10.1073/pnas.1821936116. URL: <https://www.pnas.org/content/116/39/19251>.
- [EKT93] K. Anders Ericsson, Ralf Th. Krampe, and Clemens Tesch-Römer. “The role of deliberate practice in the acquisition of expert performance”. In: *Psychological review* 100.3 (1993), p. 363. URL: <http://projects.ict.usc.edu/itw/gel/EricssonDeliberatePracticePR93.PDF>.
- [Eri08] K. Anders Ericsson. “Deliberate practice and acquisition of expert performance: a general overview”. In: *Acad Emerg Med* 15.11 (2008), pp. 988–994. URL: <https://www.onlinelibrary.wiley.com/doi/full/10.1111/j.1553-2712.2008.00227.x>.
- [Fre+14] Scott Freeman et al. “Active learning increases student performance in science, engineering, and mathematics”. In: *Proceedings of the National Academy of Sciences* 111.23 (2014), pp. 8410–8415. URL: <https://www.pnas.org/content/111/23/8410>.
- [Hua19] Wolfgang Huang. “Don’t lecture me! A discussion of active learning with Nobel laureate Carl Wieman”. In: *Nature* (2019). URL: <https://www.nature.com/articles/d42473-019-00339-6>.
- [Kap+22] Manu Kapur et al. “Fail, flip, fix, and feed – Rethinking flipped learning: A review of meta-analyses and a subsequent meta-analysis”. In: *Frontiers in Education* 7 (2022). DOI: 10.3389/educ.2022.956416. URL: <https://www.frontiersin.org/articles/10.3389/educ.2022.956416>.
- [Lec17] Jens Lechtenbörger. *Bericht zu JiTT@OperatingSystems*. 2017. URL: <https://www.stifterverband.org/lehrfellows/2016/lechtenboerger>.

The bibliography contains information for references used throughout the presentation. Actually, references on other slides are hyperlinks to this bibliography.

## License Information

Source code and source files for this OER presentation are available on GitLab under free/libre licenses.

Except where otherwise noted, the work “Teaching Statement”, © 2021, 2023 Jens Lechtenbörger, is published under the Creative Commons license CC BY-SA 4.0.

No warranties are given. The license may not give you all of the permissions necessary for your intended use.

In particular, trademark rights are *not* licensed under this license. Thus, rights concerning third party logos (e.g., on the title slide) and other (trade-) marks (e.g., “Creative Commons” itself) remain with their respective holders.

This presentation is an Open Educational Resource under the free and open license terms indicated here. Source materials are available on GitLab. Your collaboration would make me happy.