The Teaching Trick
How to improve student learning without spending more time teaching

Kristina Edström
Universiteit van Amsterdam
May 28, 2019

Kristina Edström
Engineer & Educational developer
- M. Sc. in Engineering, Chalmers
- PhD in Technology and Learning, KTH
- Associate Professor in Engineering Education Development at KTH Royal Institute of Technology, Stockholm, Sweden
- 700 participants in the course Teaching and Learning in Higher Education, 7.5 ECTS, customized for KTH faculty, 2004-2012
- Director of Educational Development at Skolkovo Institute of Science and Technology, Moscow, 2012-2013

Strategic educational development
- CDIO Initiative for reform of engineering education since 2001
- SEFI Administrative Council, 2010-2013
- Editor-in-Chief of the European Journal of Engineering Education from 2018

Some publications
Cost-neutral interventions

To persuade the grumpy professor to listen
Because my best friends found it useful
To support those dedicated to teaching

Anyone can improve a course by working 100 hours more...

• Yeah. We don’t have those hours!
• And “more of the same” is not the best strategy

This is about how to get better learning from existing teaching resources
Pedagogical competence

1. setting clear objectives (intended learning outcomes)
   - relevant for the study programs
   - defining the threshold level of quality
   - deeper working understanding

2. uphold the threshold level of quality
   - only pass the students who reach the goals

3. create a course which generates appropriate learning activity
   - so students actually reach the goals
   - good throughput - with good quality

Or in other words...

Formulating intended learning outcomes

- What work is appropriate for the students to do, to reach the learning outcomes?
- How should the students demonstrate that they fulfil the learning outcomes?

Designing activities

Designing assessment

Constructive alignment [Biggs]

What should the students be able to do as a result of the course?
Pedagogical competence

1. setting clear objectives
   (intended learning outcomes)
   - relevant for the study programs
   - defining the threshold level of quality
   - deeper working understanding

2. uphold the threshold level of quality
   - only pass the students who reach the goals

3. create a course which generates appropriate learning activity
   - so students actually reach the goals
   - good throughput - with good quality

4. and doing this while using teacher time effectively
   - generate appropriate study for the students
   - spend your time where it has effect on learning
   - create a sustainable workload for yourself
   - and sustainability for your institution and country

The acts of teachers need to be judged in the light of their impact on student learning.

Boud & Molloy, 2013
The teaching trick

Do more of that which contributes to learning  
Pretty easy

But since we don’t have 100 hours more:

Do less of that which does not contribute  
Pretty hard

Which one is easier?

Examples are illustrations of principles

A specific example will illustrate generic principles to inspire applications - of many different kinds.
Family dinner
Seven minutes
Invest 0,20 €
Master test
# No comments
Ultimate Frisbee
Fireworks
Stroke of Genius
2+2
Inheritance

# No comments
The teaching trick:
Do less of that which does not contribute

Spend less time on…
”finishing” student work!

Professor S told us:

"I got 60 reports. It is a boring task to give feedback and it takes me two weeks. I gave individual comments and asked those who had failed to re-submit. When the reports came back they were still bad. The students had only corrected the things I commented on specifically. They did not even read the rest!

Next year I did not give individual feedback on failed reports. Instead I made a list with the most common errors. Now the students had to find their own errors. When I got the reports back they were generally very good!"
Providing feedback on students’ work is one of the most expensive components in their education

Often an ineffective investment:
- when the feedback is too slow
- when students will not use the comments (or even read them)
  - typically in the end of the course
  - when students do not benefit from using it
  - when students focus on the grade rather than learning (e.g. just want to pass)

...this means that our assessment normally does not support learning

Remember the purpose

- The purpose is not that this particular report should be good
- The purpose is that the student should develop the skills to write reports (so that he/she can write 1000 excellent reports later)
Every time you tie the shoes for your child, you hinder her own development.

Maria Montessori

For the same reason:

Keep your hands on your back…

when you are assisting students in the computer lab – do not ever touch their keyboard!
Tax payer’s money down the drain!

Old exams archive

Make the distinction between:
- feedback for learning
- justifying grade (minimize cost)

To really influence learning:
feedback should be built into a learning activity

1. The students do something (report, presentation, etc)
2. Students get feedback (formative assessment)
3. The students do it again
4. Students get grade (summative assessment)
   - now without feedback

By definition: it is not feedback unless the loop is closed!
Family dinner

The teaching trick:
Do less of that which does not contribute

Spend less time on... marking coursework!
A cycle of weekly reports drives the course

What Professor K does...

1. Course start

2. Course end

---

Feedback session

i. Students' papers are exchanged randomly, and they write feedback with a pen.

ii. Students receive & read their feedback immediately.

iii. Advanced and lively discussions!

Afterwards, teacher collects reports (or copies) for grading.

Introduce new content

Challenge

Workshop

- Students work on their challenge
- Support and discussions if needed

---

1. Read theory and implement the method
   (straight-forward implementation)

2. Test and verify implementation
   (normal use and extreme cases)

3. Investigate creatively
   (test variants, how would it work if... play around, think for yourself)

4. Write short report (Limited: 2 or 3 pages)
   (describe methodology, limitations etc and own initiatives)
Here comes the trick: Easy marking 😊

**Grading scale**
- Fail = 0p (Seldom happens)
- Pass = 1p (Typical grade)
- Brilliant = 2p (Requires substantial own initiatives)
- Writing feedback = 1p (Needs to be of good quality)

Easy to see the difference between 0, 1 or 2 points, in fact it only takes about 1-3 minutes per paper…

---

**At the end of the course, points are converted to final grade (no exam)**
- In some courses there is also an oral exam, 0 p, 10 p, 20 p

<table>
<thead>
<tr>
<th>Points</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-28</td>
<td>A</td>
</tr>
<tr>
<td>21-24</td>
<td>B</td>
</tr>
<tr>
<td>17-20</td>
<td>C</td>
</tr>
<tr>
<td>14-16</td>
<td>D</td>
</tr>
<tr>
<td>11-13</td>
<td>E</td>
</tr>
<tr>
<td>0-10</td>
<td>Fx</td>
</tr>
</tbody>
</table>

---

**What about larger classes?**

- **Thursday workshops**
  - Might need some more assistants (PhD students).

- **Feedback sessions**
  - Peer feedback works just as well.
  - The group discussions risk to be a little less "personal".

- **Marking**
  - E.g. A few PhD students need to turn up in your office in time for marking.
  - Discuss the in-between cases.
The principle is to separate the processes

--- then both can be made cost-effective

Feedback for learning
- made into a group learning activity
- intense involvement
- learn to discuss the subject
- immediate feedback
- expose variation
- social motivation

Assessment for grading
- by the teacher
- minimalistic
- sufficiently fair

Good for learning!

Continuous studies
- Distributes student effort during the course.

The formative feedback session *as a whole* (giving feedback, getting feedback and discussions) generates learning:
- Repetition – Variation – Fast feedback.
- Deep & interesting discussions (instead of discussions on definitions).
- Social motivation – expose your understanding to others and see theirs.

Satisfaction:
- Students feel that the teacher really cares about their work.
- Clear, fair and transparent grading system.
- Students feel their progression.

Good for the teacher!
- ≈1-3 minutes per paper.
- Final grading is no extra work 😊
Invest 0,20 €

The Iceberg Principle

Group work with random presenter

Tell them on day one:
All students in the group should be ready to present the whole project and take questions on all parts

Last minute:
Choose the presenter randomly
Students choose
- It is possible to hide behind strong students
- There is little incentive to learn about each others work
- Only the best presenter will practice presenting
- Towards the end it is mainly the presenter who is working

Random choice
- Everyone knows you cannot hide
- Everyone must learn about all parts
  - what questions can we expect to get on X?
  - why did we choose to Y?
- Everyone will practice presenting

What is the cost?
About 0,20 €

The real cost is explaining the setup for the students

Some students will say:
- It is unfair!

You explain:
- It is. But, you see, the previous setup was unfair too. But now the learning will be much better for all!
Seven minutes

The teaching trick:
Do less of that which does not contribute

Spend less time on...
designing and correcting exams!
Oral exams are really good for learning

- Influence student preparation – they know they must show “real” understanding in real time (create the right expectation)
- Better test of understanding & can be individually tailored

Some teachers are nervous about...

...having to invent the necessary questions
- The trick: Reverse the burden of proof
  (“the first 7 minutes are yours, to show me that you have reached the learning outcomes”)
- Follow-up questions pop up without effort

...grading
- Use a simple scale: Fail / 10p / 20p

...having to fail students
- Ask kindly how they think it went
- Use audio recording

…the time it takes
- But it is cheaper for a course of up to \( N \) students
- What is \( N \) for your course? Let’s do the math!

---

Written vs. oral exam, teacher time

Written:
Constructing one exam and solution-sheet takes \( 10-16 \) hours.
Correcting them takes \( 20 \) minutes per student.

Oral:
The exam takes \( 30 \) minutes.

But consider also the re-exam!

Let’s see if we get it
- 16 hours to prepare exam
- 80% passing rate
- One re-exam

Break-even is at \( \approx 160 \) students
We have 400 students in Introductory Physics…

…but we also have more than 10 professors who know the subject!
Master test

The teaching trick:
Do less of that which does not contribute

Spend less time (energy) on... listening to students complaints!
Professor V has a course

There were two individual assignments in the course:

**Homework 1 & 2**
The tasks were complex and theoretical…

Students complained bitterly and endlessly

- **The assignments are far too DIFFICULT**
- **They take TOO MUCH TIME!**

The intervention

The assignments were renamed:

**MASTER TEST 1 & 2**
(MÄSTARPROM)

What happened?

- Complaints just stopped
- Students take the assignments very seriously – and are very proud!

…other interesting words…

Accident investigation
Weekly challenge
Show
Master test
Demonstration
Gymkhana
Show & Tell
Fair
Keynote
TED talk
Potluck
Conference
Deadline
Inspection
Q&A session

Evaluation
Summit
Negotiation
All hands on deck
Campaign
Consultancy
Pitch
Elevator pitch
Pecha kucha
Speed dating
Match
Audition
Ceremony
Installation
Inauguration
Boot camp

Time out
Grand challenge
Dress rehearsal
Opening
Court hearing
Stop-press
Workout
Personal training
Vernissage
Hearing
Review
Test pilot
Advisory group
Working party
Quest

Certificate
Jam session
Dissection
Hackathon
Talk show
Level up
Expert panel
Investigation
Workshop
Emergency room
Launch
Countdown
Pit stop
Meeting
Inheritance

The teaching trick:
Do less of that which does not contribute

Spend less time... lecturing to passive students!
**Professor B inherited a course**

7 weeks course, 90 students

**Each week**

1. 2 lectures
2. A tutorial in groups of 30 students with teaching assistants

**Problems** – the usual ones:

- The teachers perceived the students as lazy and passive during lectures.
- Towards the end of the course, the students had a big heap of raw notes as the only result of 56 hours contact time.
- Students started studying too late.
- Many students had poor results on the exam and poor understanding…

**What Professor B did**

**A material for self studies was handed out**

(referenced to chapter + problem exercises).

**Weekly cycle** was introduced:

1. Individual work on the problem sheets.
2. A workshop with teaching assistants in 3 parallel groups of 30, where the students could ask about difficult things.
3. A meeting with 9 students (no teacher) in jigsaw-groups (mixed from different tutorial-groups). The task is to make a list of things that are still problematic and unclear. The list is sent to the lecturer.
4. One lecture based on the issues the students had listed. This is the only lecture.
Good for learning!

• At first, students were pretty confused but system settles during second week
• Students work continuously during the course
• Students spend much more time actually engaging with the subject
• Excellent exam results!

Good for the teacher!

• The weekly lectures attracted a full audience and were considered excellent
• One lecture/week instead of two!
• More preparation time for the single lecture – at least the first time
• The lectures now have a clear purpose – helping students with the problematic parts of the subject

Fireworks
The teaching trick:
Do less of that which does not contribute
(especially if it is expensive)

Spend less time on...
writing feedback

~ 40 students
write an
open-ended
assignment
of 4 pages
(e.g. essay, design, reflection…)

- The assignment is personal and important (a credo).
- It would take several days to write good feedback!
- Instead a final seminar
  - Intensive learning activity
  - Plenty of peer feedback and some from the teacher
  - Minimal summative assessment, sufficiently fair (pass/fail grade)
The teacher skims essays and makes quick decision:
- **Accepted** to join the seminar
- **Pending acceptance**, allowed to join but must submit improved version after the seminar (and they must tell the group and ask for guidance)
- **Reject**, cannot join and must redo assignment the next time the course is given

Divides the students in groups of 4
(Usually one excellent essay, two medium good, and one needing improvement)

Sends mail with instructions
- Download your colleagues’ work (from the digital platform).
- Write ½ page constructive comments to each colleague, strong aspects and how the work can be improved.
- Bring prints of comments to the seminar (4 for the group + 1 to the teacher).

This takes maximum 2 hours…

---

**Teacher prepares feedback before the seminar**

- Merges all essays into one big pdf.
- Searches for **a strong aspect** in each text, making sure to cover the things that are important in the course.
- Marks the passage with a "star" in the margin with some keywords.
- This takes just as long time as a hockey game 😊

[Recommended the GoodReader app for annotations]
At the seminar – group feedback

- Discuss each essay with the aim to improve it (4*30 minutes).
- Meanwhile, the teacher reads the written comments (to see that they were taken seriously + as input)
- Their feedback is quite useful
  - Students are really good at pointing out deficiencies
  - Getting three different comments on your essay is great

End with fireworks

1 hour in plenary:

- Display the pdf and discuss each “Gold Star” full of enthusiasm and passion (fireworks). Bring it on!
- End by recommending 3 – 4 essays to read before writing version 2.0 (for most students it is voluntary).
- Publish the pdf in the digital platform as an invitation to browse.
Experiences

- An excellent way to summarise the most important points in the course through the students' own work
- Creates a positive final chord, a feeling that we have really achieved something together
- Social motivation (teachers and friends)
- Rich feedback
  - It is a good learning activity to comment on the others
  - Peers are excellent to spot deficiencies
  - The teacher adds the positive things for which the students lack frames of references
- Exposes quality and variation (considerately but clearly)
- Handles poor work fairly but discreetly
- Course evaluations are written immediately after the seminar, in a rush of excitement 😊

2+2
The teaching trick:
Do less of that which does not contribute

Spend less teacher time on…
grading exams!

4-hour exam in two steps

First part (2h)
- Students write the exam and hand in
  (During the break exams are photocopied as cheating safeguard)

Second part (2h)
- Hand out exams randomly (with a red pen)
- For each task, joint class discussion to agree how to mark it
  (Teacher has the last say - naturally)
- Students mark the exam as we go along

Afterwards
- The teacher takes home the bunch for marking (extra check)
  (check results near boundaries, plenty of random checks, see how well they learned)
- Good marking is rewarded with a few bonus points
Advantages

Good for learning!
- Repetition is built in
- Fast and detailed feedback
- Students discover what they could achieve on their own, and not...
  - They go home with the whole and correct answer
  - Exposure creates social pressure to do well
  - See variation when correcting each others and discussing
  - Students are active and involved
    - Criteria for quality are made visible and explicit
    - Transparency and sense of fairness

Good for the teacher!
- Robust against cheating
  - It can still be the basis for fair grading
- Less routine teacher-work

Stroke of genius
The teaching trick:
Do less of that which does not contribute

Spend less time on...
ineffective group supervision!

Professor E’s students do a project
She has 140 students, in groups of 5

First how it used to be:
Near the beginning of the course
- Students hand in an early draft
  - supervisors comment (formative) and grade (summative)

Near the end of the course
- Students hand in the final version and give oral presentation
  - another group comments on it, and act as opponents in the oral presentation
  - the supervisor comments and gives grade
Problems

- It takes lots of teacher time to read and comment!
- Some groups “pause” the work while waiting for feedback on their drafts (sometimes it can take two weeks).
- Some groups fix only what supervisors commented on, with little reflection.
- Some groups have obviously divided the work and students seem to focus mostly on “their own” part.
- Some individual students often come to the supervisor for feedback: “Are we on the right way?”

Classical problems! What can be done?

This year Professor E increased to two peer reviews, one early (on drafts) and one in the end.

BUT

THE SUPERVISORS WERE WORRIED

- that student feedback would be of low quality ("a blind leading a blind")
- that they would just get more work, now they had to read also all the reviews…

Of course we should have peer assessment! But let’s do it smart…
But professor E had a stroke of genius!

- Instead of "groups reviewing groups" she turned it into an individual task: "individuals reviewing groups".
- Each person was responsible for commenting on the work of another group (in draft and final stage).
- Thus, each group received **five different sets of comments**, and the group had access to five other reports that its members had read and analysed.

Template for reviews

Examples of questions:

- What are the strongest aspects of the work?
- What are the most important areas for improvement?
- Other comments?

- After having read and analysed this work, what is your most important reflection you do for yourself – for your group – for your future professional role?

- The questions or issues that I want to discuss with this group are (DESCRIBE):
- The issue is relevant because (RATIONALE):
First review (on drafts)

- “BUT THEY SAID DIFFERENT THINGS, AND WE DON’T AGREE IN THE GROUP EITHER…”
- “ON THE ONE HAND… BUT ON THE OTHER…”

A compulsory meeting with the supervisor:

- Discuss the comments you have received, your thoughts about the different views, what reflections you made when making your reviews and how you want to proceed with your own work.
- After this meeting they can revise their draft before handing in for approval by the supervisor (no further feedback).

Second review (final draft and oral presentation)

- Students deliver their written comments the day before the presentation.
- Many groups had quickly revised their work and prepared answers to the questions.
- After the seminar they were allowed to revise their reports before the supervisor graded it (without writing any feedback).
- Students reviewed the same group’s work both times. This was mainly meant to save them some time. It opened up for many comments about the progression of the work, and on how well the group had handled the earlier comments.
RESULTS

Better learning:
- The work was of higher quality: more worked out in detail and aligned with the instructions. Better justifications for decisions.
- Student feedback was delivered faster than supervisors could have achieved.
- Students thought that the reviews took much time, but was rewarding.

More effective teaching:
- Supervisors’ time is used to discuss face-to-face with students and guide students in interpreting and using the comments.
- Fewer students came to check “if they were on the right way”.

But still:
- Some supervisors thought it felt strange, "unprofessional", not to give written and detailed comments on student work – despite the fact that they could see the improvements…

Ultimate frisbee
Dear Professor,

I coach the women’s ultimate frisbee teams and based on your workshop I changed our program for the practice weekend.

Normally, since a game only involves 14 players, we would rotate and the others would do some drill on the side.

Now, instead, I had a non-playing team standing on the sidelines and assigned each of them a player. Then I stopped the game periodically and had the sideline players give individual feedback to their assigned player.

It went over remarkably well. A number of the ladies had very positive feedback, and said they had numerous strategy talks that they found incredibly helpful. It was also great for me, since I can’t possibly watch every player all the time. It was incredibly time efficient!

So in conclusion, thanks again for the workshop. I thoroughly enjoyed it, and I thought you might like hearing about an application in a completely different “field”!

Best regards,

Professor D

---

The trick question

Do more of that which contributes to learning  \textit{Easy part}\[\text{(especially when it is cheap)}\]

Do less of that which does not contribute  \textit{Hard part}\[\text{(especially when it is expensive)}\]

Doing additional things \textit{on top of the old} is not sustainable…

What could make us keep doing things that are less effective for learning?
Why do teachers often keep doing things that are less effective for learning?

- 
- 

What reasons can there be...?

Convenience and minimising risk
- With traditional methods, we don’t need to think, decide, explain, defend, persuade, take responsibility.
- When the old model doesn’t work we can blame the students, but if I try something new, everything is my fault.
- It kind of worked last year.

Lack of alternatives
- We never tried teaching in different ways and have nothing to compare with.
- We have not reflected on our routines and traditions.

Low capacity for course development
- We truly believed that it would always take more time so we actually never thought of this.
- There is little incentive for teaching well.
- We use all our time for running the course and plan no time for development.
- Lack of knowledge and inspiration in course design.
- Rules and bureaucracy (long time lag for steering documents) hinder change.

Expectations and image
- Student expectations (or what we think they want).
- Colleagues expectations (or what we think they think).
- This would be seen as “radical”.
- We want to play “good” and conform to what the seniors have been doing.

Lack of learning perspective
- We teach in ways that make us feel good ourselves, without thinking much about learning.
- We see teaching as a performance in itself, rather than a way to make learning happen.
Remember that we are here to improve education

How to talk with students about this

NEVER EVER SAY:
this is "alternative" – I learnt a trick – I’m saving my time

Show that this truly belongs in the education

Several tricks address competences relevant for most educational programs. Make this explicit in the learning objectives!

After the course you should be able to (for instance)
- evaluate your own work and the work by others...
- critically analyse and give feedback on...
- critically assess alternative solutions...
- orally present and discuss your conclusions and the underpinning knowledge...
- argue and contribute in discussions about...

Student: Why do I need to read their report?
Teacher: Look at the course learning outcomes. This is how you practice to...critically review and give feedback on technical solutions! You will need that in working life.
The tricks are not just “oil in the machinery”

It is about

QUALITY TIME WITH YOUR STUDENTS
- more value adding, meaningful and fun!

It is also about a more stimulating role for teachers

Value-adding processes are often more stimulating
The least value-adding processes are often boring routine tasks
Also note that the most value-adding processes are the last to be replaced…

And we only live once…
What was the message today?  
(in one sentence)

STUDENTS CAN LEARN BETTER  
without more work from the teacher.

What do people seem to remember?  
The teacher can save time.

My (not so) hidden agenda

Enabling educational development by addressing implementation issues  
Furthering a learning perspective by gift-wrapping it

Challenge the image of educational development as self-sacrifice
Implications for educational developers and researchers

- It is great if teachers start analysing teaching from a learning perspective – even if they begin doing it for egoistic reasons.
- To make change happen – and in particular to make it sustainable – we need to focus on how educational ideas can be implemented in reality.
- Show concrete practical instances of educational theory and philosophy.
- It is not sufficient to promote pedagogical ideas and theories on an abstract level only. It is not fair to focus on the advantages for learning without tackling the issue of resource requirements.
- Let us make realistic recommendations based on a better understanding and empathy with teachers' work situations.
- Let us understand what is blocking teaching innovation in the organisation, and what can help support innovation.