From Teaching to Learning through Coaching (TLC) – Experience from Three Master Level Engineering Courses

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1

Outline

Introduction
Teaching, Learning and Coaching
How to set a deadline
Selecting tasks that support learning
The student's learning experience
Conclusions

2

New courses – new examination

(Instead of written exam)

- Homework and simulation exercises (2 examples)
- Essay on topic of choice, using information searching (1 example)

3

TLC: An analogy from sports

The role of the coach is to support the development of the athlete by

- Making athletes train regularly
- Selecting harder and harder challenges
- Giving feedback and encouragement
- Encourage team spirit

The role of the university teacher could likewise be stated as

- Making students learn regularly
- Selecting harder and harder homework
- Giving feedback and encouragement
- Encourage teamwork

4

How to set a deadline

- No deadline
- After the end of the course
- A few deadlines distributed during the course
- Every week
- Every class meeting

- Let the students select the deadline

Table 1. Simulation course deadlines and grading, fall 2008 (IH2653)

HW	Points	Matlab	CMP	NanoHUB	Deadline	Content
1	10	Yes			Mon 3/11	Solution ODEs
2	10	Yes			Mon 10/11	FDM 1D
3	10		Yes	Yes	Mon 10/11	Diode
4	10	Yes	Yes		Mon 17/11	FDM 2D
5	10	Yes	Yes	Yes	Mon 17/11	Diffusion
6	10			Yes	Mon 24/11	MOSFET
7	10	Yes			Mon 24/11	FEM, Sch-G
8	10	Yes		Yes	Mon 1/12	Transport, Scaling
9	10			Yes	Mon 1/12	Ballistic transport
10	10	Yes			Mon 8/12	Monte Carlo

Homework should be emailed on the date above at 23.59 latest, with your name as filename.

Table 2. Device course deadlines and grading, spring 2008 (IH2657)

What	Points	Deadline	nanoHUB	Content
HW 1	5	Mon 31/3	-	Basics
HW 2	10	Mon 7/4	-	Scaling/High K
HW 3	10	Mon 14/4	-	SOI/FinFETs
LAB 1	15	Mon 21/4	Yes	Scaling of MOSFET
LAB 2	15	Mon 28/4	Yes	Transport models
SEM 1	10	Tue 29/4	-	Article summary and signup
HW 4	15	Mon 5/5	-	Strain/nano/interconnect
SEM 2	10	6, 8, or 9/5	-	Seminar: presentation + QA
SEM 3	10	Mon 12/5	-	Written summary of seminar

* A grade > E requires that the student has some points for each area: homework, labs and seminars.

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7

Clear grading criteria

Points	Grade
≥ 90	A
≥ 80	B
≥ 70	C
≥ 60	D
≥ 50	E
< 50	Fx

Points are deducted for late homework

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8

Tasks that support learning and avoids plagiarism

- **Peer assessment of essays**
  peer pressure stronger than teacher pressure, motivates deadline
- **Requiring drafts**
  makes student start task earlier
  authentication
  opportunity for early detection
- **Using warm-up tasks**
  makes student start and allows them chance to practice without penalty

9

Other things to avoid plagiarism

- Clear information in course syllabus
- Talk about it in first lecture or several lectures
- Discuss it in conjunction with a warm-up task
- Feedback after draft
- Detection on final draft

10

Table 3. Seminars and homework in the Frontiers course, spring 2008 (IT2655)

Week	Date	Time	Reading plan / Content	Pages	Homework due 10 AM
4	25-jan	13-15	Introduction / Referencing + Plagiarism		
5	1-feb	13-15	Gray pages (all sections) / Info searching	104	Select topic ("Title")
6	8-feb	13-15	I Fundamentals / Summarizing	144	Article search KTHB
7	15-feb		*No Class Meeting*		Summary of article 1
8	22-feb	13-15	II Technology and analysis / Abstract	112	Summary of article 2
9	29-feb		*No Class Meeting*		Abstract, keywords
13	28-mar	13-15	III Logic devices / Feedback 1	142	First draft
14	4-apr	13-15	IV Random access memories / Different sources	62	Feedback 1
15	11-apr	13-15	V Mass storage devices / Peer review	76	Source criticism
16	18-apr	13-15	VI Data transmission and interfaces / Feedback 2	86	Second draft
17	25-apr	13-15	VII Sensor arrays and imaging systems + VIII Displays / Final version	126	Feedback 2
19	9-maj	13-15	*Essays*	852	Final essay

11

The students' learning experience

- Based on surveys, sometimes extra credit for doing survey
- Positive to homework/essay rather than exam
- Homework useful but time consuming
- One student used 200 hours for course (7,5 hp)
- Feedback appreciated
- "Best course at KTH"

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12

Conclusions

- Examination rate above 90%.
- The coaching involves setting clear grading criteria, and selecting tasks of proper difficulty, at suitable time, and giving prompt feedback.
- My experience is that adding more work for the students seems to improve learning.
- Although in year 4 or 5 they still need help in planning their time.

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13

Discussion – further improvement

1. New each time
2. Demand higher-order thinking skills
3. Specify local, recent, specific contexts
4. Specify what sources and information to use
5. Control the process, get students to start early
6. Authenticate the result

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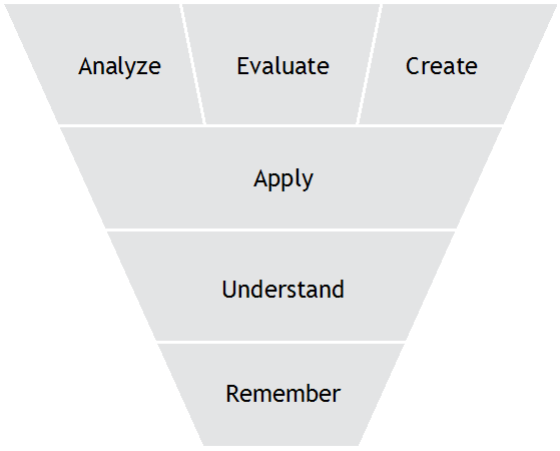
14

Taxonomy of Educational Objectives



http://en.wikipedia.org/wiki/Bloom%27s_Taxonomy

15

References

- Full paper from Utvecklingskonferensen 2008 http://www.kth.se/ingenjorsutbildningarna/papers/Zetterling.pdf
- Course home pages:
  http://www.ict.kth.se/courses/IH2653/
  http://www.ict.kth.se/courses/IH2657/
  http://www.ict.kth.se/courses/IT2655/

16