A Good Start

Designing the first two years of a master programme

Lars Lundheim

CDIO Conference 2021

Required courses:

- Pulp Paper Production Principles
- Pencil Sharpening Workshop
- Chemistry of Crayons
- Art History I
- Geometric Theory of Perspective
- Art History II
- Visual Composition
- Goethe's Colour Theory (elective)
- Eraser plasticity and durability (elective)
- just to mention a few ...

New five year program from 2014

ELSYS: Electronic System Design and Innovation

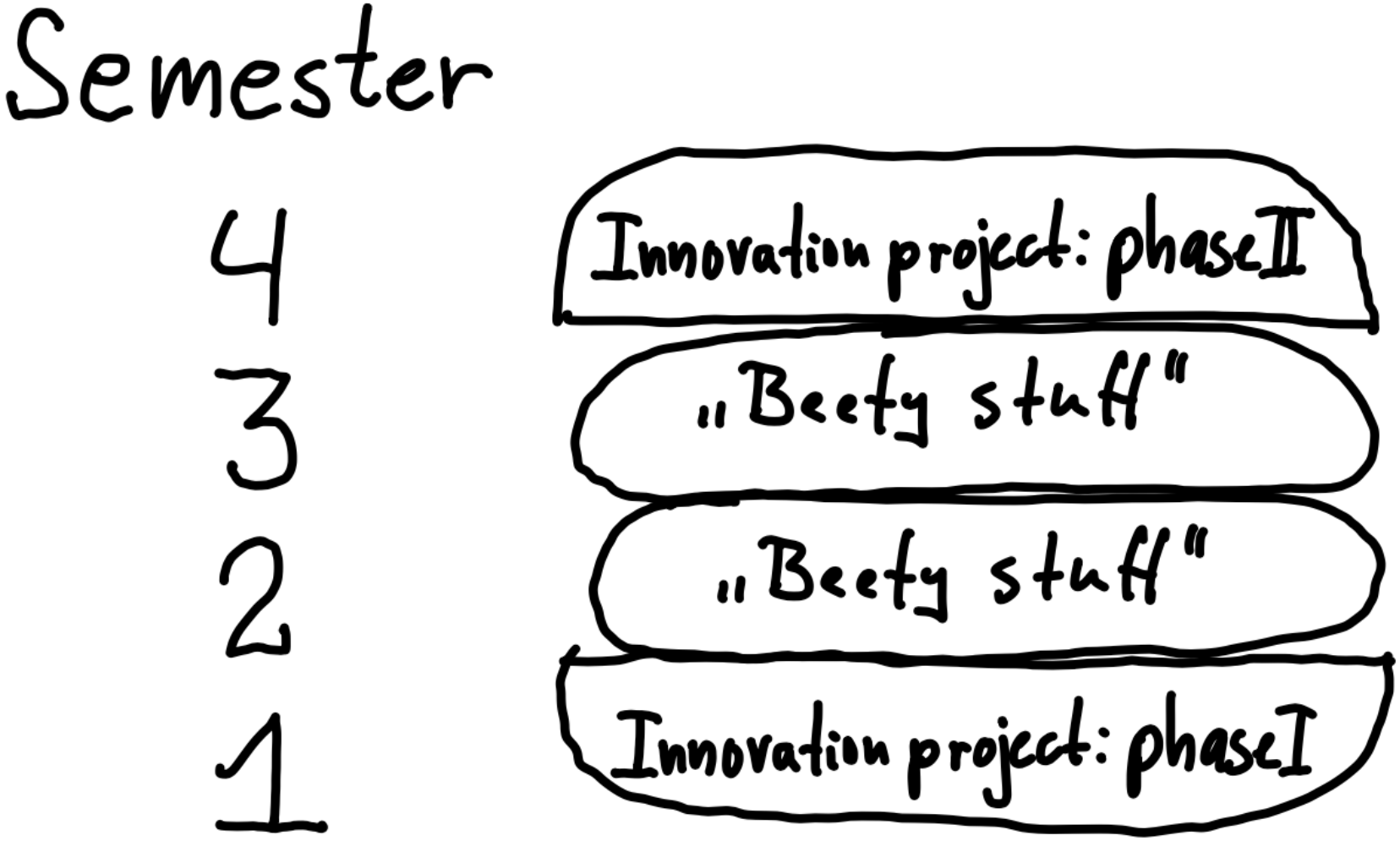
Before 2014
(16 x 7.5 ECTS)

Semester				
4	Math	Physics	Ciricuits and electronics	Ciricuits and electronics
3	Math	Physics	Computer Science	Ciricuits and electronics
2	Math	Math	Computer Science	Ciricuits and electronics
1	Math	Ciricuits and electronics	Computer Science	Intro to philosopy

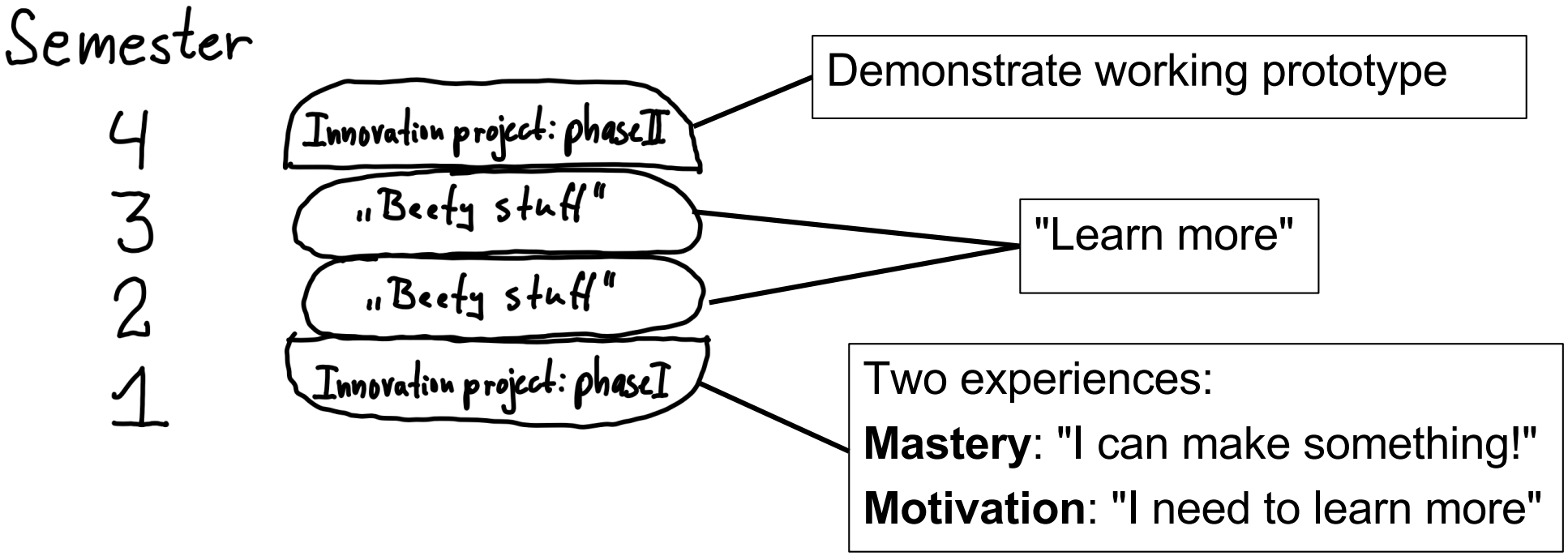
The engineering ladder

Semester				
4				Step 4
3				Step 3
2				Step 2
1				Step 1

A double hamburger



Structure of progress



First semester

- All student activity on one weekday: *Wednesday is Elsys Day!*
- No exam
- No homework
- Compulsory attendance 0815-1600
- Alternating between classroom and work space

A typical Elsys Day

08.15 Assembly in classroom
- Plans for the day
- Lecture?

09.00 (at the latest) Group Work

11.15 Guest Talk (always!)

12.00 Lunch

13.00 More Group Work

15.15 Assembly in Classroom.
- Summary
- Presentations
- Discussion

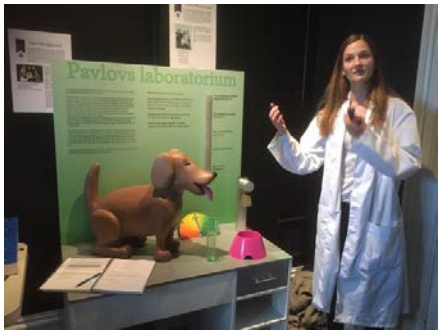
16.00 End

Authentic challenges for innovation projects

2014

Surveillance of antique ships

2015



Neuroscience demonstrators

2016

Communicating robots

2017

Pollution control

2018

Wind power and wild life

2019

Electronic curling stone

Teaching in team

Bjørn

Thomas

Torbjörn

Lars

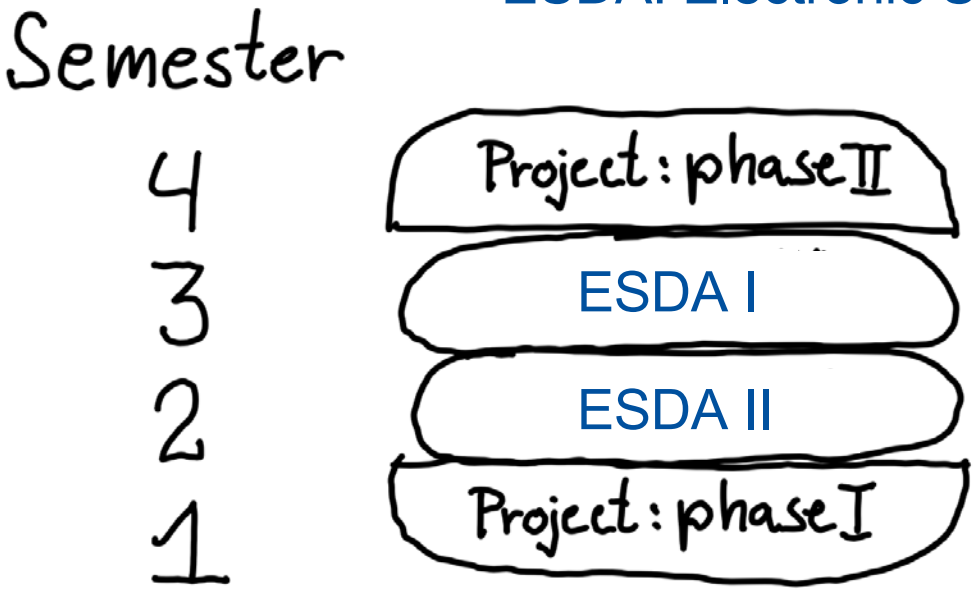
Milica

Torstein

Bojana

The beefy stuff

ESDA: Electronic System Design and Analysis



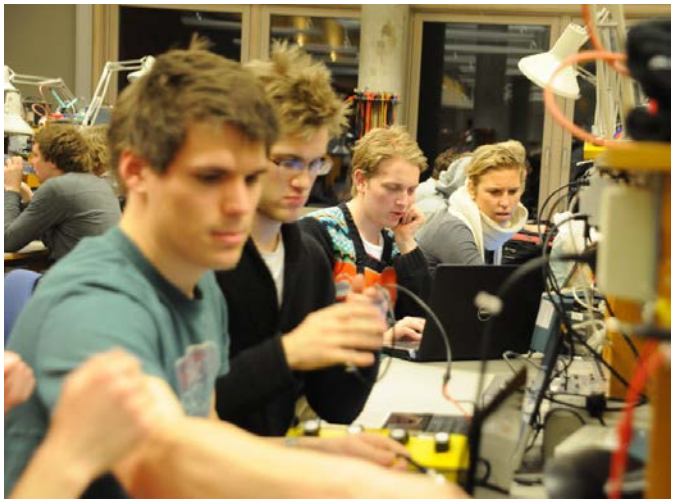
Design and analysis

Three week cycle:

1. Present "impossible" task.
   Work with relevant theory.
2. Work with relevant theory.
3. One week project to solve task.

Flipped lab!

Students in-to the lab



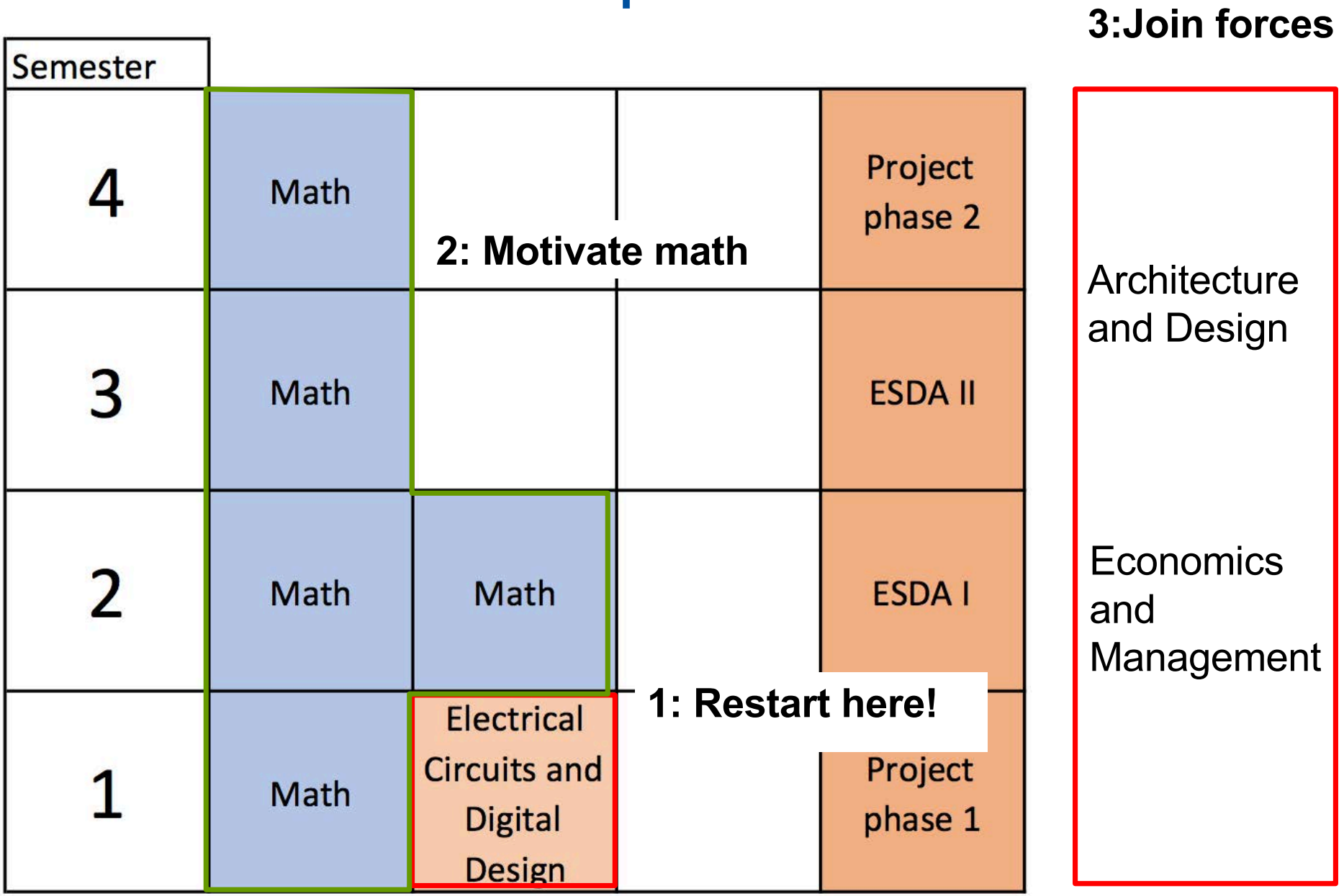
or ...

Lab out-to the students

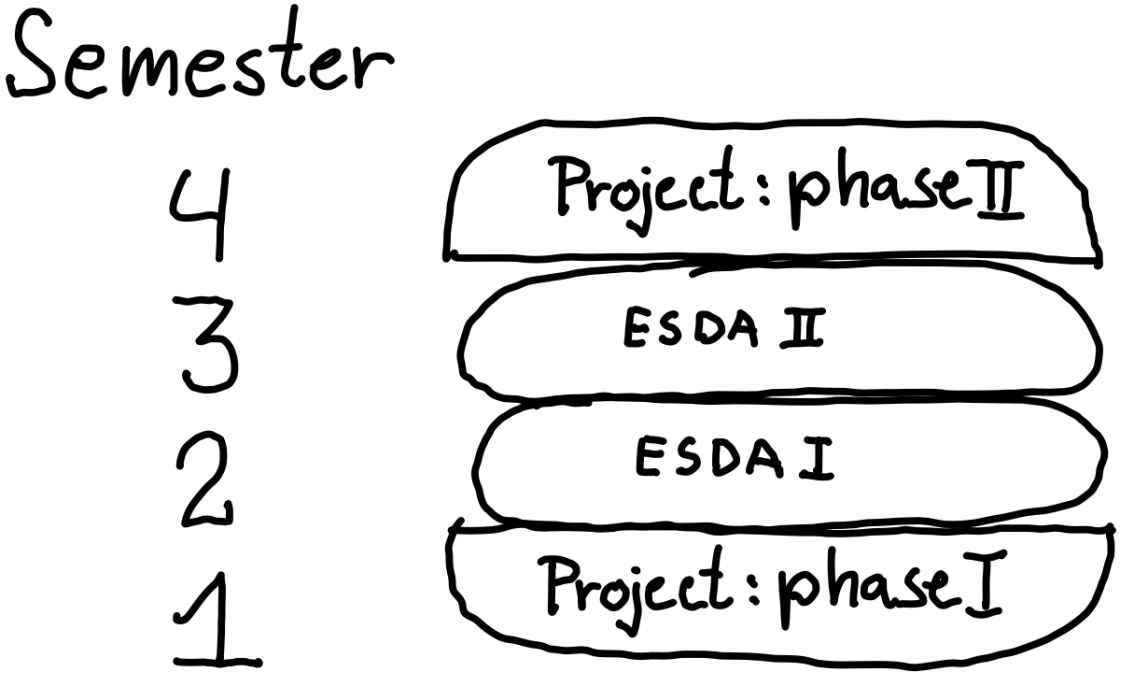
Next steps

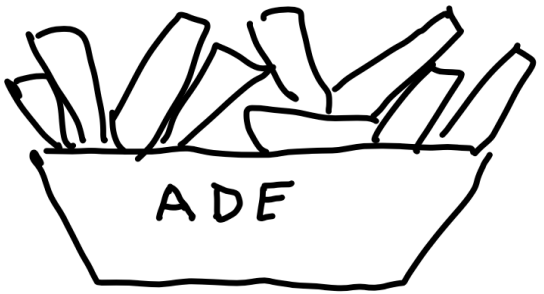
- Reforming the circuits course
- What about math?
- Collaboration across borders

Next steps:


Semester
4
3
2
1
Math
Math
Math
Math
Math
Electrical Circuits and Digital Design
Project phase 2
ESDA II
ESDA I
Project phase 1
2: Motivate math
1: Restart here!
3:Join forces
Architecture and Design
Economics and Management

Step 1: Hamburger with fries

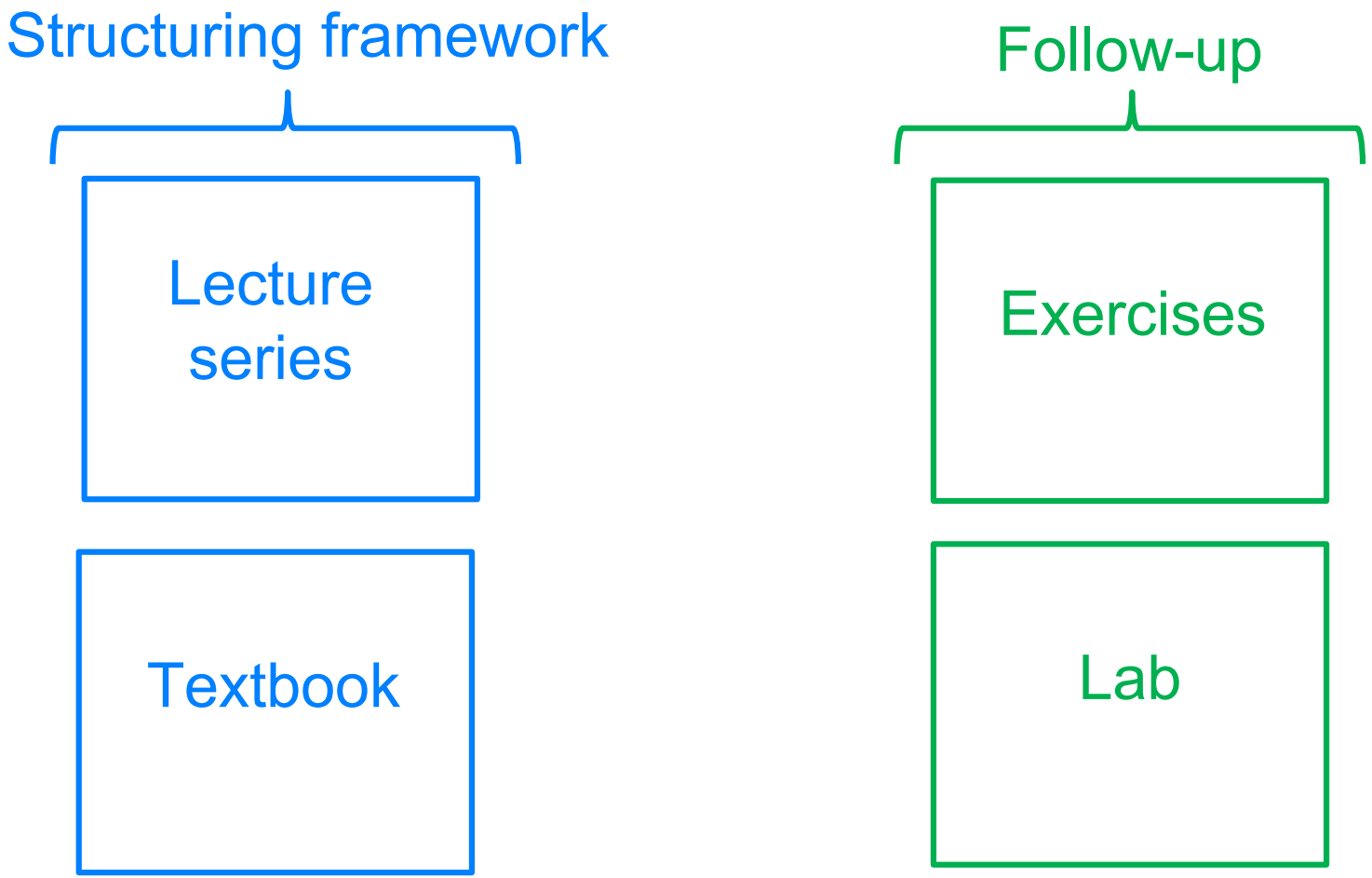




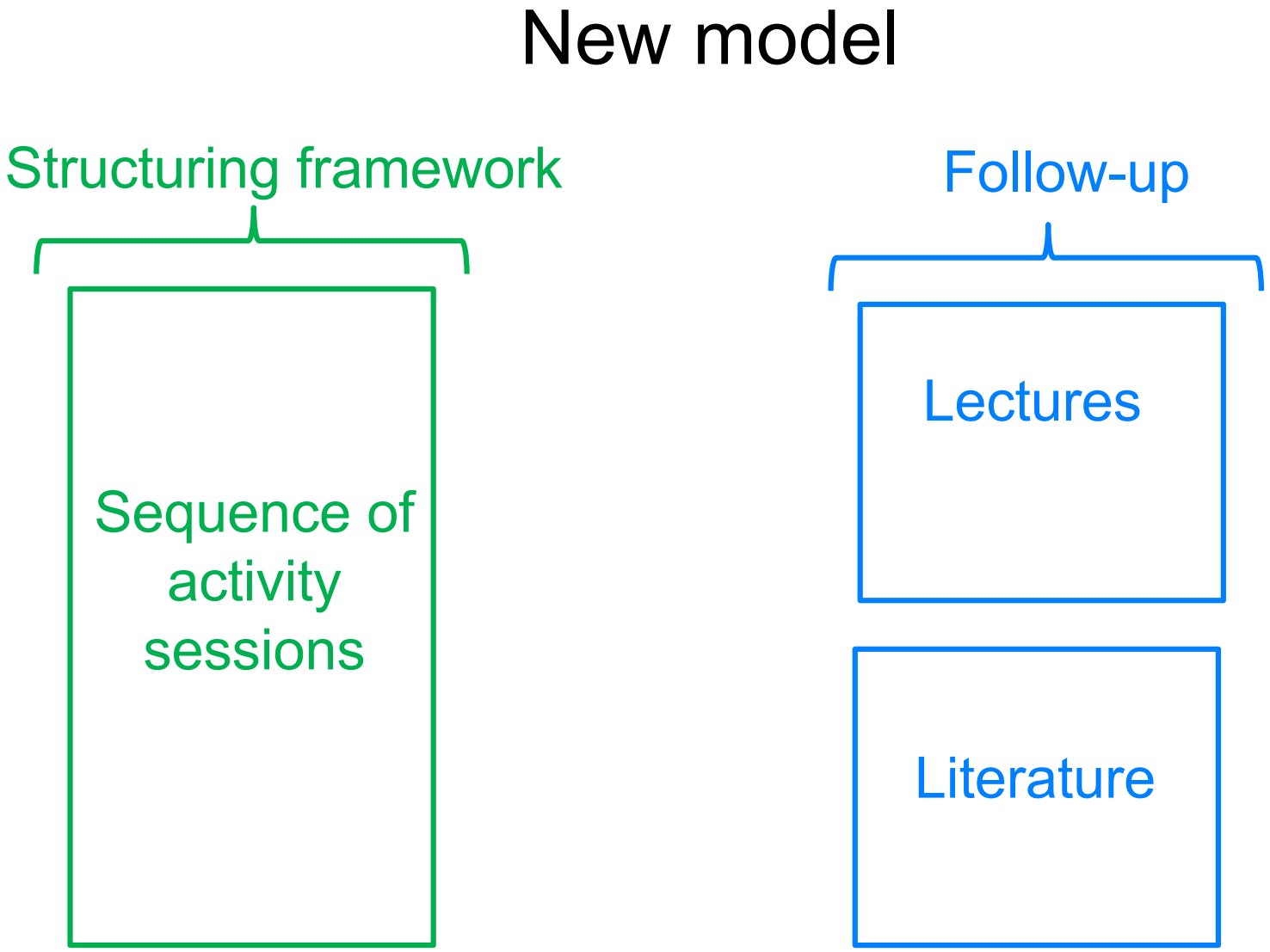
ADE: Introduction to **A**nalog and **D**igital **E**lectronics

Activity based course organization

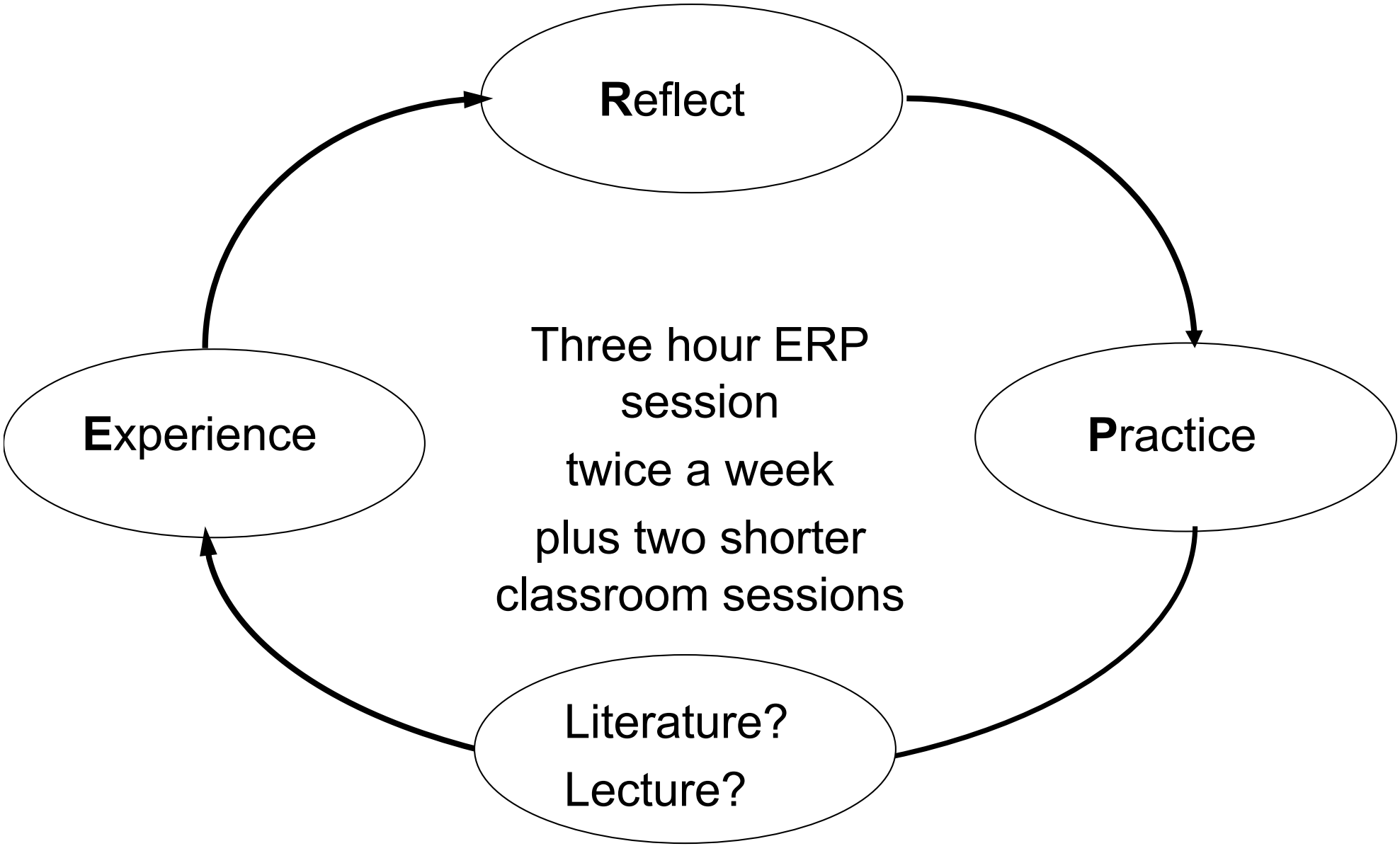
Traditional model



Activity based course organization



ERP!

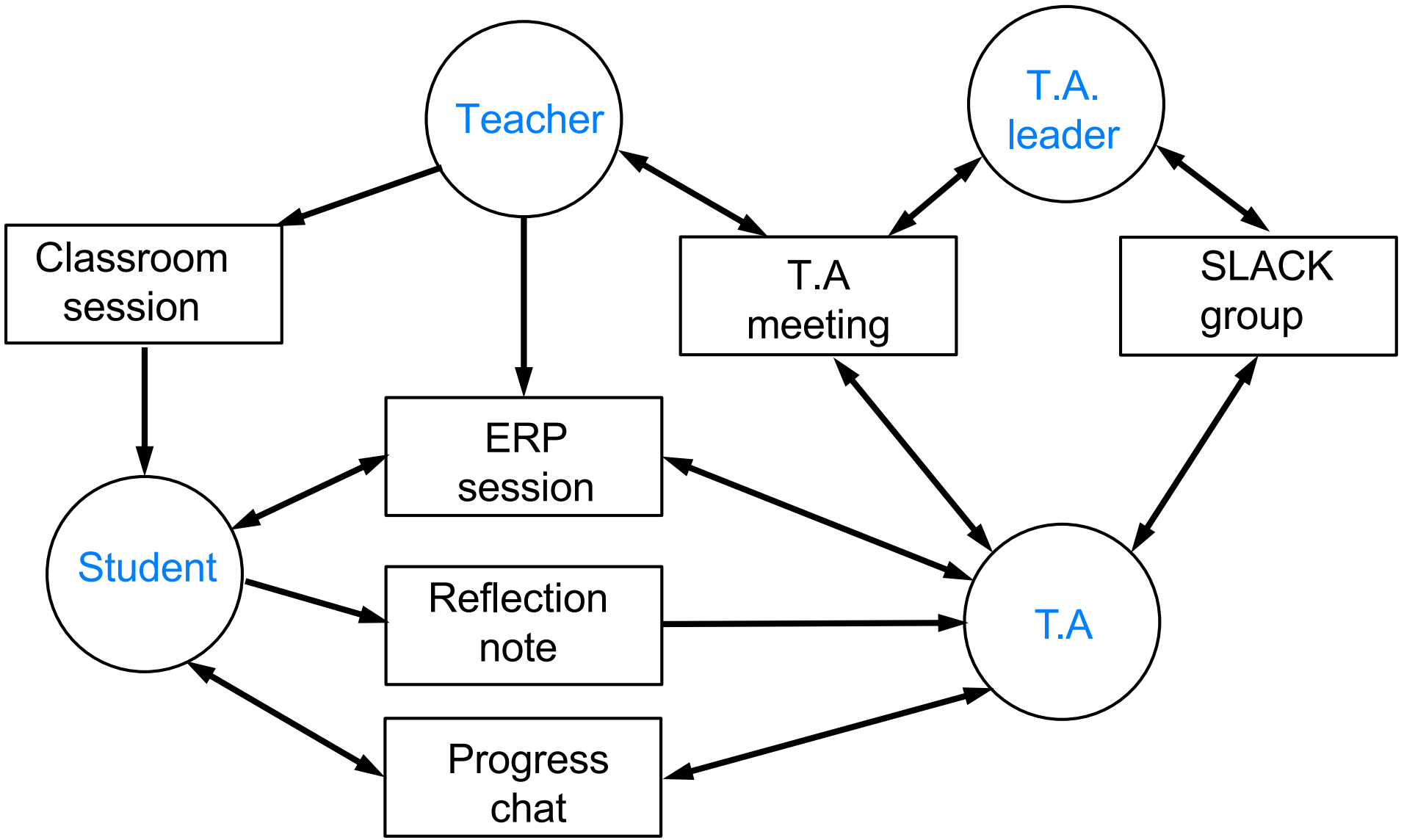

Reflect
Practice
Literature?
Lecture?
Experience
Three hour ERP session
twice a week
plus two shorter classroom sessions

Sage on the stage

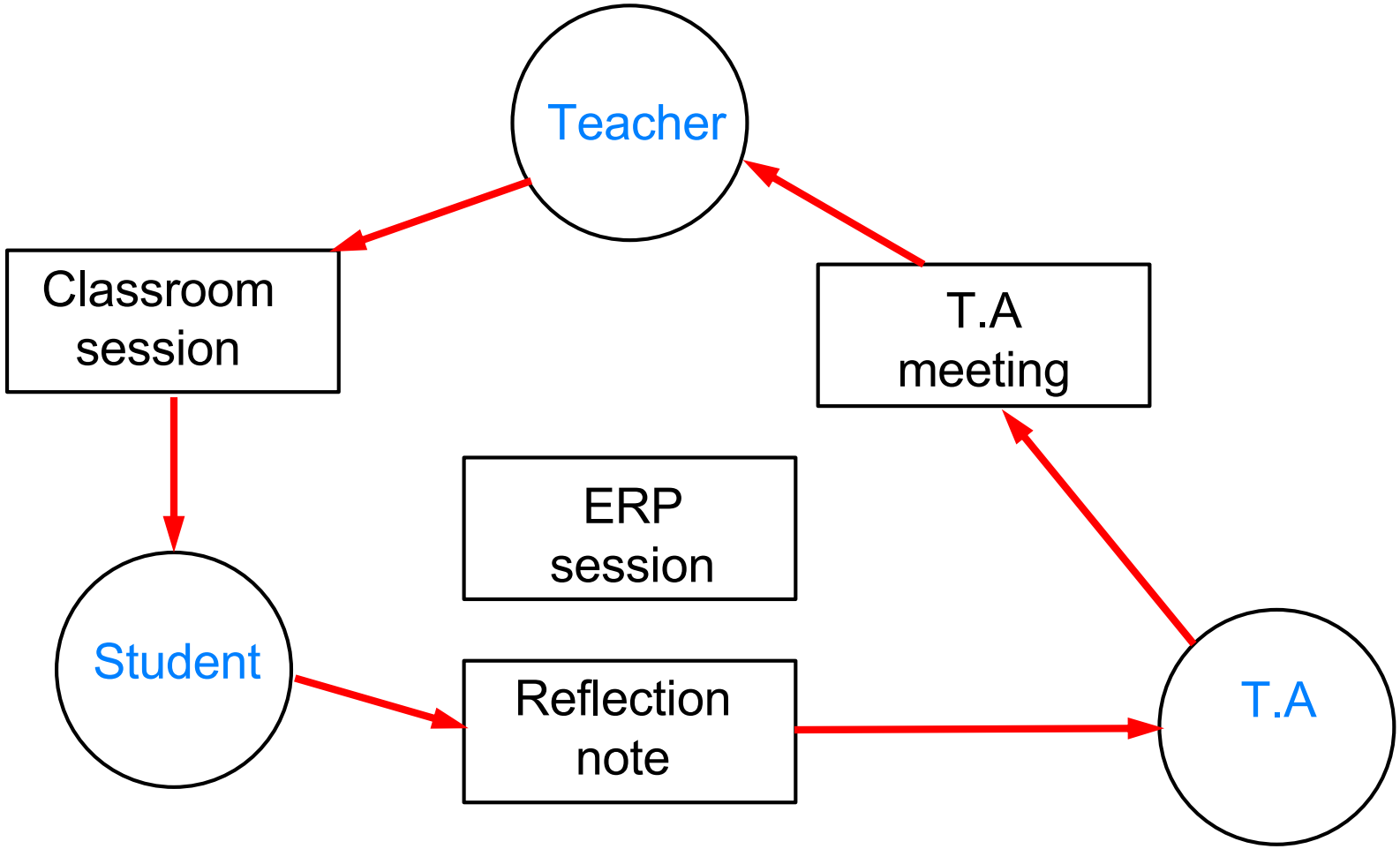
Guide on the side

Guide of the guides

Roles and interactions



Main cycle


Teacher
Classroom session
T.A meeting
ERP session
Student
Reflection note
T.A

Step 2: Motivate math

- Math is hard
- Connection to other disciplines is often obscure
- Normally taught independent of particular needs

Pilot project for Elsys

- Shared responsibility for motivating math.
- Same topics as earlier but adjusted emphasis
- Sequence of topics adjusted to needs – mutual adjustment
- Teachers in the Elsys program explicitly point out and demonstrates the relevance of what is going on in parallel math classes

Step 3: Join forces

Interdisciplinarity