

CCSE

Center for Computing
in Science Education



Status CCSE T3-2019

Develop materials
and methods

Build educational
research group



CCSE Centre for Computing
in Science Education

Vision “an **international hub** for **research-**
based integration of **computational**
methods in education”

Build culture for
teaching and learning

Disseminate nationally
and internationally

Personell

Finansiert over CCSE



Skramstad,
Kontorsjef



Caballero,
Prof. II (20%)



Odden,
Post. Doc.



Lockwood,
Prof. II (20%)



Sand,
PhD-student



Aiken,
PhD-student

Ledergruppe CCSE (20%)



Malthe-Sørensen,
FI



Mørken,
MI



Tellefsen,
MN/KURT



Nederbragt,
IBV



Sølna,
MN



Sandve,
IFI



Hjorth-Jensen,
FI



Henriksen,
FI

ProFag



Haraldsrud,
Univ. Lektor (40%)



Løvold,
Univ. Lektor (50%)

Honours-programmet/FI



Sveinsson,
Post-doc

S-ASSESS (NFR, FinnUt)



Winther-Larsen,
PhD-student



Marin,
Sci. Programmer

Ten-year progress plan

Present state (2016)	Progress
Existing culture with some excellent practices, student engagement	
Math and programming in first semester	
Full CSE integration in 2 of 6 courses, partial in others	
2 textbooks published	
Research basis is sparse	

Five-year-goal (2021)	Progress
Initiated research-based approach to curriculum change with students	Ok
Pilot extension to biology	Ok
Pilot adaptation at external partner	Ok
Pilot school program	Ok
Full CSE integration in 4 of 6 courses	Ok
4 textbooks published	3 of 4
Pilot studies of learning outcomes and teaching methods in 3 courses	Ok-

Ten-year-goal (2026)	Progress
Internationally leading hub	
Extension to 3 other disciplines at UiO	
Adaptation at 2 external partners	
Running school program	
Full CSE integration in 6 of 6 and 2 advanced courses.	
4 textbooks published	
Internationally recognized - computational science education	

Overview - status

- Høydepunkter 2019
- Aktiviteter 2019
- Økonomi – 2019
- Budsjett – 2020
- Planer 2020

Highlights 2019



Summer Institute



ProFag / Moving in



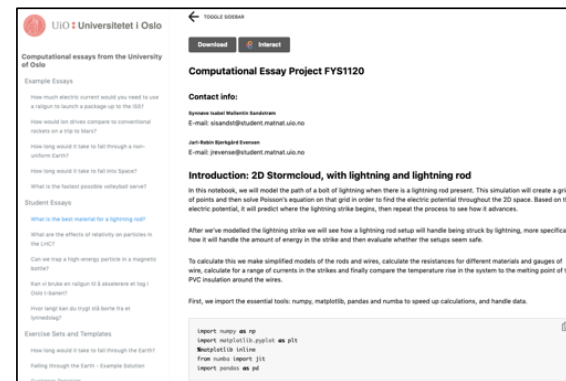
Learning assistants



Sabbaticals: John Burk,
Elise Lockwood



Learning analytics



Computational essays

INTPART
Seminar series

UTVIKLING

Utvikling: Summer institutes

2018: Bioscience
(University of
Minnesota)

2019: Computing in
physics (MSU)

Pedagogisk fokus (50%)


Integrasjon av
programmering (50%)

IKKE et kurs i
programmering

Nasjonal og lokal
deltagelse i 2019

Events • FDW2019

2019 PICUP Summer Faculty Development Workshop at UW River Falls



Energize Your Undergraduate Physics Courses with Computation!

In this week-long workshop, participants, with the guidance of the workshop coordinators, will develop a viable, personalized plan for integrating computation into their undergraduate physics course(s) to be implemented in the upcoming academic term(s), and interact with other enthusiastic faculty committed to improving the physics curriculum across the fruited plain, all in a stimulating and engaging, but not too geeky, environment. And the food and snacks are fantastic!




Michigan State
University
(since 2015)

Kompetanseheving
universitet

- INTPART
- LA-programmet ved MN
- REAL undervisning
- Summer Institute

MN's Summer Institute

In close collaboration with Michigan State University, we are happy to give faculty from UiO, NMBU, UiA, USN and UiB the opportunity to attend a four days intensive workshop in state-of-the-art scientific teaching in context. In 2019 we focus on integrating computation in undergraduate physics.




Facts about this course

When
17th - 20th of June 2019

Where
The Physics building,
University of Oslo

Contact Us
realfagsundervisning@mn.uio.no

In collaboration with

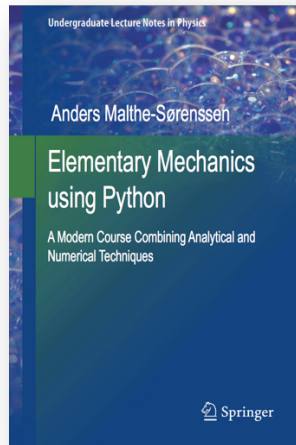


University of Oslo (since 2018)

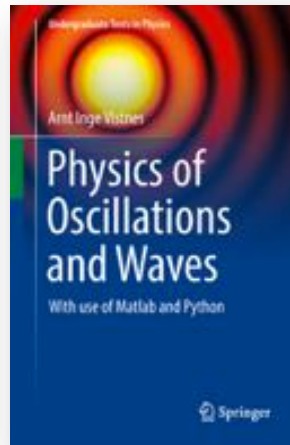
Utvikling: Lærebøker



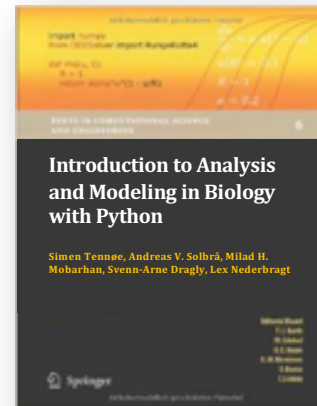
2007



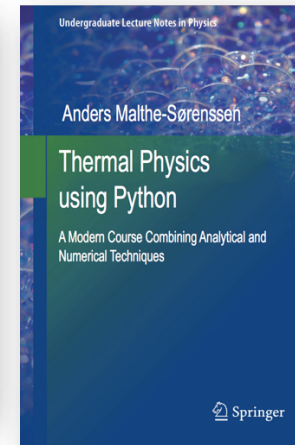
2015



2017



2020



2021

QM

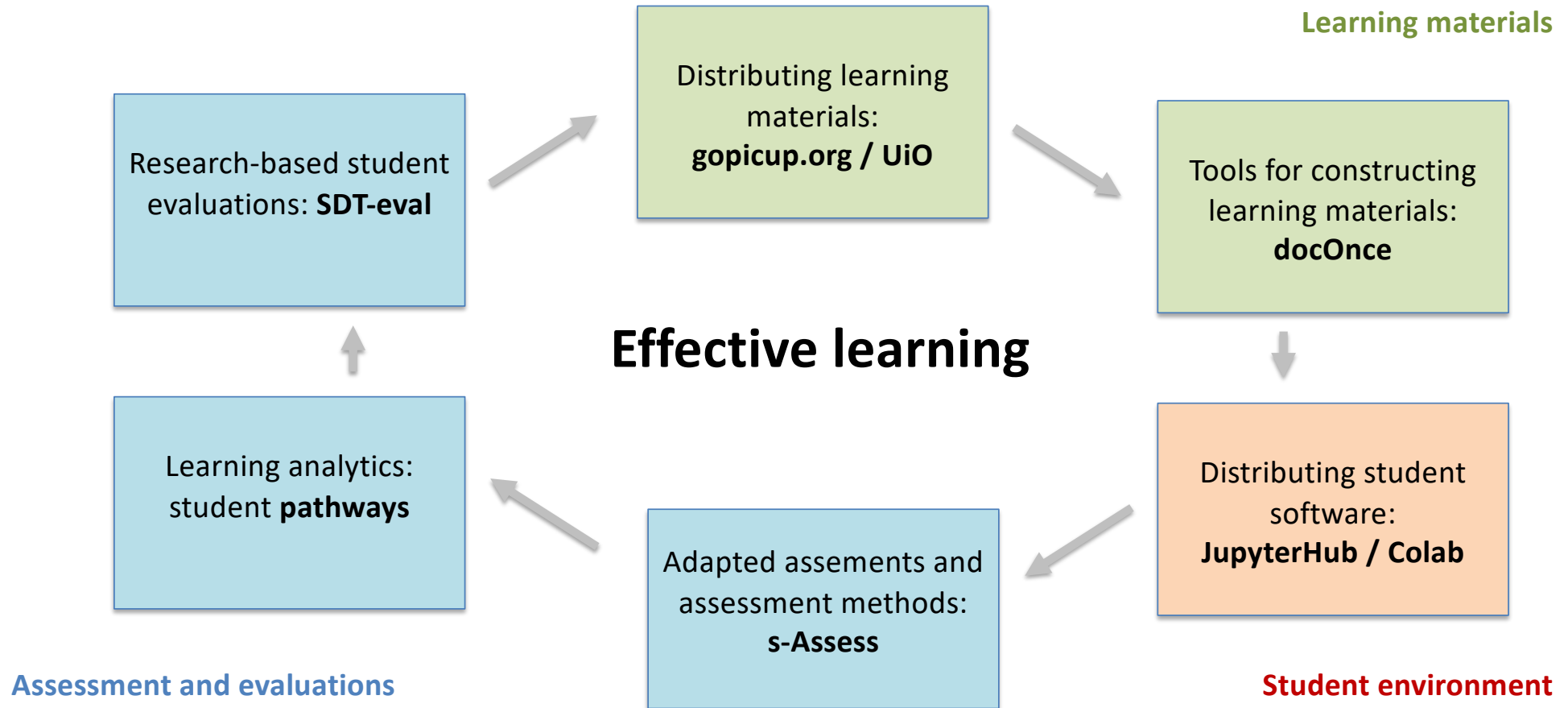
EM

2023

Avtale om lærebokserie i fysikk med Springer

Verktøy: Doconce – fullstendig løsning for læringsmateriale

Developing the underlying tools for change



Utvikling/Forskning: Computational essays

Pilotstudie Fys1120 2018
(20 studenter)

Obligatorisk Fys1120
2019 (160 studenter)

Obligatorisk Fys2130
2020 (80 studenter)

Gode tilbakemeldinger

Følgforskning: 3 artikler
i 2019

Utvidelse/samarbeid:
MSU, UC-Boulder

Andre programmer?

```

zeroneighbor[ix, iy-1]=np.float('nan')
if (iy<y-1):
    zeroneighbor[ix, iy+1]=np.float('nan')

ns = ns + 1
c[ix, iy] = ns #create an array of the lightning's path, scaled by the number of
if (iy<ymin): #iterate to the next set of y-values
    ymin = iy

plt.rcParams['figure.figsize'] = [16, 4]
plt.subplot(1,3,1)
plt.imshow(c.T) #create a plot of the lightning's path
plt.colorbar()

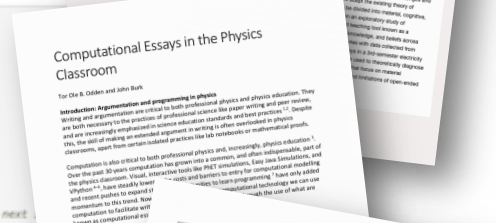
plt.subplot(1,3,2)
plt.imshow(s.T) #create a plot of the final potential
plt.colorbar()

plt.subplot(1,3,3)
plt.imshow(sprob.T) #create a plot of the relative probabilities of the next
plt.colorbar()
plt.show()
    
```

Additional questions you might investigate

1. What happens if there is a lightning rod or other conductor attached to the ground?
 - o Remember that that $E = 0$ inside conductors, so there will be a constant potential around it
2. What happens if the stormcloud has a defined shape?
3. Does this simulation tell us anything about other cases, like cloud-to-ground lightning?
 - o In real cases of cloud-to-ground lightning, lightning strikes consist of so-called "leaders" move down from a cloud) and "streamers" (oppositely charged ions that move upwards/ meet the leader). Does this simulation allow us to understand anything about the condit and/or streamers?

(Note that these are just meant to be suggestions—feel free to investigate any question you find interesting!)



Odden, Post. Doc.



Caballero



Lockwood

Utvikling/Forskning: Learning Assistants

2017: Pilotstudie Fys-mek1110

2018: Innført Fys-mek1110, Fys1120, Mat-inf1100

2019: Innført Fys2130, Fys2140

2020: Bred innføring på UiO?

Pedagogisk opplæring av gruppelærere

Basert på internasjonalt utprøvd program

Student-aktive metoder II (DIKU)

Læringsprogresjoner



Odden, Post-doc.



Caballero



Bøe, Assoc. Prof. FI



Lauvland, PhD-stud

Følgforskning

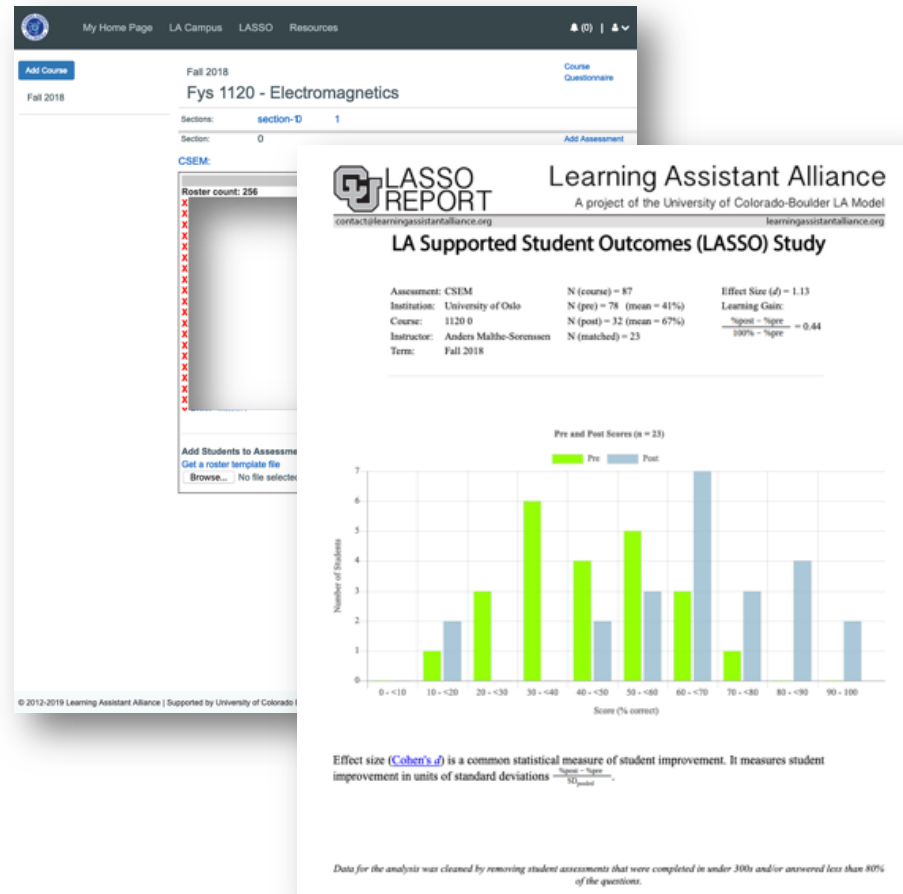
Utvikling/Forskning: Assessments

Standardiserte tester

Utvikling av lokale løsninger

Tilpasning til beregningsmessige problemer

Spredning til flere emner



Odden, Post. Doc.



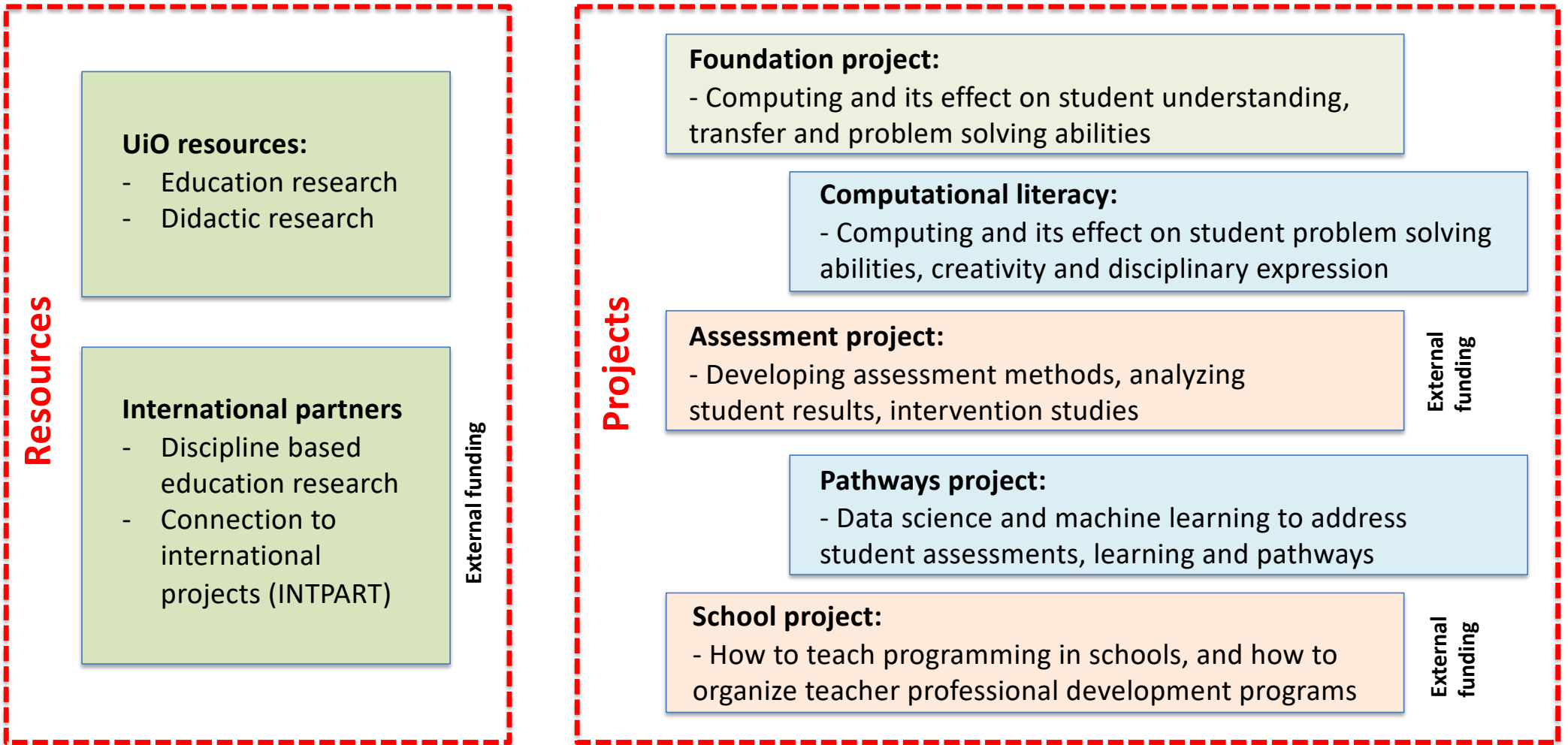
Caballero



Winther-Larsen,
PhD-student

FORSKNING

Developing a discipline-based education research activity



Forskning: Learning analytics

Student pathways: basert på MSU data

Thon-prosjekt: Sommer-studenter 2018, 2019, 2020

Solid vitenskapelig impact
(3 Phys Rev 2019, 1 Phys Rev 2018)

Utfordring: lokale data og lokal involvering
(Assessment-prosjektet)



Aiken,
PhD-student



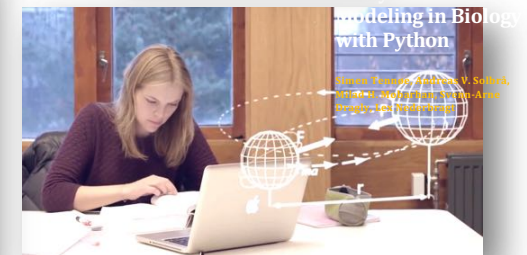
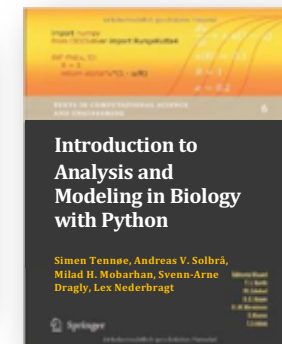
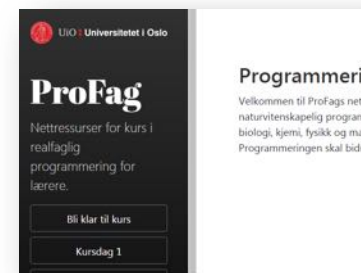
Caballero

SPREDNING

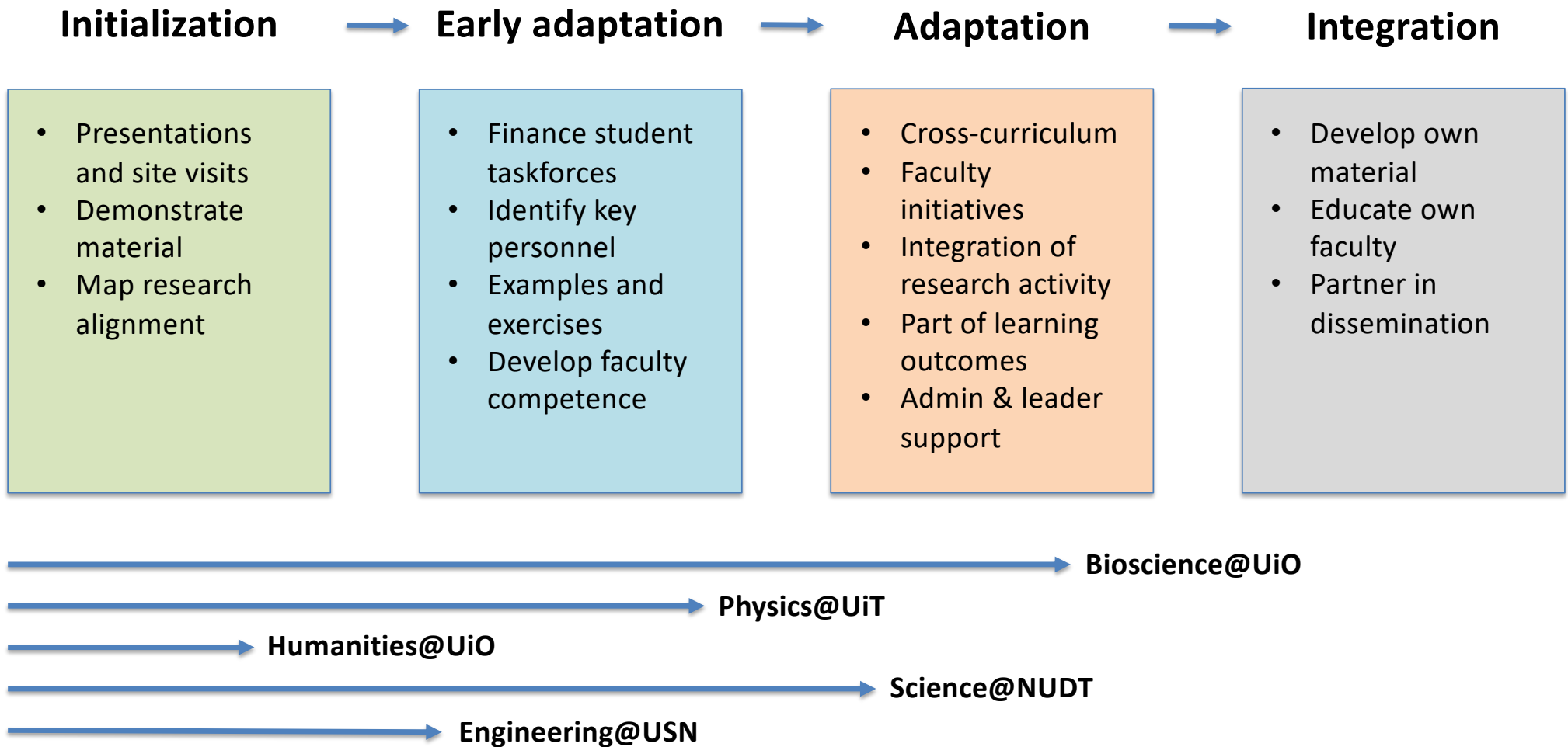
Research-based dissemination strategy

Research shows: Dissemination must be based on the same principles as student-active teaching

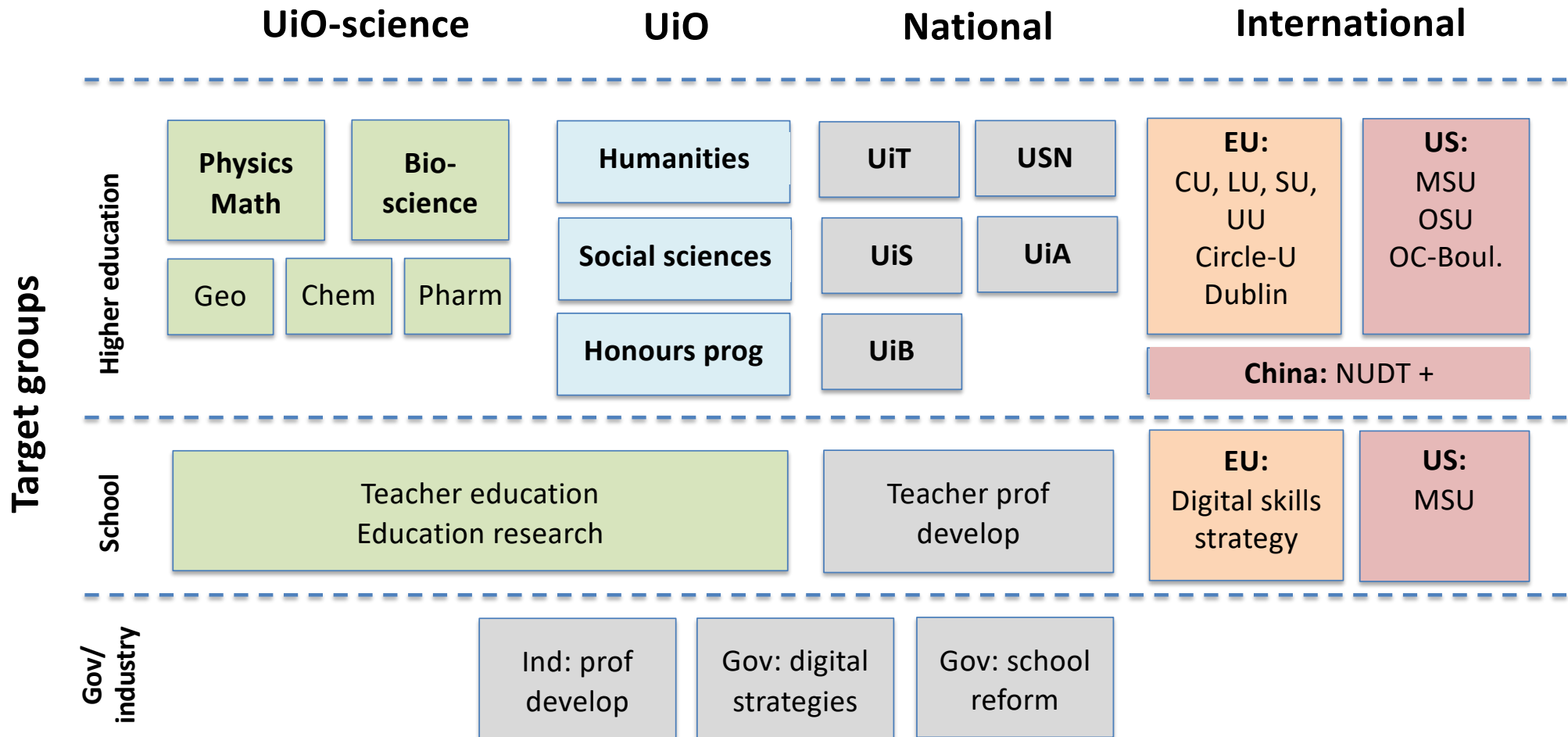
- Flexible material
- Workshops and instruction
- Partner with teachers
- Adapt to situation
- Monitor and improve!
- Students play active role!



Dissemination: Playbook



Dissemination: Partners and collaborators





ProFag – Realfaglig Programmering

ProFag er etterutdanning for lærere i PROgrammering for FAGenes skyld. Tittelen signaliserer at vi setter faget i sentrum. Programmeringen skal bidra til styrking og utvikling av realfagene.

- Programmering i Python – basisopplæring
- Algoritmisk tenkning
- Didaktiske utfordringer
- Programmering for fagets skyld
- Programmering endrer fagene

Foto: Simen Kjellin



ProFag: Skole- og kompetanseutvikling

Dypt involvert i Fagfornyelsen 2020

ProFag: Etablert merkevare

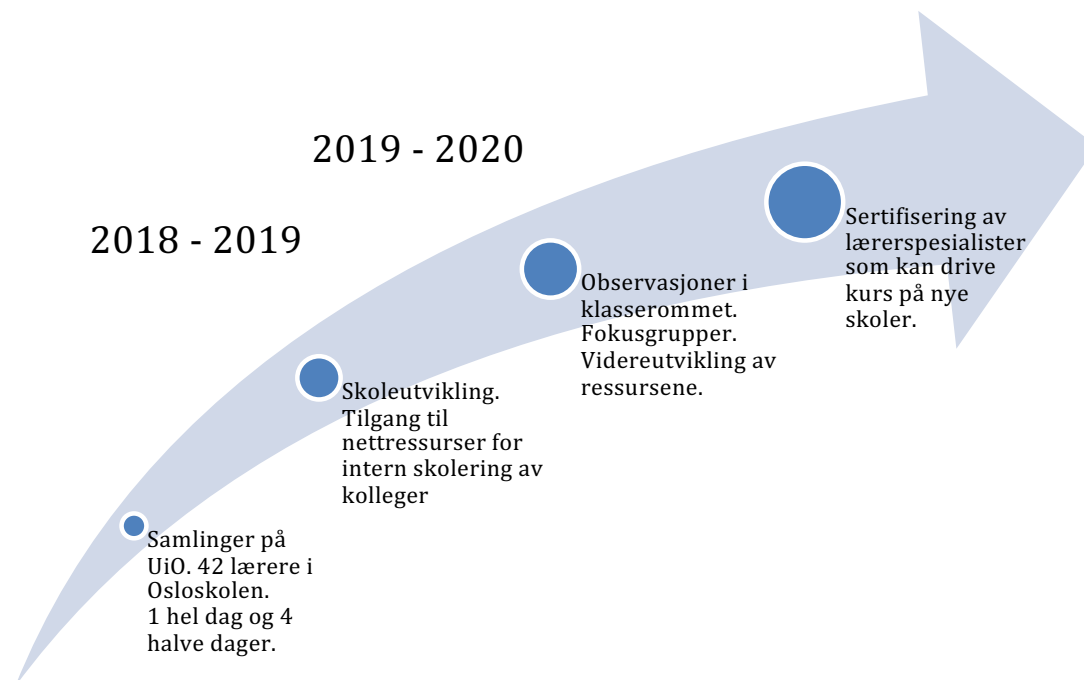
Nasjonal rolle

Dekomp:

3 mill 2018-2019
4 mill. 2019-2020

Utfordring:

- Følgeforskning
- Riktig skalering



Hvem	Nivå	Kurs	Samlinger	Antall kursdager	Deltakere
UDE	Ungdomskole	4	6	24	55
UDE	VGS	2	4	8	34
Akershus	VGS	2	4	8	70
Totalt	-	8	-	40	159



Tellefsen,
MN/KURT

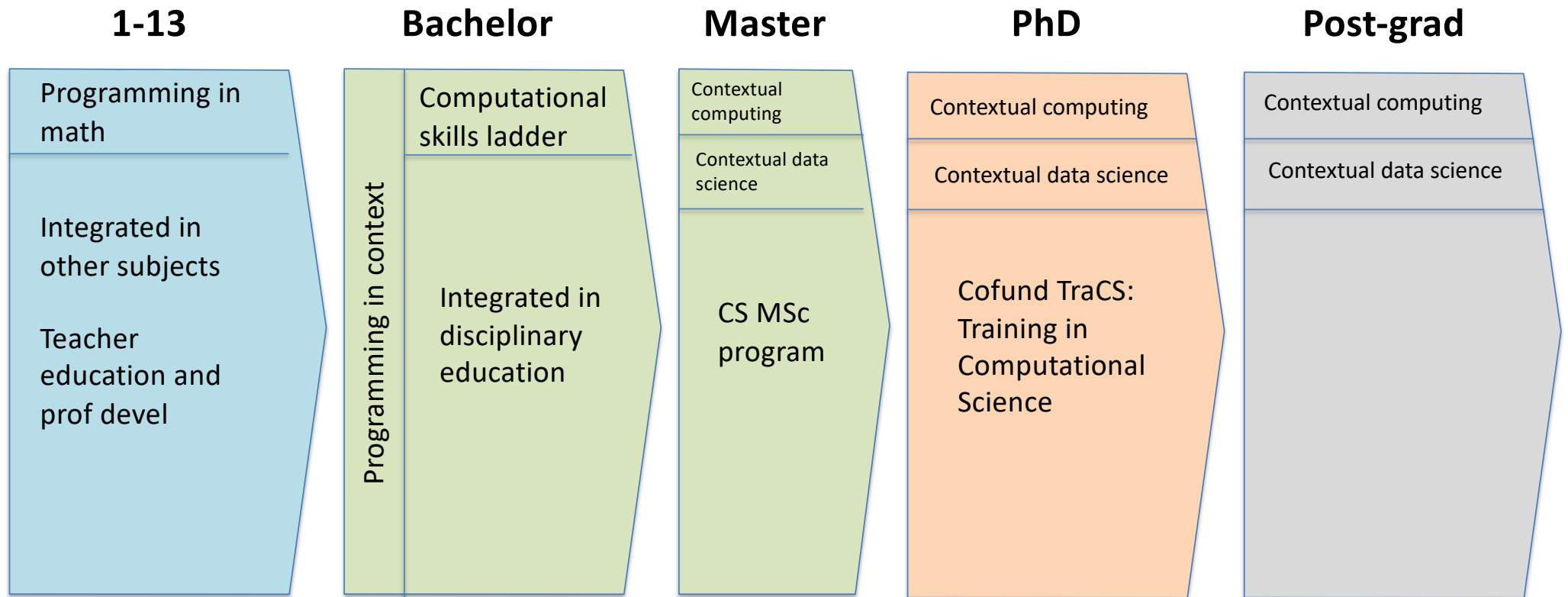


Haraldsrud,
Univ. Lektor (40%)



Løvold,
Univ. Lektor (50%)

Integration across the educational timeline



Økonomi – Regnskap 2019

Egenandel

Hvordan sikre tilstrekkelig med ressurser til utvikling og forskning?

		2018	2019	2020	2021
Pls					
FI		0,75	0,75	0,75	0,75
MI		0,2	0,2	0,2	0,2
IBV		0,2	0,2	0,2	0,2
IFI		0,2	0,2	0,2	0,2
MN		0,4	0,4	0,4	0,4
Sum		1,75	1,75	1,75	1,75
Budsjett 2016		1,15	1,15	1,15	1,15
FVA					
FI		1	1	1	1
MI		0,2	0,2	0,2	0,2
Sum		1,2	1,2	1,2	1,2
Budsjett 2016		1,2	1,2	1,2	1,2
MVA					
FI		0,6	0,2	0	0
MI		0	0	0	0
IBV		0,4	0,2	0,2	0,2
IFI		0,4	0,2	0	0
Sum		1,4	0,6	0,2	0,2
Budsjett 2016		1,2	1,2	1,2	1,2
Sum		4,35	3,55	3,15	3,15
Budsjett 2016		3,55	3,55	3,55	3,55