

# Forsøgsfaget teknologiforståelse

Forslag om temamøde for BUU og andre interesserede MF'ere

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Direktør, It-vest

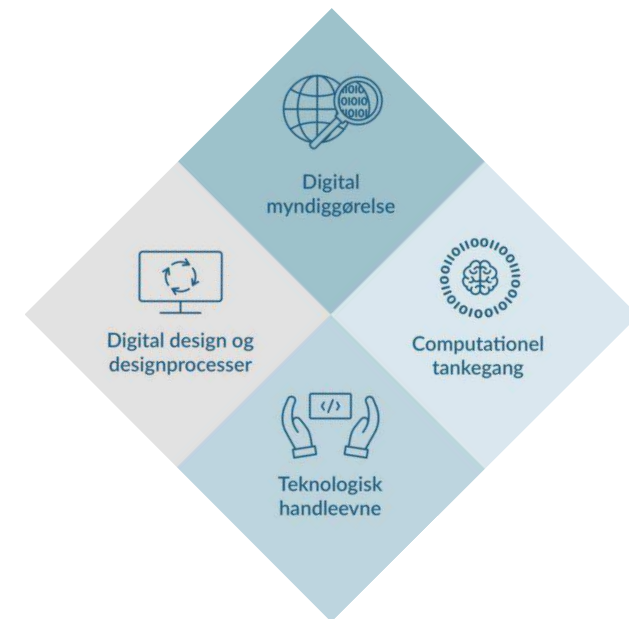
Adjungeret professor, Institut for Datalogi, AU

### ATV

Digital Vismand

Medlem af styregruppen for S&E i uddannelserne

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# På vegne af...

## ATV's Digitale Vismandsråd

*Formand* Kaj Grønbæk, Institutleder, Professor, Institut for Datalogi, AU  
*Næstformand* Stephen Alstrup, Professor, Datalogisk Institut, KU og CEO, SupWiz  
*Kontaktperson* Maja Lænkholm, Konsulent

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 Per Bruun Brockhoff, Institutdirektør, professor, DTU Compute  
 Michael E. Caspersen, Direktør, It-vest og adjungeret professor, Institut for Datalofi, AU  
 Jan Damsgaard, Professor, Department of IT Management, CBS  
 Bo Nørregaard Jørgensen, Centerleder, Energy Informatics, MMMI, SDU  
 Pernille Kræmmergaard, Direktør, Digitaliseringsinstituttet  
 Kim Guldstrand Larsen, Professor, Institut for Datalogi, AAU  
 Jan Pries-Heje, Professor, Roskilde Universitet, CBIT  
 Ole Lehrmann Madsen, Professor, Institut for Datalogi, AU  
 Brian S. L. Rasmussen, CTO, IBM Nordic  
 Helle Rootzén, Direktør og founder, Andhero  
 Natasha Friis Saxberg, Direktør, IT-Branchen  
 Brit Winthereik, Professor, IT-Universitetet i København

### Arbejdsgruppen for it og digitale kompetencer hos børn og unge

Formand Michael E. Caspersen  
 Helle Rootzén

## Styregruppen for Science & Engineering i uddannelserne

*Formand* Lars D. Christoffersen, Dekan, DTU  
*Næstformand* Berith Bjørnholm, Senior Vice President, Education and Outreach, Novo Nordisk Fonden  
*Kontaktperson* Dorthe Brander Pedersen, Chefkonsulent, ATV

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 Direktør Mikkel Bohm, Astra  
 Olav Breinbjerg  
 Michael E. Caspersen, Direktør, It-vest og adjungeret professor, Institut for Datalogi, AU  
 Claus Crone Fuglsang, Senior Vice President, Novozymes A/S  
 Agi Csonka, Programchef, Villum Fonden  
 Hanne Hautop, Rektor, Rosborg Gymnasium  
 Anette Kolmos, Professor, Institut for Planlægning, AAU  
 Mikkel Kragh, Professor, AU  
 Marianne Lykke, Professor, Institut for Kommunikation og Psykologi, AAU  
 John Finnich Pedersen, Direktør, Firstmind  
 Erik Meineche Schmidt, Chefkonsulent og rådgiver, AU  
 Nanna Seidelin, Erhvervschef, Herningsholms Erhvervsskole og Gymnasier  
 Lotte Thøgersen, Uddannelses- og Forskningschef, VIA  
 Martin Etchells Vigild, Chefkonsulent i Uddannelses- og Forskningsministeriet  
 Poul Toft Frederiksen, Programchef, Poul Due Jensens Fond

# Meget mere end industri 4.0



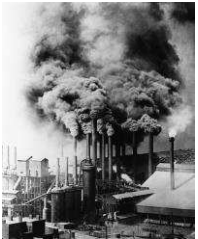
## Trykpresse-revolutionen

~ 1450

**Læse og skrive**

Fremmer menneskehedens **kulturelle** formåen

Renæssance  
Oplysning  
Demokratisering  
Dannelse og uddannelse



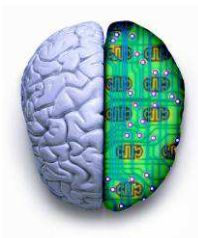
## Den industrielle revolution

~ 1760

**Matematik og naturvidenskab**

Fremmer menneskehedens **fysiske** formåen og velfærd

Mekanisering  
Masseproduktion  
Elektronisk automation af produktlinjer  
Industri 4.0



## Den computationelle revolution

~ 2000 (1843)

**Informatik og computationelle metoder**

Fremmer menneskehedens **kognitive** formåen

Computational automation og innovation af komplekse (kognitive) processer i alle aspekter af livet.

**Store implikationer** for dannelse og uddannelse **for alle!**

# De fire kompetenceområder

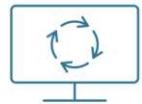


Digital  
myndiggørelse

## Digital myndiggørelse

Kritisk, reflektiv og konstruktiv undersøgelse og forståelse af digitale artefakters muligheder og konsekvenser.

**Analyse af teknologi, formål og brug | Konsekvensvurdering | Redesign**



Digital design  
og designprocesser

## Digital design og designprocesser

Tilrettelæggelse og gennemførelse af iterative designprocesser under hensyntagen til fremtid brug.

**Rammesættelse | Idégenerering | Konstruktion | Argumentation og introspektion**

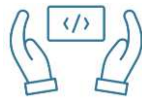


Computational  
tankegang

## Computational tankegang

Analyse, modellering og strukturering af data og dataprocesser med henblik på automatisk udførelse af en computer.

**Data | Algoritmer | Strukturering | Modellering**



Teknologisk  
handleevne

## Teknologisk handleevne

“Mestring” af digitale teknologier (computersystemer, netværk og sikkerhed) og tilhørende sprog samt programmering.

**Programmering | Computersystemer | Netværk | Sikkerhed**



**Pave Frans opfordrede i marts 2019**

alverdens skoleelever til at lære informatik og til at bruge deres digitale kreativitet til det fælles bedste.



# Vi er ikke alene ... og mange flere internationale initiativer!

Weekly Address: Giving Every Student an Opportunity to Learn Through Computer Science For All

Central emne | Obama's sidste 'State of the Union-Address' | januar 2016

WH.GOV

2013  
2014  
2015  
2016

In the new economy, CS is not an optional skill; it is a basic skill, right along with the three R's

Reading ◊ wRiting ◊ aRithmetic ◊ algoRithms

European Commission

DIGITAL EDUCATION  
ACTION PLAN  
2021-2027

Resetting education and training for the digital age

informatics for all

Informatics Curriculum Framework for School

Interim version  
May 2021

by  
Michael E. Caspersen (Chair)  
Ira Diehlheim  
Judith Gal-Ezer  
Andrew McGietrick  
Enrico Nardelli  
Don Passay  
Branislav Rován  
Mary Webb

DigComp 2.1  
The Digital Competence Framework for Citizens  
With eight proficiency levels and examples of use

Informatics Competence Framework  
(prospective)

After the reboot: computing education in UK schools

Visions-video

THE ROYAL SOCIETY

**Action 10**

*Inclusive high-quality informatics education at all levels of education.*

# Internationale ekspertudsagn



## Michael Kölling, Professor, King's College London, UK

A good number of nations have started their efforts to provide these important curricula in their general school systems, and those who have not are at least planning to do so.

Initially, this wave was led in Europe by a small number of countries, such as Denmark, the UK, and Israel. Many other countries followed, but the efforts of the early movers remain influential in setting the direction of travel.

Among the now many national curricula available to study, the Danish one stands out.

Instead of teaching as if we were trying to turn every school child into a software engineer, the Danish curriculum focusses on those aspects of digital education that are general and universal, those competencies which are needed and should be understood by every child.

This leads to a different approach in teaching Informatics, an approach driven by humanist principles rather than technical goals or economic requirements.

I admire the Danish curriculum for its boldness and quality. It is a curriculum that should be studied by every pupil in modern times, and I hope that other countries will follow the path Denmark has shown us all.



## Ira Diethelm, Professor, Oldenburg University, Germany

The discussed informatics curriculum for primary and lower secondary school seems highly appropriate to meet these needs.

It provides a solid and clear structure of competence areas offering teachers a clear view and long-lasting guidance on the subject to help all children to cope with the state of constant change.



## Judith Gal-Ezer, Professor, Open University, Israel

The curriculum developed by the Danish Ministry of Education is original, coherent and exemplary with a well-articulated rationale.

Its thorough and broad focus on informatics – both the technical aspect and the human side – is novel and an inspiration for other countries who want to embrace informatics *for all*. The Danish curriculum will make a change!



## Mark Guzdial, Professor, University of Michigan, USA

The effort in Denmark is notable for having a set of articulated principles for what belongs in the curriculum.

These principles are referenced as model in discussions of computer science curricula for schools.



## Chris Stephenson, Head of CS Education Strategy, Google

All students need a fundamental understanding of computational thinking, informatics, and machine learning (AI).

Denmark is now preparing to use the most powerful tool available for the democratization of digital knowledge and skills: the implementation of a comprehensive, scientifically-validated curriculum for all students.



## Tim Bell, Professor, University of Canterbury, New Zealand

I was impressed that the proposed curriculum balances technical skills with a critical view of the “possibilities and consequences”.

This balance makes the curriculum relevant to all students regardless of their vocational path, and sets the knowledge in the context of how the technology works for the most important part of a computer system: people.

# It i uddannelse – et vidt begreb!

Vidensområde

## Informatik / teknologiforståelse

I almen uddannelse både som fag og i fag  
På samme måde som dansk og matematik



Understøttelse

Som administrativt værktøj

Ledelse

Som fagligt værktøj/medie i fag (sort-kasse)

Fagligt

E-læring / pædagogisk it

Pædagogisk

It-literacy ("It-kørekort")

Praktisk

Teknologi og infrastruktur

Teknologisk

# Forslag om temamøde

## Tilbud

ATV vil gerne tilbyde for eller i fællesskab med BUU at arrangere et temamøde på 1½ - 2 timer om informatik/teknologiforståelse i almen uddannelse.

## Formål

Formålet skal være, at give udvalgets medlemmer og andre interesserede MF'ere mulighed for at få et begrebsapparat om forsøgsfagligheden og dens enorme potentiale for almen uddannelse og dannelse i en mere og mere digital verden.

## Form

På temamødet ville vi stille nogle få udvalgte eksperter til rådighed, som kan fortælle om fagets intentioner og hvordan det kan foldes ud i en hverdag i folkeskolen.

Der vil naturligvis være mulighed for at udspørge eksperterne, og BUU er naturligvis velkomne til at pege på relevante eksperter.

## Tidspunkt

Sidst på året, når slutevalueringen for forsøgsfaget foreligger, men inden de politiske drøftelser for alvor går i gang.



# Resumé

## Meget mere end industri 4.0

	<b>Trykpresse-revolutionen</b> ~ 1450 <b>Læse og skrive</b> Fremmer menneskehedens <b>kulturelle</b> formåen	Renssance Oplysning Demokratisering Dannelse og uddannelse
	<b>Den industrielle revolution</b> ~ 1760 <b>Matematik og naturvidenskab</b> Fremmer menneskehedens <b>fysiske</b> formåen og velfærd	Mekanisering Masseproduktion Elektronisk automation af produktlinjer Industri 4.0
	<b>Den computationelle revolution</b> ~ 2000 (1843) <b>Informatik og computationelle metoder</b> Fremmer menneskehedens <b>kognitive</b> formåen	Computational automation og innovation af komplekse (kognitive) processer i alle aspekter af livet.  Store implikationer for dannelse og uddannelse for alle!

## De fire kompetenceområder

	<b>Digital myndiggørelse</b> Kritisk, refleksiv og konstruktiv undersøgelse og forståelse af digitale artefakters muligheder og konsekvenser. <b>Analyse af teknologi, formål og brug   Konsekvensvurdering   Redesign</b>
	<b>Digital design og designprocesser</b> Tilrettelæggelse og gennemførelse af iterative designprocesser under hensyntagen til fremtid brug. <b>Rammesættelse  Idégenerering   Konstruktion   Argumentation og introspektion</b>
	<b>Computational tankegang</b> Analyse, modellering og strukturering af data og dataprocesser med henblik på automatisk udførelse af en computer. <b>Data   Algoritmer   Strukturering   Modellering</b>
	<b>Teknologisk handleevne</b> "Mestring" af digitale teknologier (computersystemer, netværk og sikkerhed) og tilhørende sprog samt programmering. <b>Programmering   Computersystemer   Netværk   Sikkerhed</b>

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Pope Francis opfordrede i marts 2019 alle verdens skoleelever til at lære informatik og til at bruge deres digitale kreativitet til det fælles bedste.

European Commission

Informatics Curriculum Framework for School

Reading · wRiting · aRithmetic · algoRithms

After the school hours

Visions-video

Supporting innovation and training for the digital age

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## Internationale ekspertudsagn

	<b>Michael Kölling, Professor, King's College London, UK</b> A good number of nations have started their efforts to provide these important curricula in their general school systems, and those who have not are at least planning to do so. Initially, this wave was led in Europe by a small number of countries, such as Denmark, the UK, and Israel. Many other countries followed, but the efforts of the early movers remain influential in setting the direction of travel. Among the now many national curricula available to study, the Danish one stands out. Instead of teaching as if we were trying to turn every school child into a software engineer, the Danish curriculum focusses on those aspects of digital education that are general and universal, those competencies which are needed and should be understood by every child. This leads to a different approach in teaching Informatics, an approach driven by humanist principles rather than technical goals or economic requirements. I admire the Danish curriculum for its boldness and quality. It is a curriculum that should be studied by every pupil in modern times, and I hope that other countries will follow the path Denmark has shown us all.
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Teknologi og infrastruktur	Teknologisk

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