Center for Digital Education

Center Launch, January 10, 2020

UNIVERSITY OF COPENHAGEN
What is Digital Education and why a transdisciplinary center?

Inaugural lecture and Center Launch

Morten Misfeldt, Center for Digital Education, January 10. 2020
Overview

- What is digital education?
- My work on Digital Education: *Understanding and Improving Mathematics Teaching and Learning Using Digital Technology*
- The scope, Ambitions and Workplan for the Center for Digital Education
What is Digital Education?
What is Digital Education
What is Digital Education

The Machines Are Learning, and So Are the Students
nytimes.com
What is Digital Education
What is Digital Education
What is Digital Education
What is Digital Education
What is Digital Education
What is Digital Education

1. A range of phenomenons
2. Some questions to pursue
3. A number of key dilemmas
4. Not a thing to be considered in solitude – but in interaction with disciplines, institutions and traditions.
What is Digital Education: phenomenons

1. Transformation of educational institutions
2. Growing ed-tech sector
3. Digital competencies as mainstream and important
4. Digital transformation of society as such
What is Digital Education: questions

1. What is the contribution of digital solutions to the quality and efficiency of education
2. What is the importance and nature of digital competencies (compared to other competencies)
3. How can education be innovated and supported through digital solutions
4. What is the role of education in the future society
What is Digital Education: dilemmas and problems

1. The moving target dilemma
2. The complexity dilemma
3. The implementation/adoPTION transformation dilemma

4. Continuity and division of labor between innovating and criticizing/reflecting
Why and How “Digital Education”

Why Digital Education
A term with soft boundaries and forgiving translations
A term that connects technical and pedagogical disciplines

How Digital Education
Digital education as a transdisciplinary phenomenon
Design, implementation and criticism

Phenomenons | Questions | Dilemmas
---|---|---
Understanding and Improving Mathematics Teaching and Learning Using Digital Technology

Morten Misfeldt
Key elements in my research

- Mathematical Practices
- Digital tools in the teaching and learning of mathematics
- Immersive learning environments and Learning analytics
- Connections between design thinking, computational thinking and mathematics
- Implementation research in relation to digital education
Key elements in my research

- **Mathematical Practices**
- Digital tools in the teaching and learning of mathematics
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"jeg solver lige den her"
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\[
\begin{align*}
(2t-2) \cdot \begin{pmatrix} 2 \\ 2 \\ 2 \end{pmatrix} &= 0 \\
2(2t-2) + 2(2t-2) &= 0 \\
4t - 4 + 4t - 2 &= 0 \\
8t &= 8 \\
t &= \frac{1}{2} \\
\text{Vigter et C}
\end{align*}
\]

*Figur 109*
Key elements in my research

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Key wicked problem of digital education
Key elements in my research

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Meaning Making in educational scenarios
Scenario based education

Disciplinary domains

Specialized domain: construction site

Educational Scenario

Scholastic domain

Everyday domain: competitive game
Scenario based education

Disciplinary domains

Educational Scenario

Scholastic domain

Specialized domain: construction site

Everyday domain: competitive game
Access to students’ experience
<table>
<thead>
<tr>
<th>rowID</th>
<th>userName</th>
<th>groupName</th>
<th>created</th>
<th>content</th>
<th>Tradeoffs</th>
<th>Model Rel</th>
<th>Balance</th>
<th>Location</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1107</td>
<td>Andrew F.</td>
<td>L-CAG</td>
<td>3/1/2016 7:19</td>
<td>Good Morning</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>1109</td>
<td>Kristen B.</td>
<td>L-CAG</td>
<td>3/1/2016 7:20</td>
<td>Morning!</td>
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<td>0</td>
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<tr>
<td>1113</td>
<td>Meg S.</td>
<td>L-CAG</td>
<td>3/1/2016 7:20</td>
<td>Hi!</td>
<td>0</td>
<td>0</td>
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<td>0</td>
</tr>
<tr>
<td>1118</td>
<td>Kira Velmenni</td>
<td>L-CAG</td>
<td>3/1/2016 7:22</td>
<td>OK everyone, it's time to start our meeting. We'll be going over your preference survey feedback. I'd like to hear from everyone</td>
<td>0</td>
<td>0</td>
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<tr>
<td>1120</td>
<td>Andrew F.</td>
<td>L-CAG</td>
<td>3/1/2016 7:22</td>
<td>I'm ready for the meeting whenever</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>1122</td>
<td>Jake L.</td>
<td>L-CAG</td>
<td>3/1/2016 7:22</td>
<td>Present</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
</tr>
<tr>
<td>1124</td>
<td>Andrew F.</td>
<td>L-CAG</td>
<td>3/1/2016 7:22</td>
<td>Andrew: Present</td>
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<td>0</td>
</tr>
<tr>
<td>1125</td>
<td>Jake L.</td>
<td>L-CAG</td>
<td>3/1/2016 7:22</td>
<td>And I am also ready for the meeting</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1127</td>
<td>Meg S.</td>
<td>L-CAG</td>
<td>3/1/2016 7:23</td>
<td>Present</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1139</td>
<td>Kira Velmenni</td>
<td>L-CAG</td>
<td>3/1/2016 7:23</td>
<td>So, you just finished using iPlan for the first time. What did you learn about the relationship between the map and the indicators?</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1148</td>
<td>Jake L.</td>
<td>L-CAG</td>
<td>3/1/2016 7:24</td>
<td>As you change regions of the map the indicator levels will changed based on what you do.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1152</td>
<td>Andrew F.</td>
<td>L-CAG</td>
<td>3/1/2016 7:24</td>
<td>More industrial area is the best way to increase jobs</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1158</td>
<td>Jake L.</td>
<td>L-CAG</td>
<td>3/1/2016 7:25</td>
<td>For example, changing an industrial space to a wetland will reduce runoff and Phosphorus.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1162</td>
<td>Kristen B.</td>
<td>L-CAG</td>
<td>3/1/2016 7:25</td>
<td>Based off of the changes we make the phosphorus, nesting sites, runoff, and housing levels increase or decrease</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1168</td>
<td>Meg S.</td>
<td>L-CAG</td>
<td>3/1/2016 7:26</td>
<td>I agree with Jake and Kristen</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>1173</td>
<td>Andrew F.</td>
<td>L-CAG</td>
<td>3/1/2016 7:26</td>
<td>Yes, that sounds right</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>1175</td>
<td>Kristen B.</td>
<td>L-CAG</td>
<td>3/1/2016 7:26</td>
<td>Yes sounds correct</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1176</td>
<td>Meg S.</td>
<td>L-CAG</td>
<td>3/1/2016 7:26</td>
<td>Yes that sounds right</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1178</td>
<td>Kira Velmenni</td>
<td>L-CAG</td>
<td>3/1/2016 7:26</td>
<td>You've just received feedback on your first preference survey. What did you learn from your stakeholder feedback?</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>1180</td>
<td>Aren O.</td>
<td>L-CAG</td>
<td>3/1/2016 7:26</td>
<td>Yes</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>1186</td>
<td>Andrew F.</td>
<td>L-CAG</td>
<td>3/1/2016 7:27</td>
<td>Not many other stakeholders agree with Lee's perspective</td>
<td>0</td>
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</tr>
<tr>
<td>1189</td>
<td>Aren O.</td>
<td>L-CAG</td>
<td>3/1/2016 7:28</td>
<td>They are very picky and really only care about what they personally want</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
</tbody>
</table>
**Justine**

Indicators Based Justifications

Model Relationships

Balance

Stakeholder Based Justifications

Value Indicators

Trade-offs

Intervention

Justine is:
- balancing issues stakeholders care about
- how land use changes affect indicators in the model, and how that can help balance issues stakeholders care about

You might suggest that Justine thinks about:
- how land use changes affect indicators in the model, and how that can help balance issues stakeholders care about

Chat

**Justine:**
I tried to change carbon monoxide, but clearly it didn’t work.

**Nic:**
I feel like I was just randomly changing industrial plots to open space/lands for more existing jobs and less carbon emissions, but I feel like if really knew how to successfully zone, the outcome would be better.

**Justine:**
It seems almost impossible to please every stakeholder because you have to sacrifice jobs and sales to reduce carbon emissions and increase renting sites, so we will have to compromise.
Supporting Teachers’ Intervention in Students’ Virtual Collaboration Using a Network Based Model

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1650 W Johnson Street
Madison, WI 53706
dwms@wisc.edu

Intervention
Justine is:
- balancing issues stakeholders care about
- how land use changes affect indicators in the model and how that can help balance issues stakeholders care about

Chat
Know how to balance it out.
Bet: 6/28/16 09:24 PM
That sounds right.
Justine: 6/28/16 09:25 PM
I feel need to know more about zoning and its implications.
Ryan: 6/28/16 09:25 PM
Key elements in my research

- Mathematical Practices
- Digital tools in the teaching and learning of mathematics
- Immersive learning environments and Learning analytics
- Connections between design thinking, computational thinking and mathematics
- Meaning making in complex situations: Balancing different domains of knowledge and experience
- Access to students experience: Addressing the paradox of pedagogical simulations
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Supporting primary-level mathematics teachers’ collaboration in designing and using technology-based scenarios

Morten Misfeldt¹ • Lis Zacho²
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How I have approached digital education

Purpose: to understand and improve mathematics teaching and learning using digital technology.

Approach: focus on conditions for teachers and students to engage in mathematical and pedagogical practices

Lens: Mathematical and pedagogical practices are inherently distributed. Key is the relation between (technological) environment and learner/teacher
Vision and workplan: Center for Digital Education

Center Launch, January 10, 2020
Center for Digital Education – transdisciplinary approach

Department of Science Education

Department of Computer Science

Discipline

Pedagogy → Computer science

Center for Digital Education
Four levels as an organising principle
Cognitive level
Pedagogical level
Institutional level
Societal level

WolframAlpha® computational intelligence.

triangle 3 5 7
Societal level       Institutional level       Pedagogical level       Cognitive level
Societal level  Institutional level  Pedagogical level  Cognitive level
Mission (we are here to:)

- Conduct international research in few specific areas
- Support the digital pedagogical work at UCPH with research expertise and critical mass
- Support the digitalization of core topics at UCHP
- Educate computer scientists with educational insights (targeting ed-tech industry, teaching, participation in public debates)
- Support meaningful digitalization of the Danish educational system
Vision (in 5 years we will:)

- Be a leading research center both national (in general) and international (in one area)
- UCPH is leading in how digital tools are used in teaching and in core topics
- Conduct transdisciplinary work between CS and education, and support the digitalization of the disciplines at UCPH
- We explore the possibilities and consequences of the digitalization of (STEM) education across the school system.
People and plans

- 3 tenured positions (university pedagogy (IND), CS education (DIKU-IND), Learning Analytics (DIKU) over the next years
- 3-5 post docs related to project activities
- Open invite and different types of collaborative configurations with IND and DIKU

Andreas Tamborg (IND)
Morten Misfeldt (IND-DIKU)
Helle Mathiassen (IND)
Martin Dybdal (DIKU)
Jonas Dreyøe (IND)
Katrine Lindvig (IND)
Projects and activities – spring 2020

• Programming, computational thinking and mathematical digital competencies (Andreas & Morten, w Århus)
• Data expeditions (Martin)
• National Center for Mathematics education (w. Århus)
• CIU (Katrine & Helle)
• Data based discussions on IT in math teaching (Jonas)
• 2023 projects on (1) digital teaching and learning and (2) digital methods and core topics. (Morten and Post docs)
• Collaboration with Central IT on educational data for learning analytics
• Virtual Laboratories (Helle and Morten)
• Teknologiforståelse at university colleges (??)
## Timeline

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project activities</strong></td>
<td>Initiation</td>
<td>Run, Initiate and finalize</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Staffing</strong></td>
<td>Post docs for projects, first tenured position</td>
<td>Finalize hire of tenured. Continue development of project based (temporary) staff</td>
<td></td>
<td>Organic development</td>
</tr>
<tr>
<td><strong>Teaching and service activities</strong></td>
<td>Initiate and develop</td>
<td></td>
<td>Consolidate portefolio of teaching an service work</td>
<td></td>
</tr>
</tbody>
</table>
Center for Digital Education

- Learning Analytics
- CS education
- implementation research
- cognitive tools
- university pedagogy

Discipline

Pedagogy  →  Computer science

Societal level  Institutional level  Pedagogical level  Cognitive level
Thank you!
Thank you!

- RECEPTION AT IND:
  - Out on Østervolsgade and towards nørreport
  - turn right at gate
  - Up to the old observatory

- We go together