Computational thinking in “IT design and application development” (iDA)

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Challenges
• Students enter with poor CT skills,
• Increase skills in programming and systems development,
• Increase employability,
• Increase sense of belonging.

Underwent Activities
• Roll out of the new study regulation,
• Creation of new teaching materials,
• In-depth interviews with 14 iDA students,
• Creation of two new Design Studios accessible only by the iDA students,
• Roll out of a new iDA student organization.

Initial results from Introducing CT*

a) The new P0/CT module (10 ECTS):
• Students use a subset of CT concepts (algorithm design, abstraction, automation, pattern recognition, simulation, formalization) to model a problem that is related to their Bachelor,
• P0 groups are created using an algorithm based on students’ profile similarities, and P7 groups based on dissimilarities,
• We observed an increased understanding of CT terms, better exam performance, and increased confidence.

b) The new Introduction to Programming course (5 ECTS)
• Students extend their CT knowledge through a flipped MOOC (Harvard CS50) and learn to program in C, Python and Web technologies in hands-on programming sessions with the lecturer. They have to apply the acquired programming knowledge in P7 project
• We observed better exam performance, better performance in the Foundational OO Programming course, better utilization of programming and CT in both P7 and P8 projects
• Students start programming in other languages (e.g. Android) and are less afraid to demonstrate their working prototypes.

Future Steps
• Focus on 9th and 10th semester. What is the effect of the changes?
• Monitor 7th and 8th semester. Is there a need to adjust?
• Rollout of the iDA EXPO on the 10th semester,
• Collect real data on the effect of the changes on employability,
• Empower the iDA student organization,
• Study the effect of bringing real-world cases from companies on P9,
• Study the effect of working with UN’s Sustainable Development Goals on P8
• Bring the iDA alumni closer to the new students and the department,
• Develop a branding strategy for the new iDA education

The new iDA study regulation

<table>
<thead>
<tr>
<th>Semester</th>
<th>Courses</th>
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<tbody>
<tr>
<td>7th</td>
<td>Computational Thinking and P0 15 ECTS, P7 Project 10 ECTS, Introduction to Programming 5 ECTS, Information and Organization 5 ECTS</td>
</tr>
<tr>
<td>8th</td>
<td>P8 (with SDGs) 15 ECTS, Systems Development 5 ECTS, Design and Evaluation of User Interfaces 5 ECTS, Foundational OO programming 5 ECTS</td>
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<tr>
<td>9th</td>
<td>P9 (with companies) 15 ECTS, Agile Software Engineering 5 ECTS, Database Development 5 ECTS, Entrepreneurship 5 ECTS</td>
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<tr>
<td>10th</td>
<td>Thesis, 30 ECTS</td>
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</tbody>
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*1st year of deployment, data collected from 7th and 8th semester students

Sources
Informatik og computational thinking – IT-Vest.
Google for Education – CT Overview
Microsoft Education – Basics of CT
Harvard CS50

IT Design and Application Development (iDA), cand.it.
Enter with bachelor degree in various disciplines (not IT) and no mathematical training.
Two-year education with project-organized problem-oriented studies, PBL.
Learning goals: Knowledge, skills, and competencies in Programming, Systems Thinking, Computational Thinking, Digitalization, Human Computer Interaction, Design and evaluation of IT systems.

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