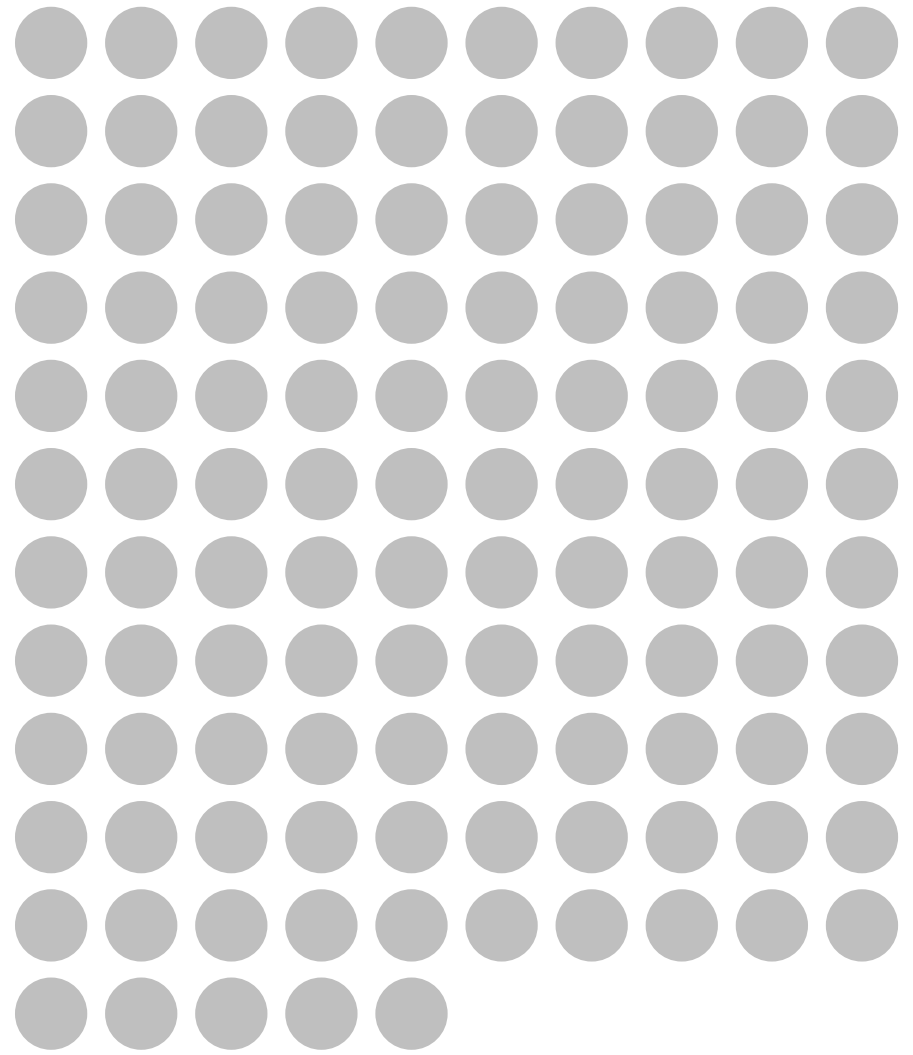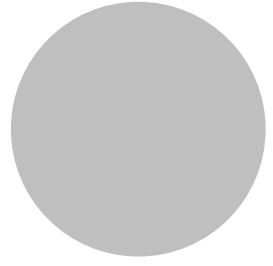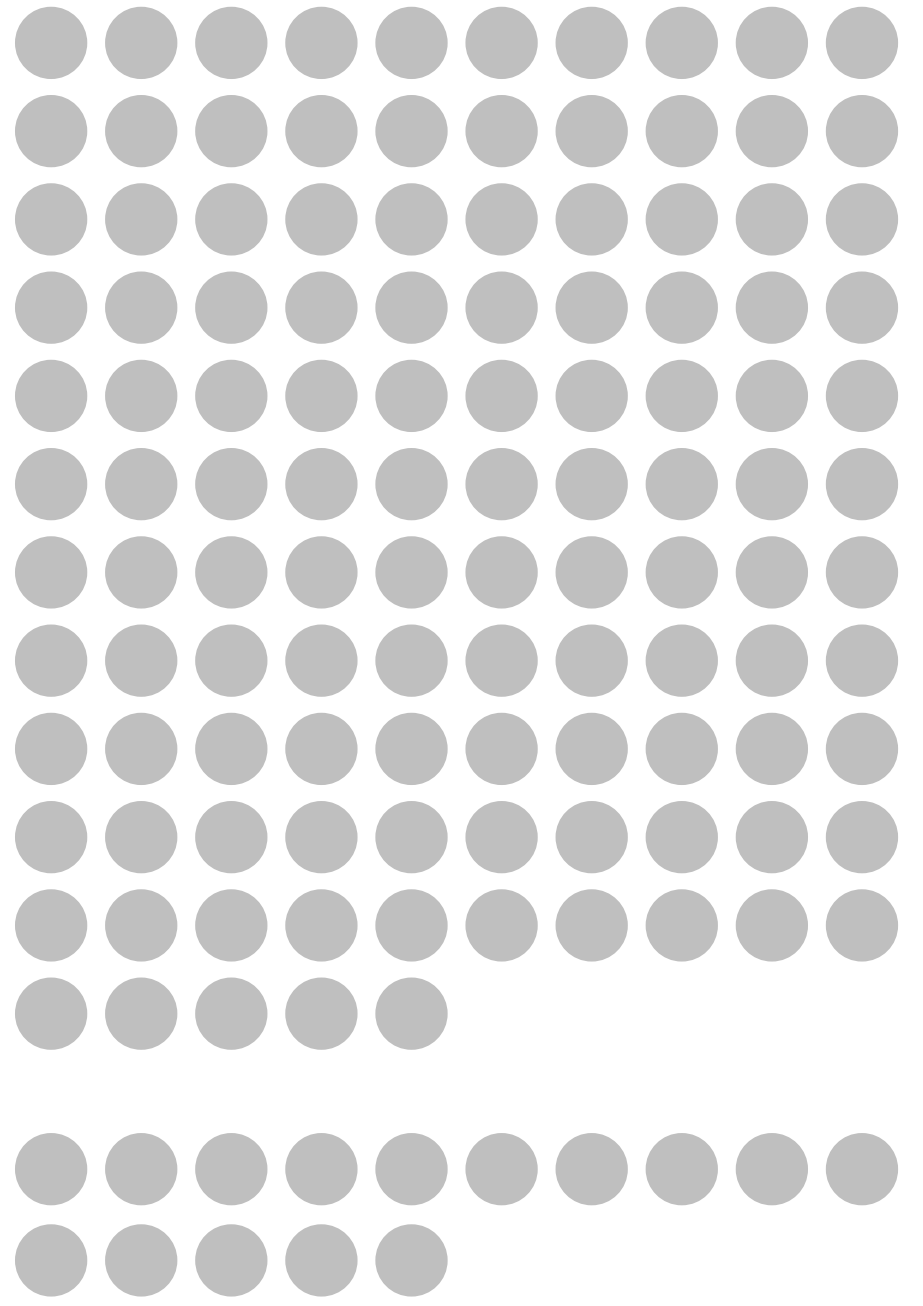# Reflections on Designing and Running Visualization Design and Programming Activities in Courses with Many Students

Søren Knudsen, Mathilde Bennetsen, Terese Høj, Camilla Jensen, Rebecca Jørgensen, Christian Loft

IEEE VIS 2023 EduVis Workshop

IT UNIVERSITY OF COPENHAGEN
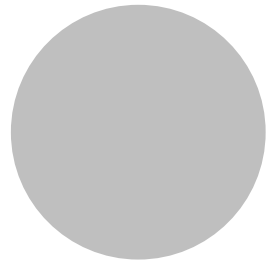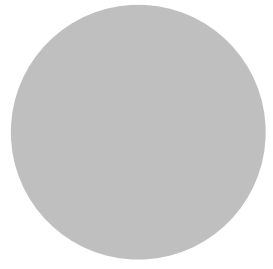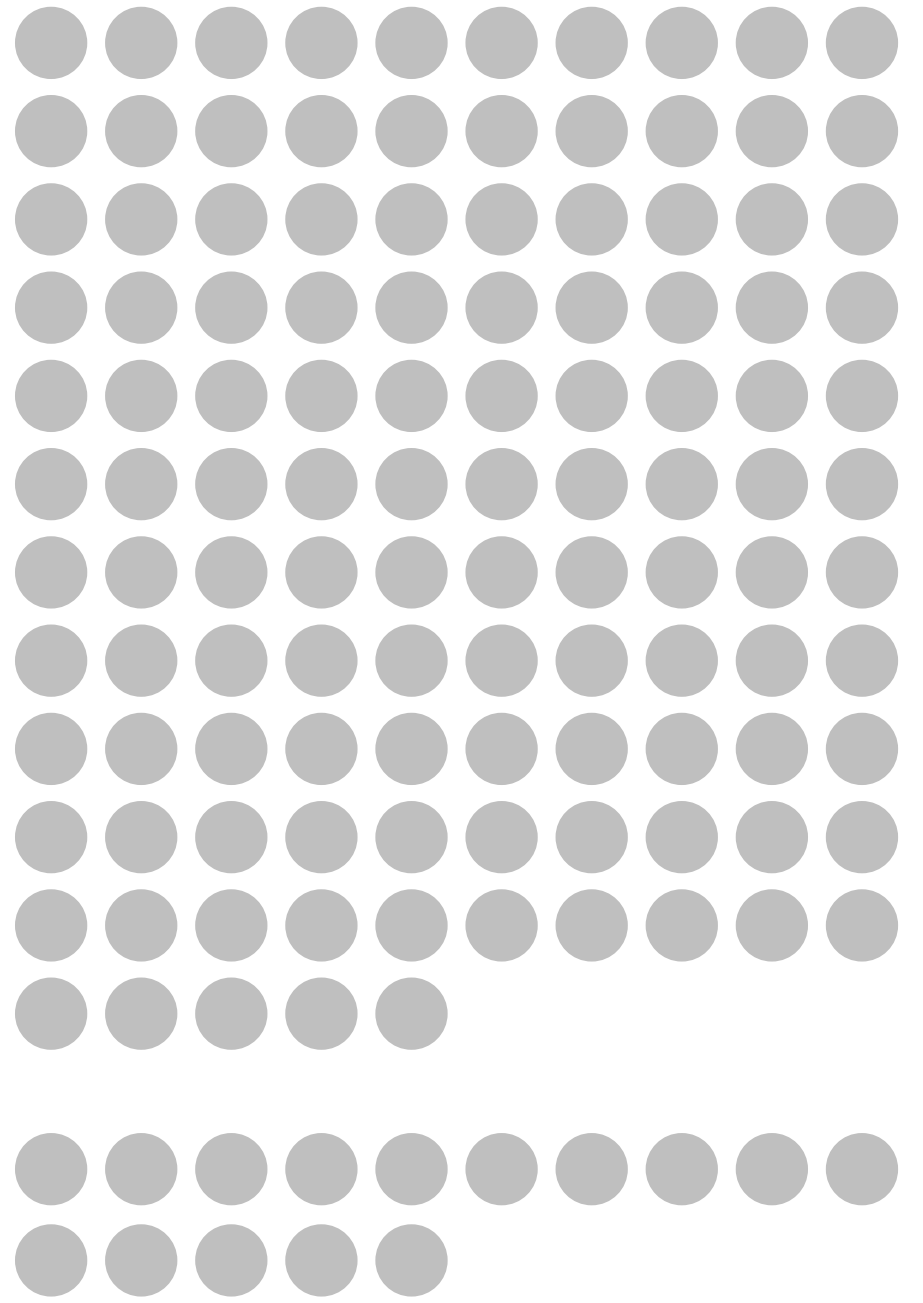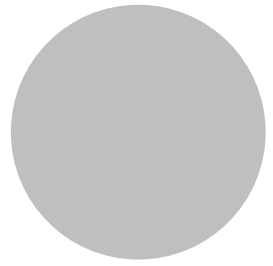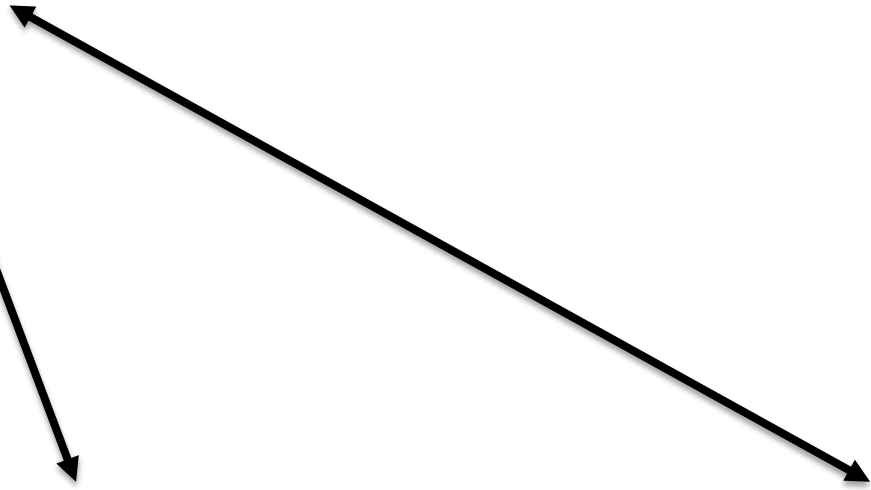
CONTRIBUTIONS

An account of six design activities in terms of purpose, structure, and outcome

Describe their relation to subsequent programming activities

We present three themes emerging from reflections between members of the teaching team

MOTIVATION

Recent call to action for the scholarship of visualization teaching and learning (Bach et al., 2023), presented at the main papers track Wednesday afternoon.

This paper discusses several challenges related to our work:

- Course design for heterogenuous student populations

- Scaffolding in course design

- The need for scaling visualization teaching

INTENDED LEARNING OUTCOMES

CONSTRUCTIVE (1)

Sketch novel data visualization designs and build interactive visualization prototypes.

THEORETICAL (2)

Explain fundamental theories and design principles in data visualization, apply them in a design process, and reflect on these.

ANALYTICAL (3)

Interpret, deconstruct, and critique data visualizations.

REFLECTIVE (4)

Reflect on the ethical and societal implications of data visualization.

COURSE STRUCTURE

We structured the course in terms of
stages of a visualization design process.

- Initially, students used exploratory and low-fidelity approaches (such as pen-and-paper based sketching).

- Later, students did more incremental high-fidelity prototyping (such as prototype implementation using the Altair visualization specification language).

PROJECT WORK AND EXAM

Students were split in groups of 4 to 5 students

Handed in a visualization design and a report (50-70,000 characters) detailing the process, the product, and alternatives considered

Groups were asked to collect data about themselves to work with in their projects

PROJECTS: COLLECTED DATA COMPRISED

Exchanges of smiles with strangers

Caffeine intake

Sleeping patterns

Use of emojis in text communication

Photography habits

Emotions and sleep

Weather and mood

Dietary habits and spending

Screen time

Listening behaviour

Clothing choices

Types of bodily touches (non-sexual)

Conversations and mood

Meeting productivity

Grocery shopping

Alcohol consumption

Student workload

Impact of medication on wellbeing

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Date	Week	Lecture topic	Exercise	Exercise topic and inspiration	Duration (minutes)	Students present (est.) Room 1	Room 2	Room 3	Handins / CIQ's
Feb 10	**1**	Course overview; What is visualization and why should we bother?							
Feb 17	**2**	Deconstructing visualization: Data abstraction, data marks, and channels	**D1**	Critique and redesign	45+15+45				119 / 1
Feb 24	**3**	Overview of visualization design processes and working with data	**D2**	Data collection and sketching, design brief	45+15, *45*				115 /12
Mar 3	**4**	Understanding user goals and tasks	**D3**	Constructive visualization [20]	55+15+60				110 / 8
Mar 10	**5**	Creating the design	**D4**	Refining visualization ideas [14]	45+15+45				52 / 4
Mar 17	**6**	Creating the design: Going digital	**D5**	Sketching in the digital medium	45+15+45				18 / 3
Mar 24	**7**	Introduction to Altair and using it in design	**A1**	Intro to Altair [12]	45+15+45				- / 2
Mar 31	**8**	Visualization theory in Altair	**A2**	Domains and scales in Altair	45+15+45				- / 0
Apr 14	**9**	Multiple views and transformations in Altair	**A3**	Faceting and multiple views in Altair	45+15+45				- / 1
Apr 21	**10**	Interaction and interaction in Altair	**A4**	Specifying interaction in Altair	45+15+45				- / 0
Apr 28	**11**	Evaluating and communicating the design	**D6**	Heuristic evaluation [42]	45+15, *45*				11 / 0
May 12	**12**	Recap, evaluation, perspectives, and questions	**P1**	*Project work*	*105*				- / -
May 17	**13**	*Semester project deadline. Submissions: 29 group projects across 129 students (14 groups of five, 12 of four, 1 of three, two and one student)*							

THEMES AND DESIGN GOALS

Theme 1:
Continuous planning for scaffolded learning

Theme 2:
Balancing homo- and heterogeneity in problem-based learning and activity design

Theme 3:
Communication between students, teaching assistants, and lecturers

THEMES AND DESIGN GOALS

Theme 1: Continuous planning for scaffolded learning

1. Continuous, iterative, course planning and design

2. Consider scaffolding when designing course transitions

3. Consider student diversity when designing for scaffolding

Theme 2: Balancing homo- and heterogeneity in activities

1. Assess when to provide direction and when to provide flexibility

2. Identify opportunities for scoping flexibility in ways that help students fulfill ILOs

THEMES AND DESIGN GOALS

Theme 2: Balancing homo- and heterogeneity in activities

1. Assess when to provide direction and when to provide flexibility
2. Identify opportunities for scoping flexibility in ways that help students fulfill ILOs

Theme 3: Communication between students and teaching team

1. Allow for experimentation in teaching and learning
2. Nurture teaching and facilitation skills, knowledge, and practices in the teaching team.
3. Build strong communities of practice framed specifically around teaching.

FUTURE WORK

Course revisions

- Flip-flop model (design+implementation, then repeat)

- Vis specification => vis programming

- More data wrangling

Research

- Gain consent for use of student materials for research

- Stuctured collection of teaching team reflections

Thank you for listening.

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