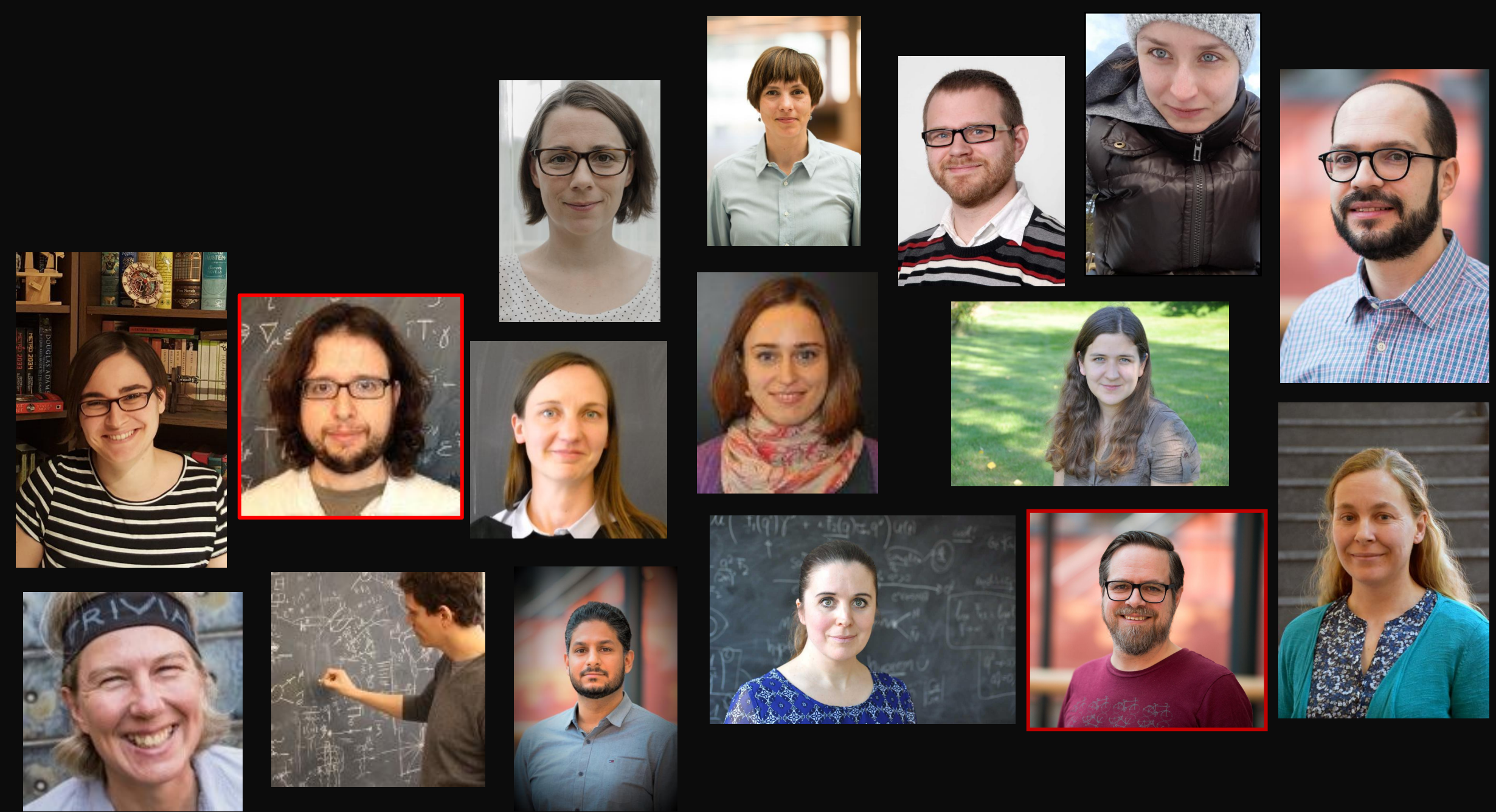




UPPSALA  
UNIVERSITET

**Andreas Solders & Marco Chiodaroli**

**Katerina Pia Günter, Lisa Freyhult, Diego Tarrío,  
Ali Al-Adili, Erik Andersson Sundén, Agnese Bissi,  
Rikard Enberg, Virginia Grande, Sophie Grape, Cecilia Gustavsson, Magdalena Larfors,  
Susanne Mirbt, Li Pöder Balkeståhl, Karin Schönning (Uppsala University)**



# STUDENT ATTITUDES TO FLIPPED CLASSROOMS

FHU-2021





# How did we start with this study?

- It started as a support group for the implementation of Flipped Classrooms (FC)
- Study to investigate the implementation in a more scholarly way. We are presenting here (part of) our preliminary results
- Large project group makes diversity of perspectives possible. We can also collect data across different courses
- Mixed-methods give deeper insights into students' perceptions
- Including students more actively into the construction of learning and teaching (via focus groups) is very valuable
- As a result of the pandemic, part of the study was performed in a **distance-learning** setting



UPPSALA  
UNIVERSITET

## Flipped classroom experiences: student preferences and flip strategy in a higher education context

Brenton McNally<sup>1</sup> · Janine Chipperfield<sup>1</sup> · Pat Dorsett<sup>2</sup> ·  
Letitia Del Fabbro<sup>3</sup> · Valda Frommolt<sup>3</sup> · Sandra Goetz<sup>3</sup> ·  
Joanne Lewohl<sup>4</sup> · Matthew Molineux<sup>5</sup> · Andrew Pearson<sup>4</sup> ·  
Gregory Reddan<sup>5</sup> · Anne Roiko<sup>6</sup> · Andrea Rung<sup>7</sup>

# Flipped Classroom

## What is missing?

Scholarly research is still lacking in the context of FC: lack of agreement in the definition, and incongruent conclusions on effectiveness

(Abeysekera and Dawson 2015; Bishop and Verleger 2013; McNally et al. 2017; van Alten et al., 2019)

Our working definition: When learning activities that typically happen in class happen outside of class (Lage et al., 2000)

Novelty of student-centred learning leads to resistance to FC approach (McNally et al. 2017)

Considerable difference among different implementations. FC is “a promising approach when appropriately designed” (cf. van Alten et al., 2019)



UPPSALA  
UNIVERSITET

# Background

## RESEARCH QUESTIONS

How did students perceive FC activities?

What factors influenced students' attitudes towards FC?

How do different implementations compare to each other?

According to McNally et al., students can be divided into **two groups** with respect to **their attitudes towards FC**:

### endorsers:

- positive attitudes towards most aspects of FC
- more involved and engaged in the content

### resisters:

- those students who do not endorse and those who have a neutral attitude



# A Mixed Methodology

## Quantitative Approach (survey)

- Two clusters regarding student preferences: endorsers and resisters (cf. McNally et al. 2017)
- Three scales to assess various aspects of our implementation (drawing from COI):
  - Teaching presence
  - Social presence
  - Cognitive presence
- Integration with course-specific information

## Qualitative Approach

Teachers' reflections

### **Focus Group Interviews**

(Vaughn et al. 1996)

with students, semi-structured

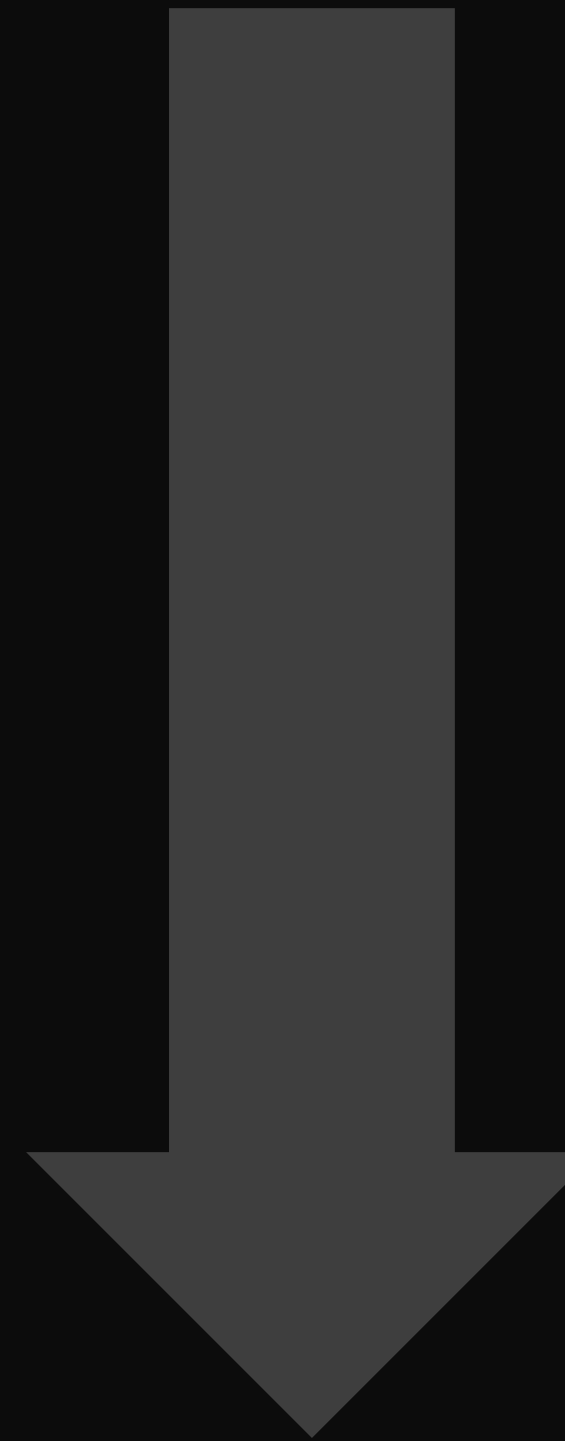
(Longhurst 2003)

Interviewers' reflections

### **Thematic Analysis**

(Clarke et al. 2008)

compare to interviewers' reflections





UPPSALA  
UNIVERSITET

# The survey

## Endorsers and resisters

5 items in the survey probe preference of aspects of FC or traditional lecturing.

4-point Likert scale

Example:

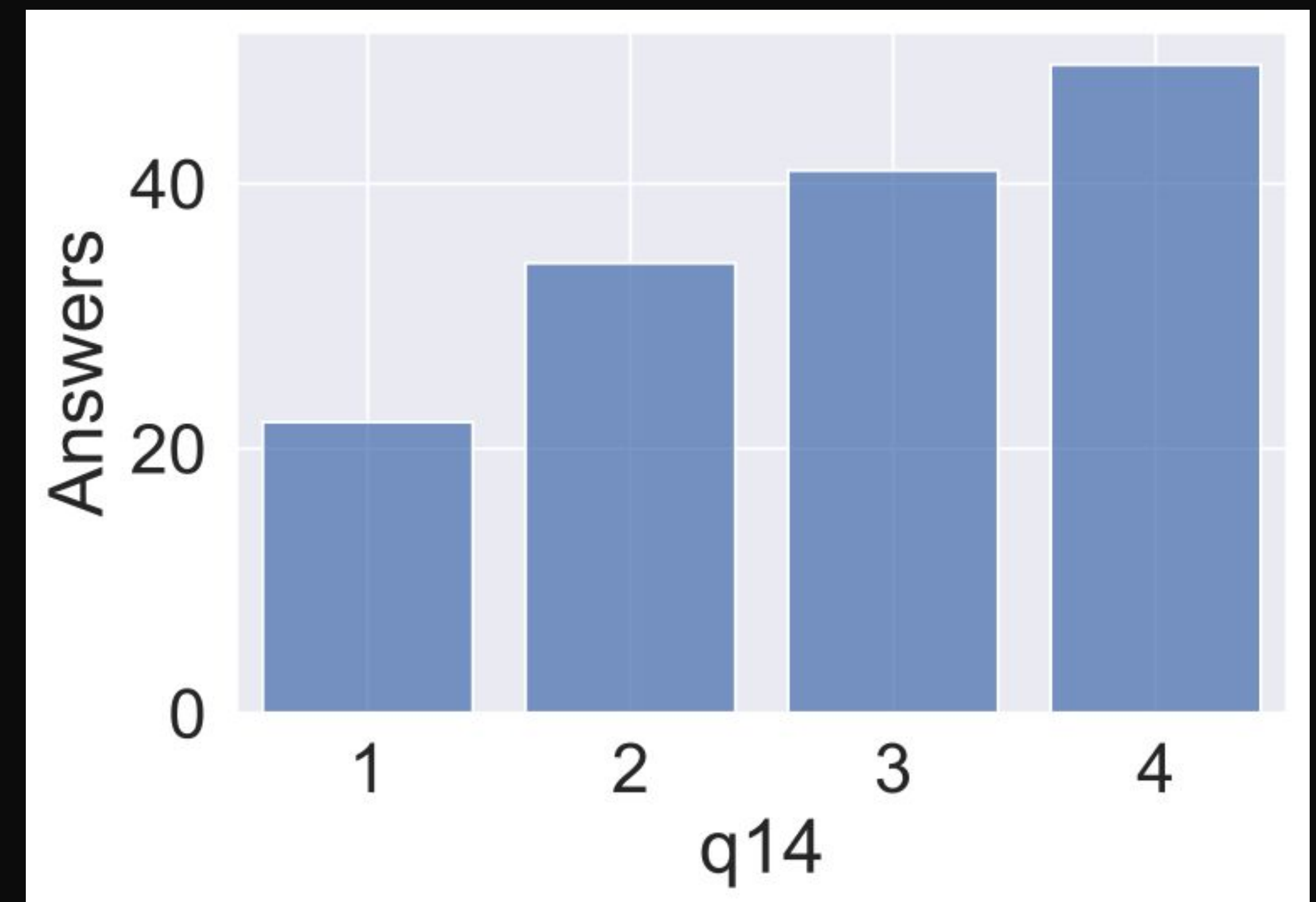
14. I would prefer to...

4 ...mostly be introduced to new material in class

3

2

1 ...mostly familiarize myself with new material before class





UPPSALA  
UNIVERSITET

# Endorsers and resisters

k-means cluster analysis and silhouette plots used to distinguish between two clusters of students:

Endorsers and **Resisters**

14. I would prefer to...

4 ...mostly be introduced to new material in class

3

2

1 ...mostly familiarize myself with new material before class

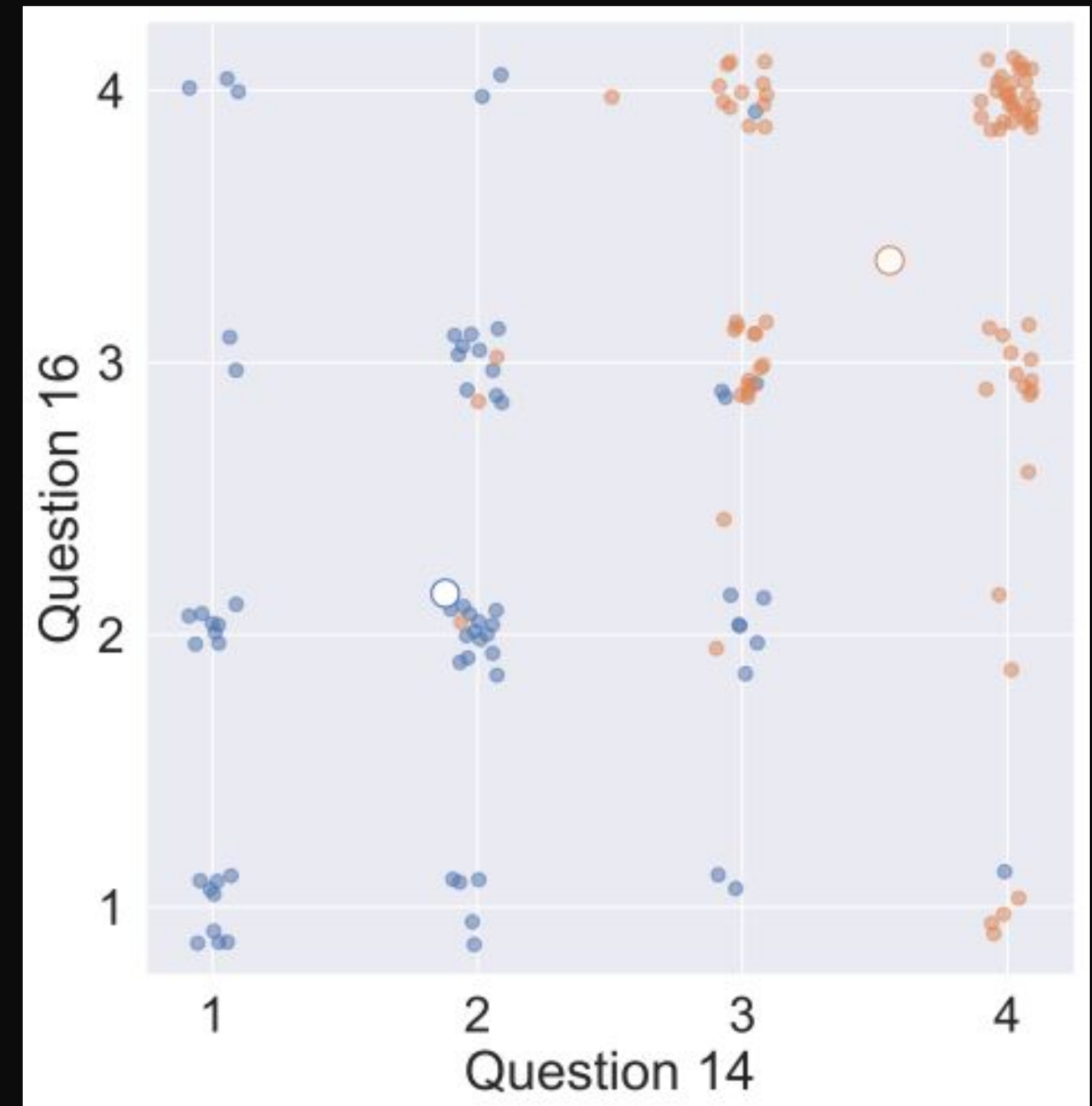
16. I would prefer to...

4 ...mostly have new content delivered during the lecture and work on exercises on my own

3

2

1 ...mostly have study material available prior to the lecture and work on exercises during the lecture





# Endorsers and resisters

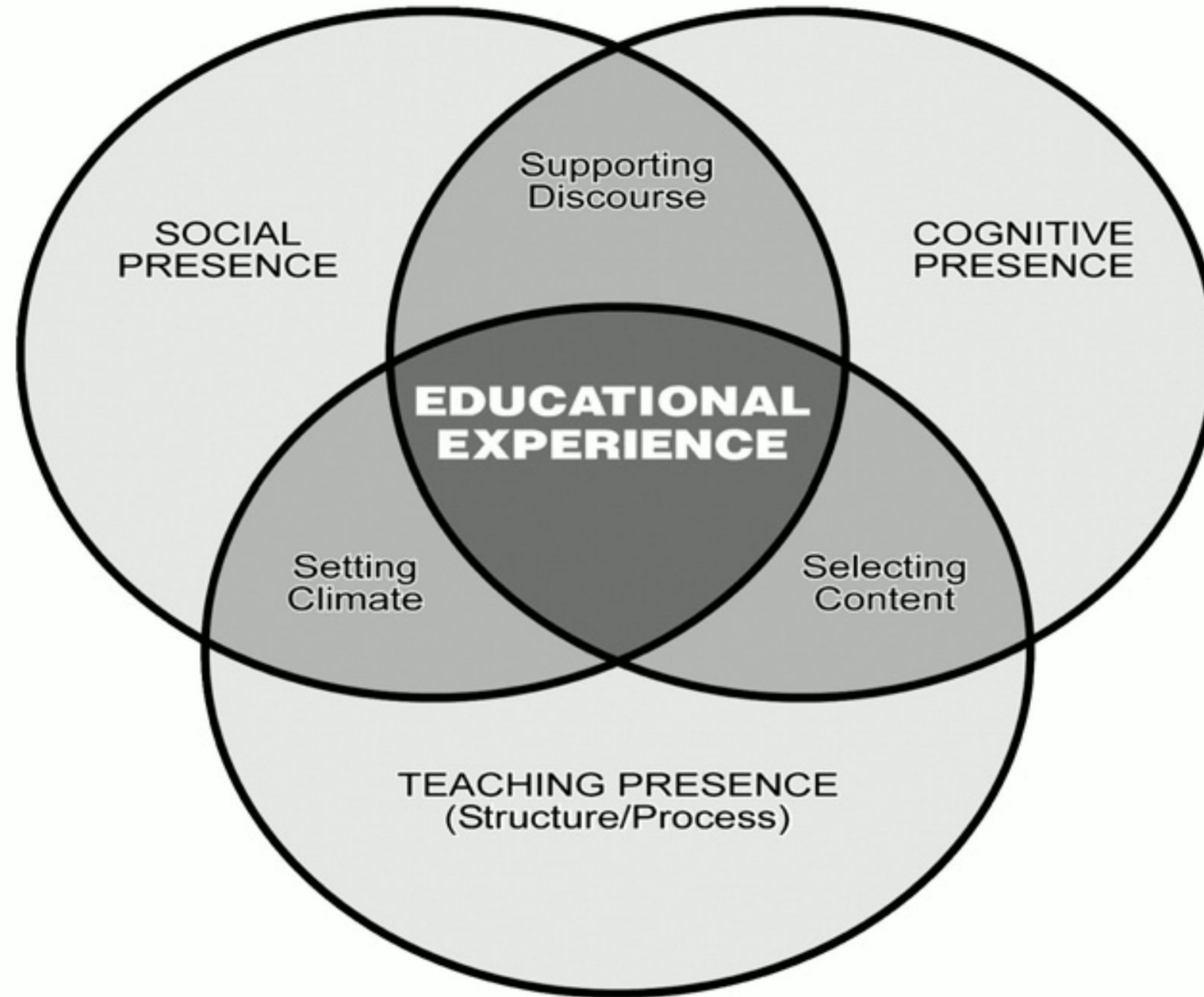
- No significant correlation found for age, gender, GPA, international-student status
- “Better established” students are more likely to be resisters (about 10% different,  $p = 0.01$ )
- Comparing the FC part of a course to “traditional instruction”, endorsers more strongly agree with the statements:
  - I got more out of the instructor
  - I went to class better prepared
  - I could better interact with other students.
  - I was more comfortable asking questions
  - The flipped part of the course was more time efficient
  - I achieved a better understanding of the course content





UPPSALA  
UNIVERSITET

# Community of Inquiry framework



(from Garrison &  
Arbaugh, 2007)



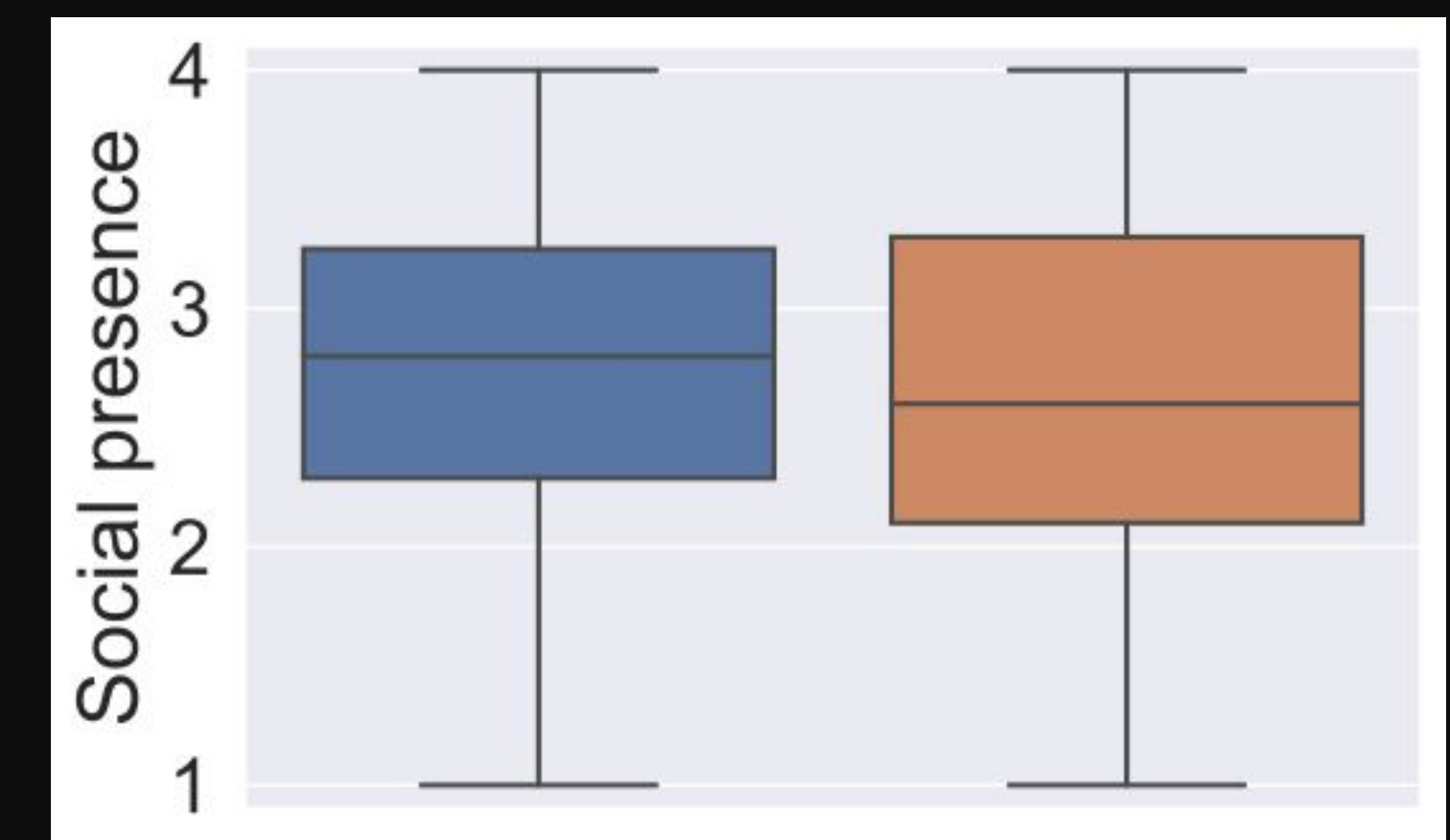
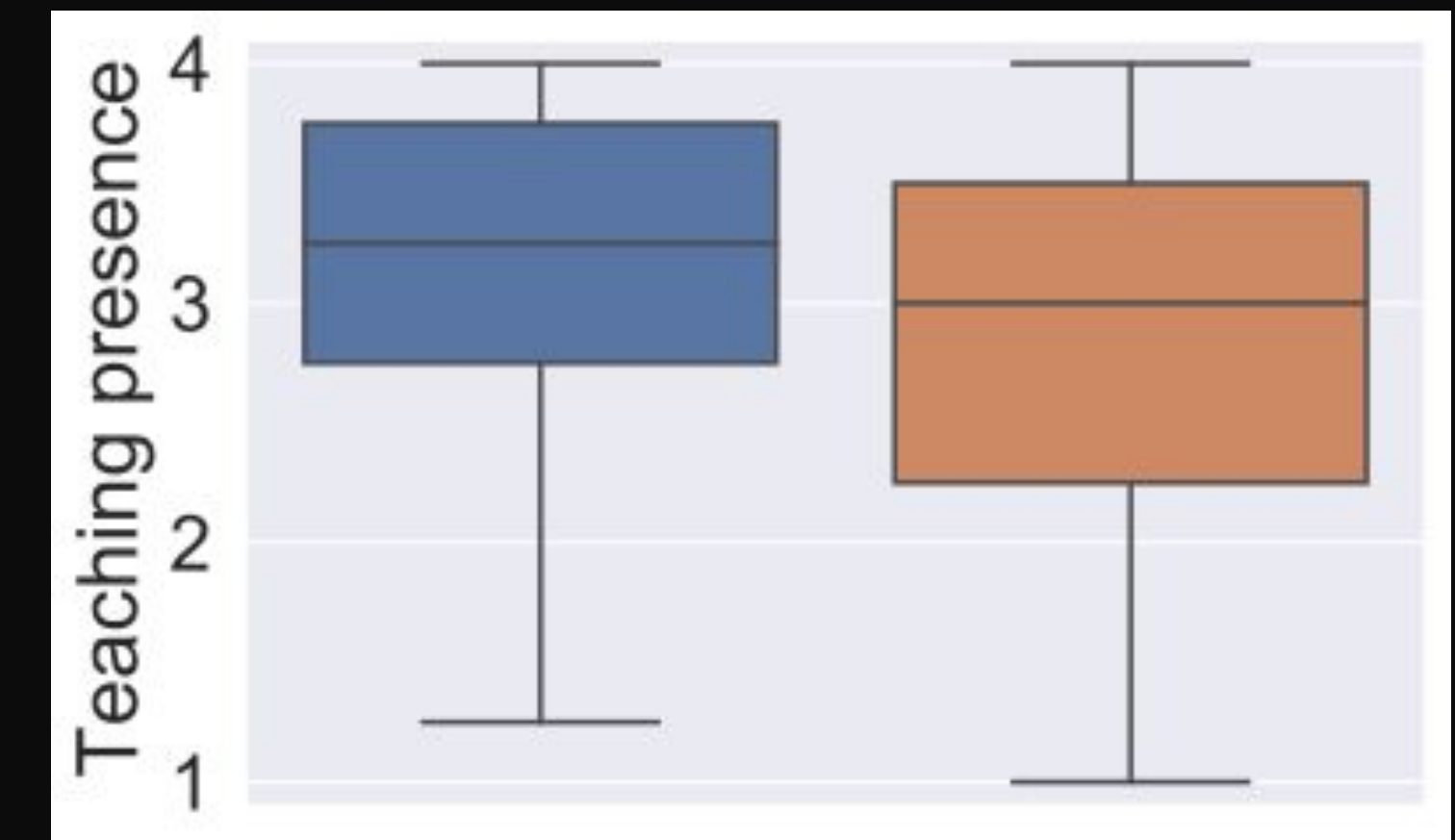
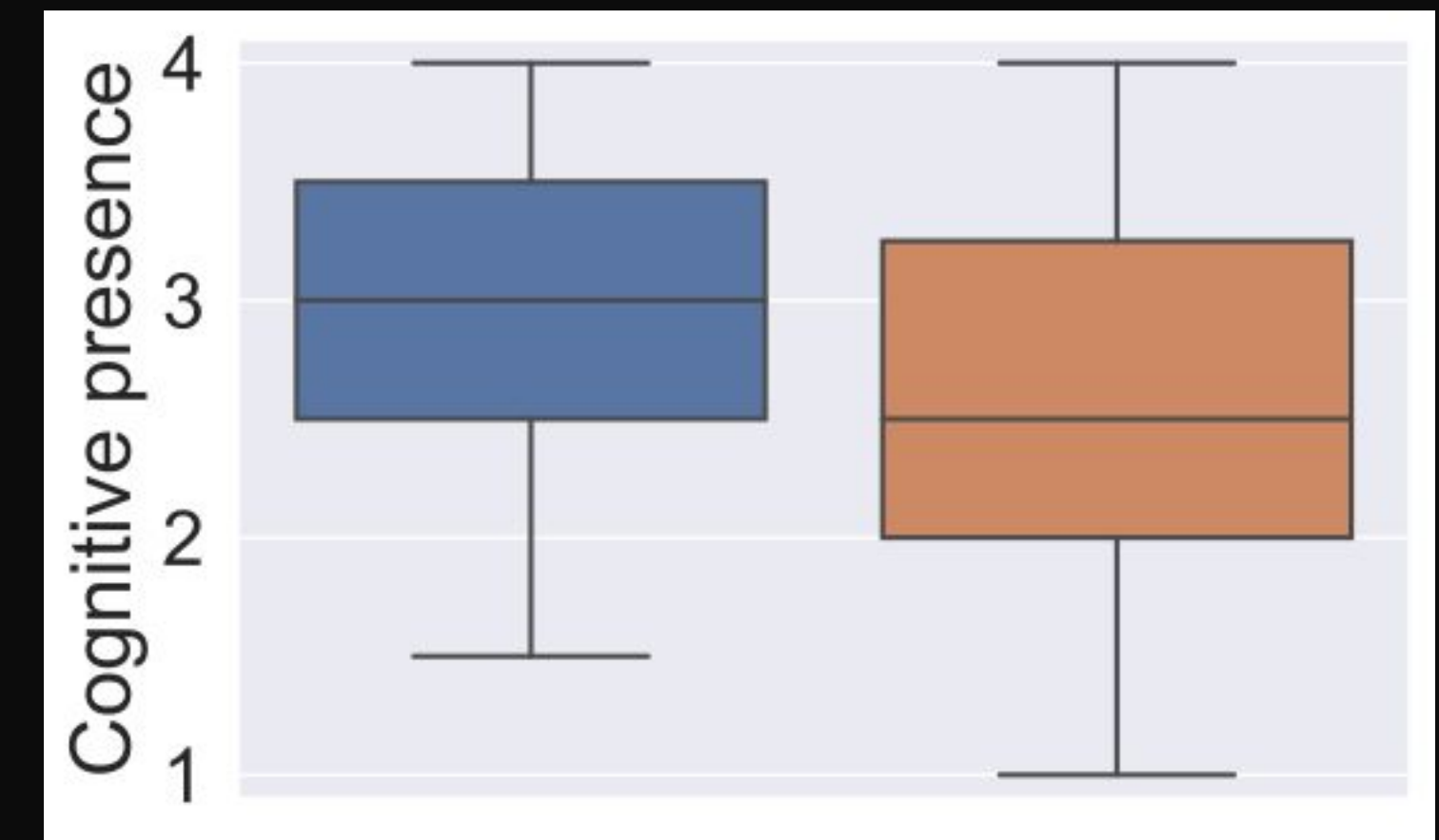
	Elements	Items (examples)	# Items	Cronbach $\alpha$
<b>Cognitive presence</b>	Knowledge building involving critical and creative thinking	<ul style="list-style-type: none"><li>• In-class activities helped me apply what I had learned before class</li><li>• In-class activities improved my understanding of fundamental concepts in course</li></ul> ...	5	0.84
<b>Teaching presence</b>	Design & organisation Facilitating discourse Direct Instruction	<ul style="list-style-type: none"><li>• The instructor provided useful explanations</li><li>• I received enough information on what was expected of me</li></ul> ...	4	0.81
<b>Social presence</b>	Open communication Group cohesion Affective Expression	<ul style="list-style-type: none"><li>• I felt comfortable expressing myself</li><li>• Working with other students gave me a sense of belonging in the course</li></ul> ...	5	0.85

(cf. Garrison & Arbaugh, 2007; Kim et al., 2014)



# Endorsers and resisters score their courses differently

	Endorsers (n = 67)		Resisters (n = 78)		Welch's t-test
	Mean	std	Mean	std	p-value
<b>Cognitive presence</b>	2,9	0,7	2,5	0,9	0,0042**
<b>Teaching presence</b>	3,1	0,7	2,9	0,8	0,036*
<b>Social presence</b>	2,8	0,7	2,6	0,8	0,27



## Main findings regarding FC

- **Endorsers** think they learn more in a FC setting.
- Both groups report having a significantly better interaction with their teacher in the FC setting.
- **Endorsers** report their social interactions to have a slightly positive impact on their learning.



UPPSALA  
UNIVERSITET

# Course-to-course variation

11 different courses, some taught multiple times

## In common:

- Subject (Physics)
- Pre-class videos
- In-class group work
- Most courses are blended

Social mean 2.87647 di

## Different:

- Level and size
- Distance / in-person
- Details about pre-class and in-class activities



UPPSALA  
UNIVERSITET

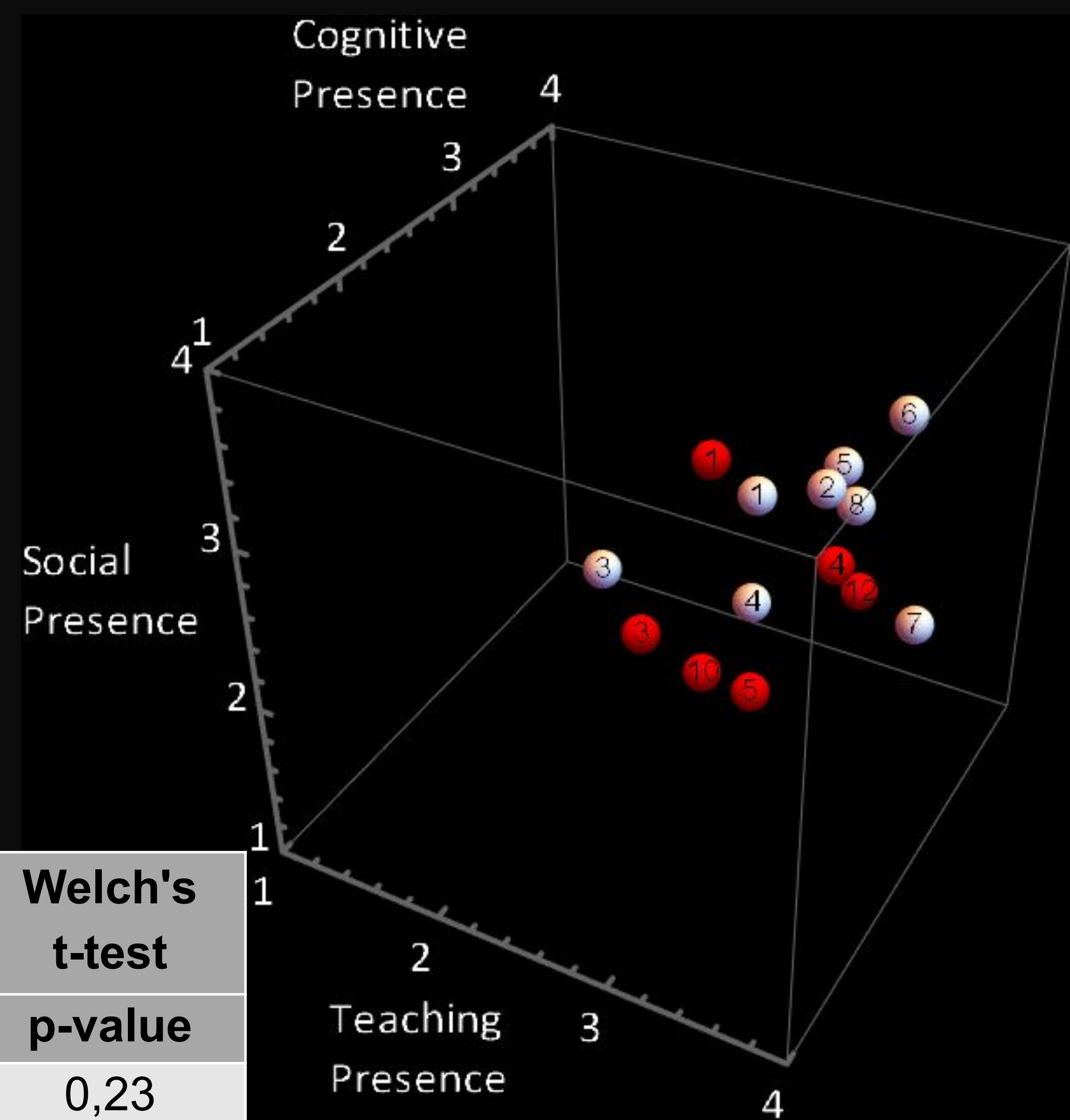
# Distance flipped courses

FC in a distance-learning setting has received relatively little attention so far

(cf. Lin, Hung & Chen, 2019)

Distance and in-person courses have significant differences in social-presence score

	Non-distance (n = 67)		Distance (n = 77)		Welch's t-test
	Mean	std	Mean	std	p-value
<b>Cognitive presence</b>	2,8	0,8	2,6	0,8	0,23
<b>Teaching presence</b>	3,1	0,8	2,9	0,8	0,14
<b>Social presence</b>	2,9	0,7	2,6	0,9	0,026*



# Qualitative Results

## Some take-away messages:

Themes of the student focus group interviews:

pre-class

- Knowing what is up next
- Using already available resources
- The use of videos
- The content of the videos

in-class

- Working in groups
- When are FC useful
- Bridging learning and research
- Learning independently

## Communication

Discussing material, method and implementation of FC with students is important to make the potential more accessible to student

## Methodology

Material, such as videos, need to be developed to activate students through questions and reflections



# Conclusions

- FC should not be seen as a fit-all-sizes solution: it works for some students and under some circumstances, but not for others. Students can be divided into endorsers and resisters.
- To get FC to work in a distance setting is challenging. Critical role played by social interaction among students.
- Discussing material, method and implementation of FC with students is important. Videos need to be developed to activate students.
- Working as a group and involving students in evaluation has many advantages.



# Conclusions

- FC should not be seen as a fit-all-sizes solution: it works for some students and under some circumstances, but not for others. Students can be divided into endorsers and resisters.
- To get FC to work in a distance setting is challenging. Critical role played by social interaction among students.
- Discussing material, method and implementation of FC with students is important. Videos need to be developed to activate students.
- Working as a group and involving students in evaluation has many advantages.

## Thank You!



# References



UPPSALA  
UNIVERSITET

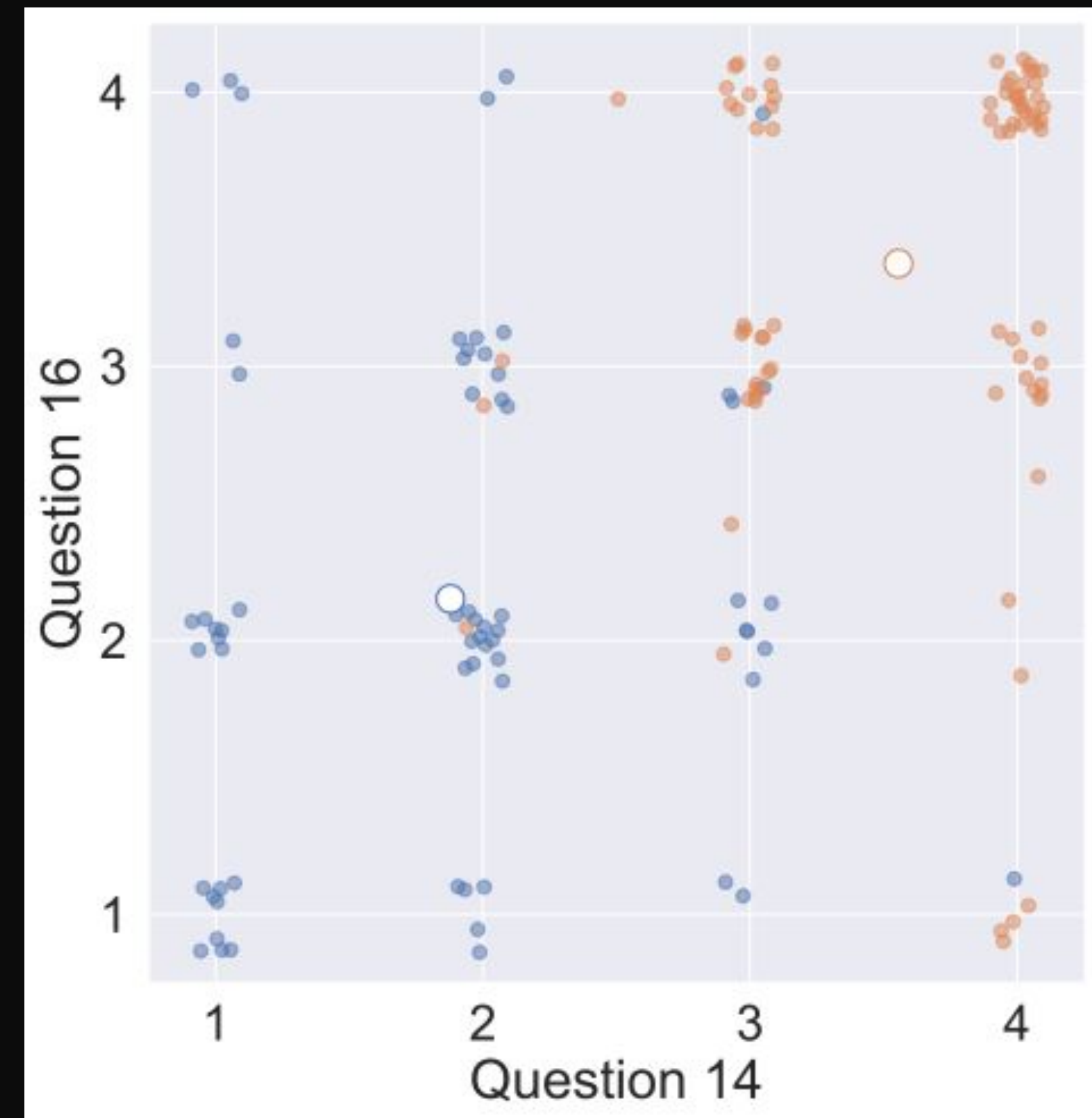
- Abeysekera, L. & Dawson, P. (2015). Motivation and cognitive load in the flipped classroom: definition, rationale and a call for research. *Higher education research & development*, 34(1), 1-14.
- Bishop, J. L. & Verleger, M. A. (2013). The flipped classroom: A survey of the research. In *ASEE national conference proceedings, Atlanta, GA* (Vol. 30, No. 9, pp. 1-18).
- Clarke, V., Braun, V., & Hayfield, N. (2015). Thematic analysis. *Qualitative psychology: A practical guide to research methods*, 222-248.
- Garrison, D. R. & Arbaugh, J. B. (2007). Researching the community of inquiry framework: Review, issues, and future directions. *The Internet and higher education*, 10(3), 157-172.
- Kim, M. K., Kim, S. M., Khera, O. & Getman, J. (2014). The experience of three flipped classrooms in an urban university: an exploration of design principles. *The Internet and Higher Education*, 22, 37-50.
- Lage, Platt and Treglia (2000). Inverting the Classroom: A Gateway to Creating an Inclusive Learning Environment. *The Journal of Economic Education*, 31(1), 30-43.
- Lin, Hung & Chen (2019). The impact of student engagement on learning outcomes in a cyber-flipped course. *Educational Technology Research and Development* 67.6: 1573-1591.
- Longhurst, R. (2003). Semi-structured interviews and focus groups. *Key methods in geography*, 3(2), 143-156.
- Lloyd, S. (1982). Least squares quantization in PCM. *IEEE Transactions on Information Theory*, 28(2), 129-137.
- McNally, B. et al. (2017). Flipped classroom experiences: student preferences and flip strategy in a higher education context. *Higher Education*, 73(2), 281-298.
- Rousseeuw, P. J. (1987). Silhouettes: a graphical aid to the interpretation and validation of cluster analysis. *Journal of computational and applied mathematics*, 20, 53-65.
- van Alten, D. C., Phielix, C., Janssen, J., & Kester, L. (2019). Effects of flipping the classroom on learning outcomes and satisfaction: A meta-analysis. *Educational Research Review*, 28, 100281.
- Vaughn, S., Schumm, J. S., & Sinagub, J. M. (1996). *Focus group interviews in education and psychology*. Sage.

Photo Credit for Karin Schönning's image in the first slide: Mats Kamsten

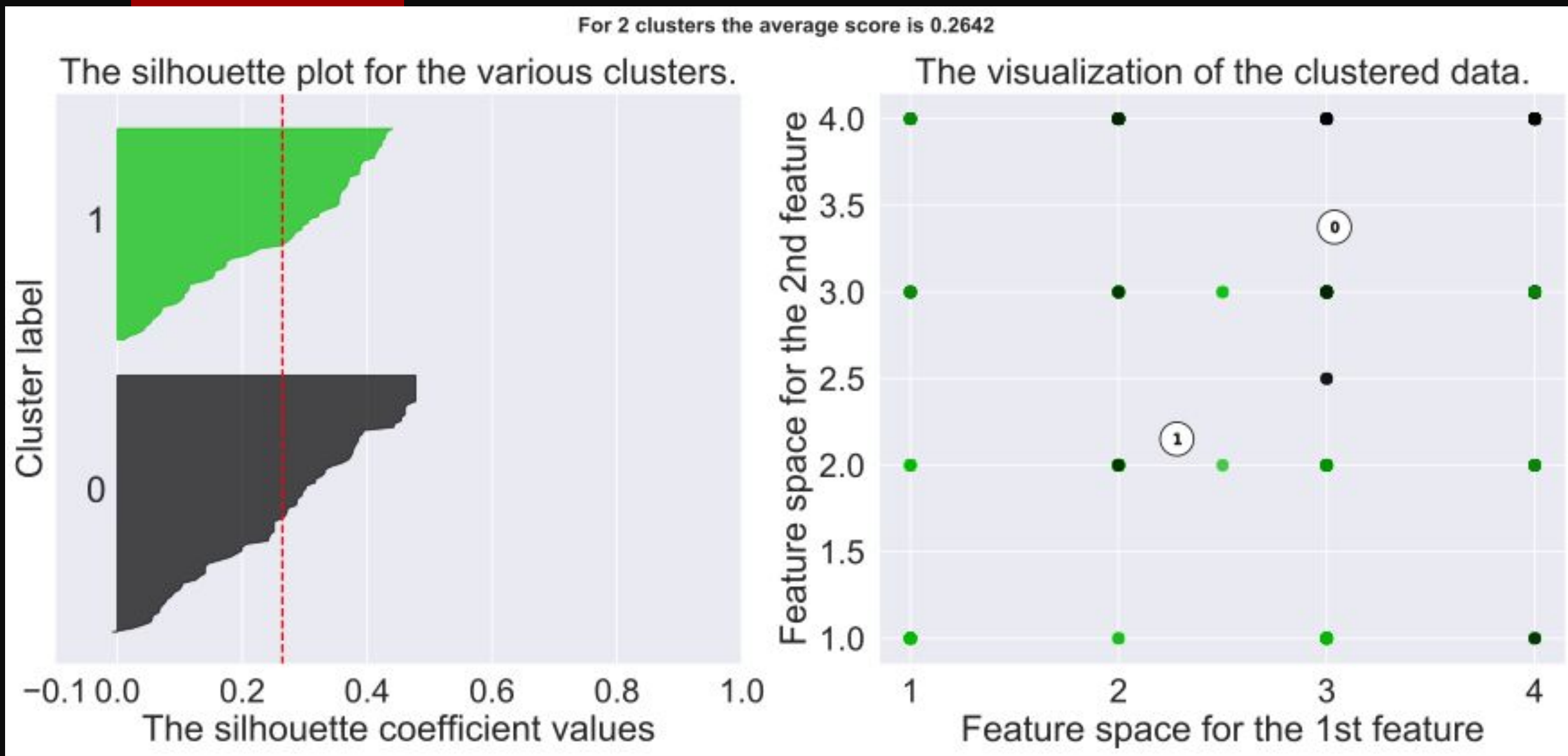


# k-means clustering

- Assume that there are  $k$  clusters
- Randomly select  $k$  centers
  - Assign each data point to the nearest center
  - Calculate the mean position of each cluster of points
  - Use the means as the new centers
- Repeat
- Repeat



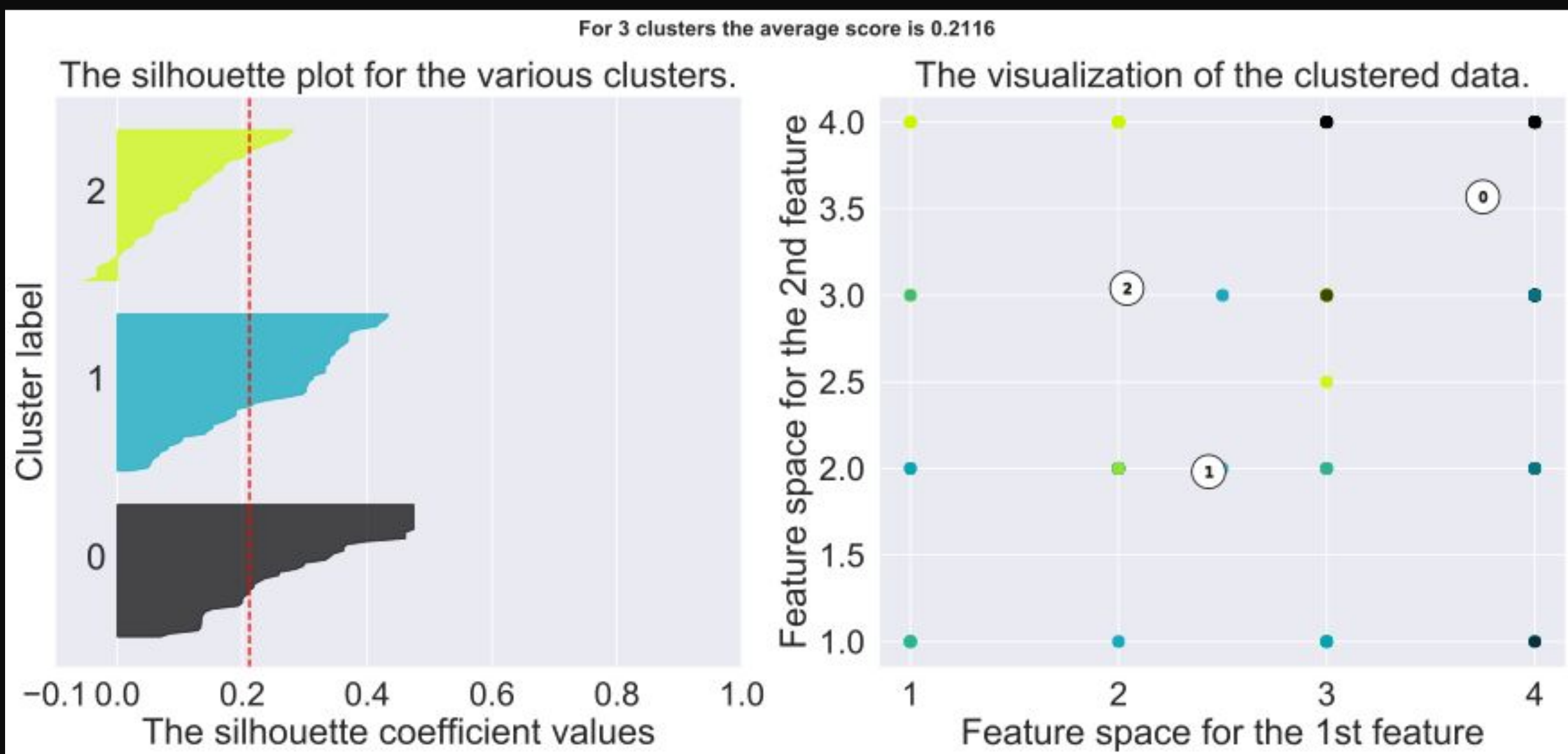
# Silhouette analysis



- Silhouette analysis

$$s(i) = \frac{b(i) - a(i)}{\max\{a(i), b(i)\}}$$

$a(i)$  – mean distance to points within the same cluster  
 $b(i)$  – minimum mean distance to points of another cluster

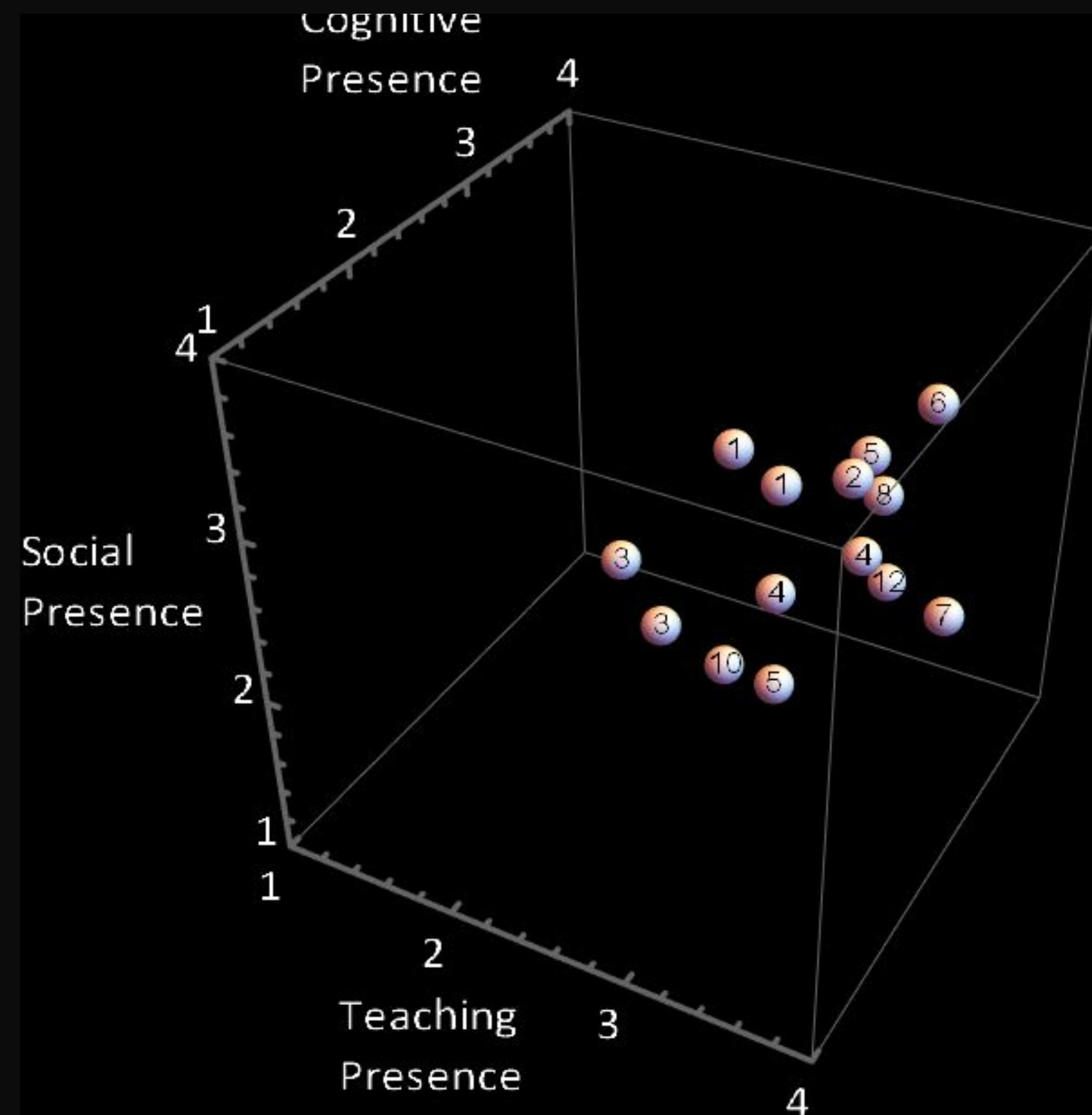


Confirm 2 clusters present.

Endorsers and Resisters.



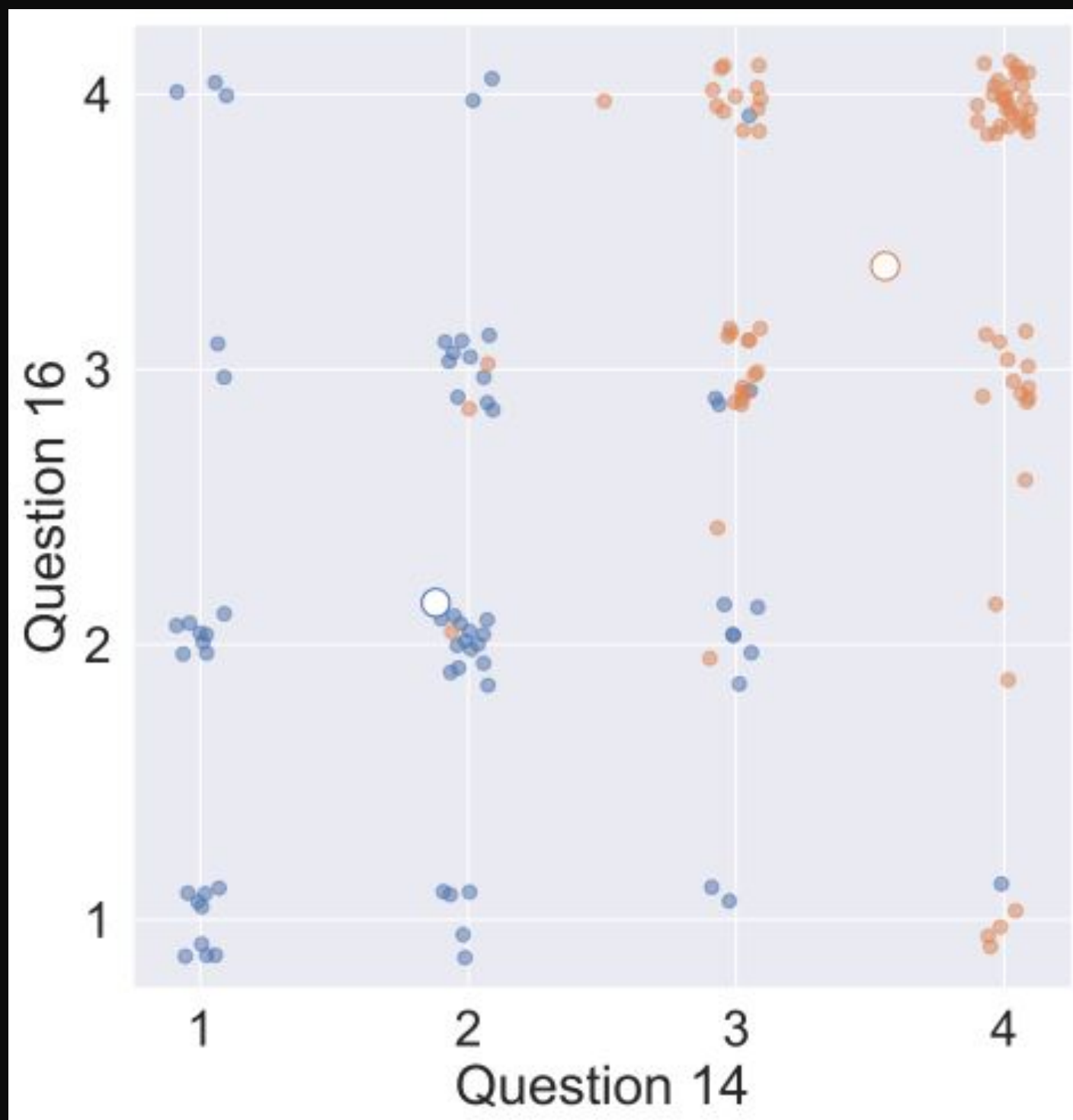
# Course-to-course variation



Course	Year	Respondents	Cognitive Pres. Mean	Cognitive Pres. SD	Teacher Pres. Mean	Teacher Pres. SD	Social Pres. Mean	Social Pres. SD
1	2020	26	2.66	0.874	2.96	0.816	2.96	0.56
1	2021	19	2.68	0.697	2.69	0.731	3.07	0.867
2	2019	5	2.83	0.532	3.27	0.308	3.	0.927
3	2019	8	2.28	0.888	2.28	0.86	2.51	0.631
3	2020	12	2.13	0.689	2.58	0.741	2.3	0.726
4	2019	5	2.52	0.769	3.02	0.614	2.4	0.673
4	2020	7	2.94	0.69	3.29	0.485	2.46	0.755
5	2019	9	3.07	0.49	3.25	0.612	2.99	0.577
5	2020	11	2.31	0.766	3.13	0.68	2.	0.699
6	2019	6	3.17	0.662	3.54	0.534	3.33	0.907
7	2019	3	2.87	0.902	3.78	0.385	2.3	1.56
8	2019	12	3.01	0.844	3.35	0.852	2.81	0.699
10	2020	3	2.33	1.15	2.83	1.61	2.	0.872
12	2021	3	3.2	0.529	3.33	0.382	2.13	0.416
SD			0.353		0.398		0.431	

# Endorsers and resisters

5 items in the survey probe preference of aspects of FC or traditional lecturing.



14. I would prefer to...

4 ...mostly be introduced to new material in class

3

2

1 ...mostly familiarize myself with new material before class

k-means cluster analysis and silhouette plots used to distinguish between two clusters of students:  
endorsers and **resisters**