

Mastering Early Number

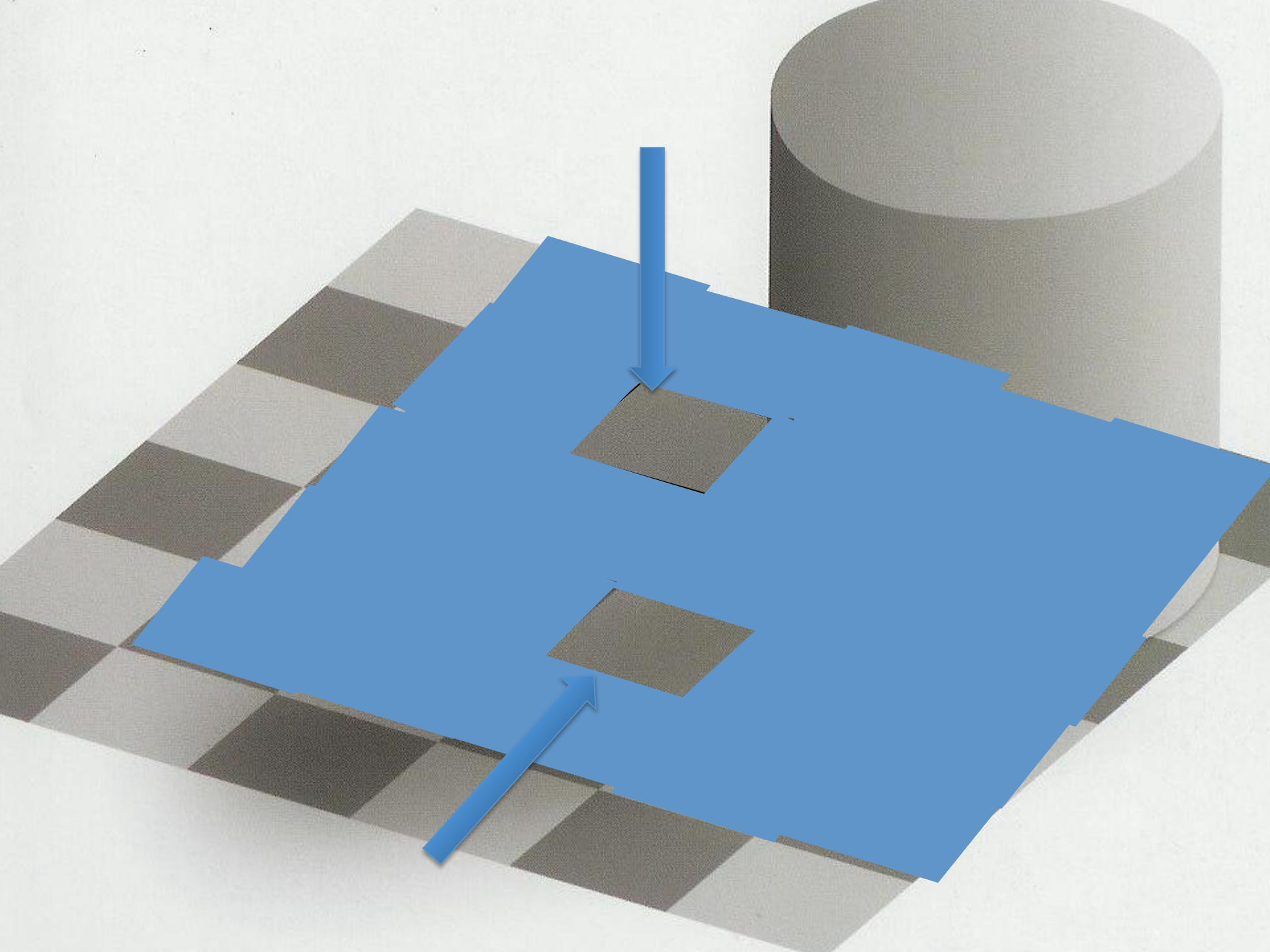
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Structure

- How do we perceive and learn? (10 mins)
- Cardinality and ordinality (theory) (10 mins)
- Approaching early number (in practice) (25 mins)
- Discussion / questions (15 mins)






Implications

- We perceive relations not things
- Perception is an 'active' process
- We learn by making new distinctions
- 'Objects' arise through interaction (verbal and physical)

Ordinality and Cardinality

9	5	7
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7	
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Symbolic
number
processing -
CARDINAL

Symbolic
number
processing -
ORDINAL

Non-symbolic
number
processing -
ORDINAL

Non-symbolic
number
processing -
CARDINAL

Approximate
Number
System (ANS)

Neuro-scientific evidence ...

- symbolic number ordering is the “odd man out,” when compared with symbolic cardinal processing and nonsymbolic number processing in general (Lyons and Beilock, 2013, p.17059)

- a key aspect of transitioning from ANS to symbolic representations of number involves extraction of ordinal information from the ANS (Lyons and Beilock, 2011, p.257).
- ... and codification of these ordinal relations in terms of direct associations between symbolically represented quantities (Lyons and Beilock, 2011, p.257).

Implications

- When students begin to under-achieve, they are typically offered concrete resources ...
- When students under-achieve *are they offered a curriculum that allows them to catch up with their peers?*
- Restricting the early study of number to the numbers 1-20 potentially does lasting damage

1

2

3

4

5

6

7

8

9

10

20

30

40

50

60

70

80

90

100

200

300

400

500

600

700

800

900

1,000

2,000

3,000

4,000

5,000

6,000

7,000

8,000

9,000

10,000

20,000

30,000

40,000

50,000

60,000

70,000

80,000

90,000

100,000

200,000

300,000

400,000

500,000

600,000

700,000

800,000

900,000

The Case of A

Relations vs objects

- In some contexts, what is required—eventually—is a fluency with mathematical symbols that is independent of any awareness of concurrent ‘external’ meaning. In linguistic jargon, ‘signifiers’ can sometimes gain more meaning from their connection with other signifiers than from what is being signified. (Tahta, 1985, p. 49)

Concluding thoughts

- *Number* can be approached as a system of relations, starting from students' ordinal awareness.
- Students can access number structure if study is not limited to 1-20.
- Actions on the Gattegno chart and TouchCounts can offer a physical experience of structure and symbolic relations, without the problems of creating a representation or model.