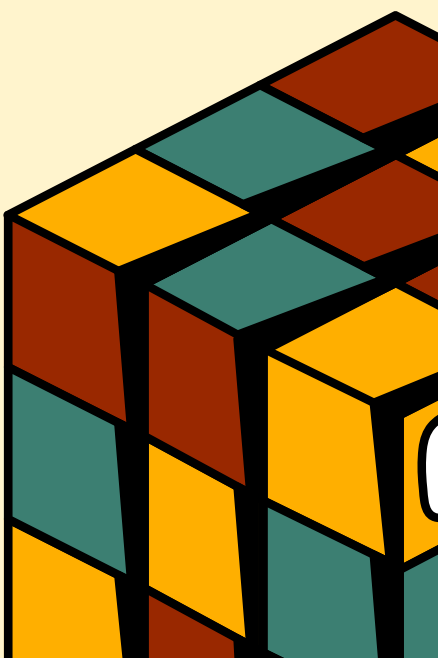
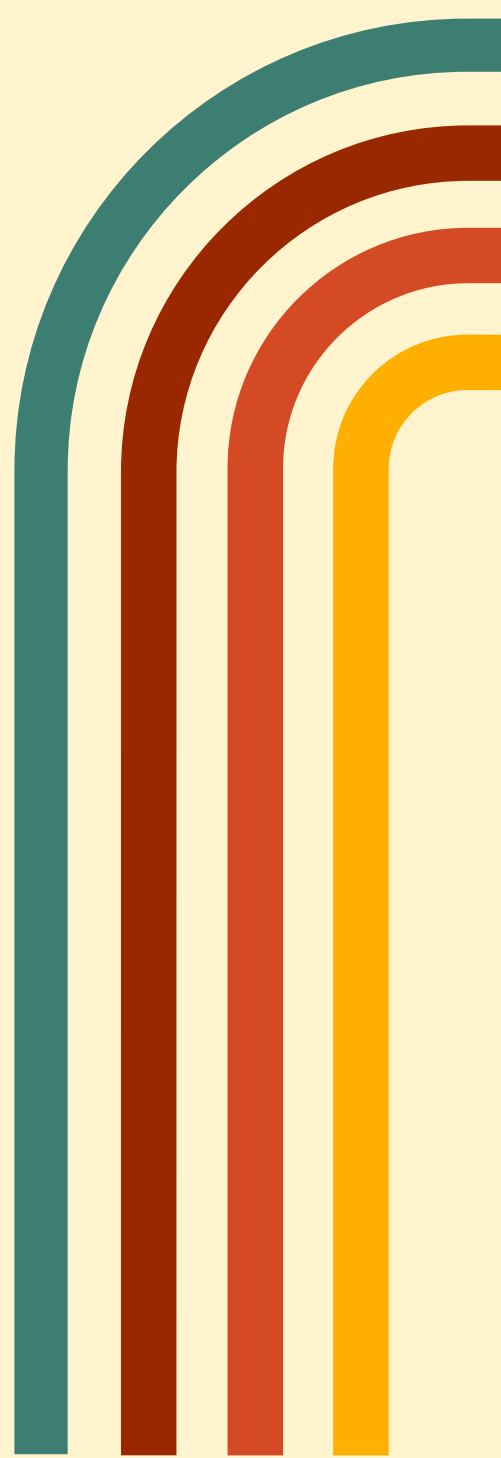
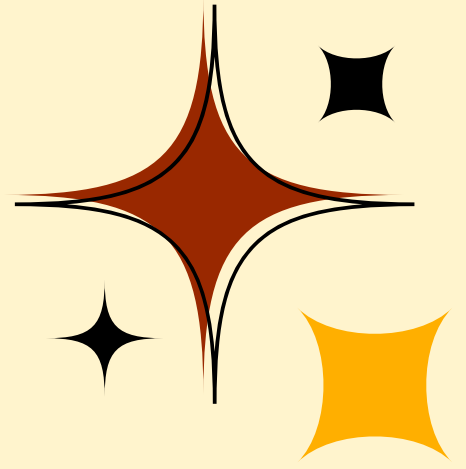


Piaget Dive

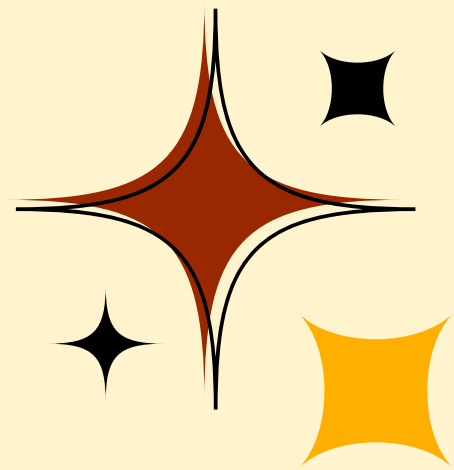
Elkind, 1961; Gelman, 1972

12 September, 2025





Presentation Outline

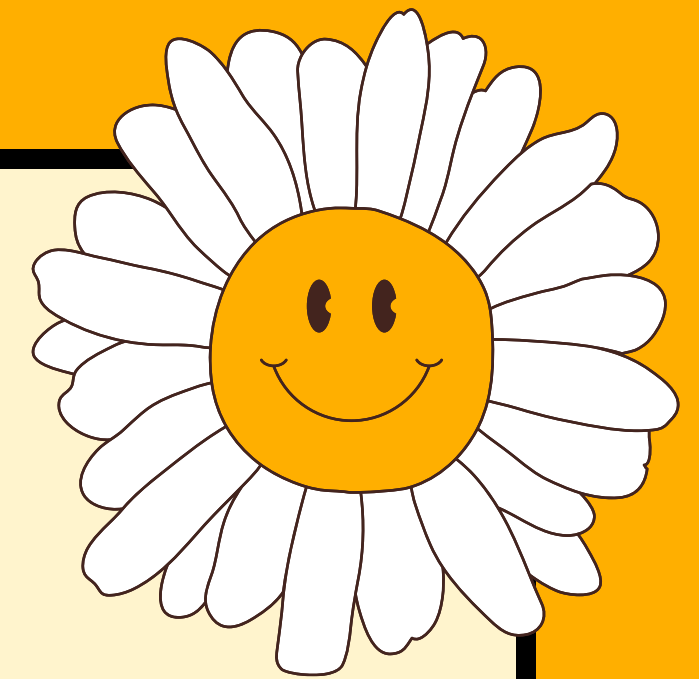


Overview of Elkind, 1961

Overview of Gelman, 1972

Bridging Themes

Introduction



- Replicate Piaget's conservation task
 - "Sausage" experiment
 - Two clay balls of same size & shape
 - Changed 1 into sausage shape
 - Asked children to predict if they would be the same
 - Claimed that **mass, weight, volume conservation followed stages and occurred in that order**
- Elkind—same procedure as Piaget EXCEPT:
 - Used cross-sectional sample of 175 children (grades K-6; ages 5-12) from school in MA
 - Had structured questions that were the same for each child

Elkind, 1961

Piaget's findings

- Mass conserved @ 7-8 yrs
- Weight conserved @ 9-10 yrs
- Volume conserved @ 11-12 yrs

Elkind's findings

TABLE 1 PER CENT ^a OF CONSERVATION RESPONSES FOR MASS, WEIGHT, AND VOLUME AT SUCCESSIVE AGE LEVELS (N = 25 at each Age Level)							
Type of quantity	5	6	7	8	9	10	11
Mass	19	51	70	72	86	94	92
Weight	21	52	51	44	73	89	78
Volume	0	4	0	4	4	19	25

^a Of 75 possible responses.

Why?

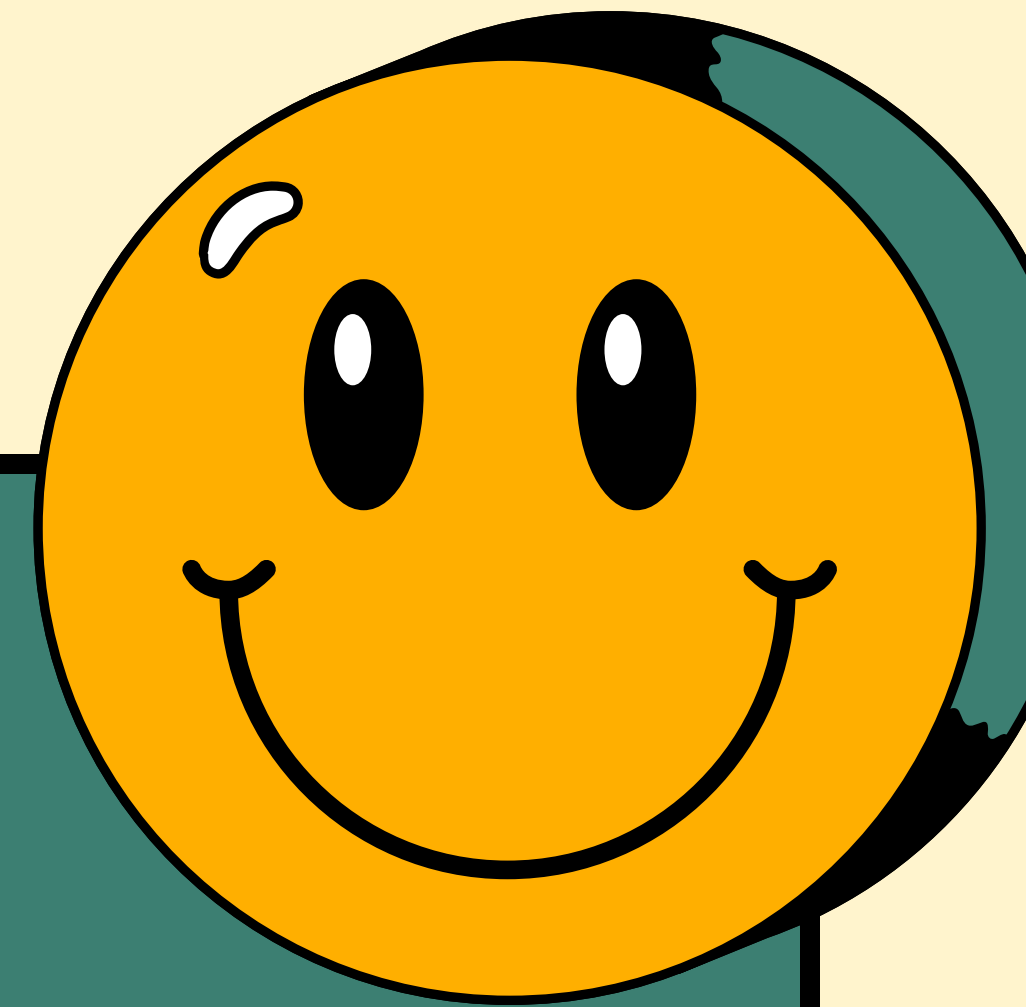
- The children's patterns of explanation/thought processes changed based on age
 - Romancing: "my uncle said so"
 - Perceptual: "it's longer, thinner vs. thicker, wider"
 - Specific: "you didn't add or take away"
 - General: "no matter the shape, it doesn't change the amount"
- Piagetian term: logical multiplication=ability to find the point of intersection between two things that are different

TABLE 2
PER CENT FOR EACH OF FOUR TYPES OF EXPLANATION GIVEN AT SUCCESSIVE AGE LEVELS
(N = 25 at each Age Level)

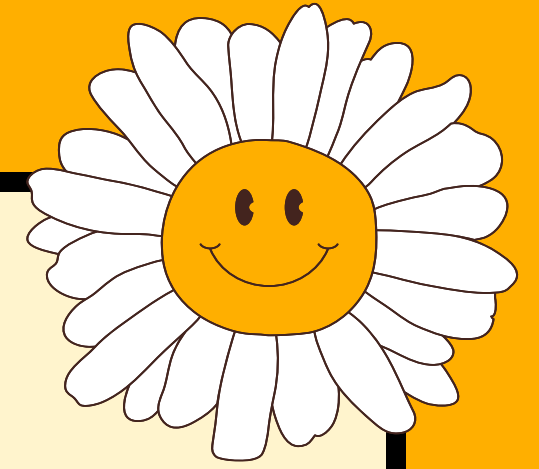
Type of explanation	Age level						
	5	6	7	8	9	10	11
Romancing ^a	4	3	7	7	0	1	0
Perceptual ^a	85	64	53	57	36	32	33
Specific ^b	11	33	40	36	60	51	49
General ^b	0	0	0	0	4	16	18

^a Explanation of non-conservation.

^b Explanation of conservation.



Elkind, 1961



Introduction

- Piaget's conservation tasks suggest young children fail to conserve number
 - Alternative view: failure may stem from language, attention, or estimation problems, not logical incapacity
 - Approach: Use "magic show" to test number invariance without relying on verbal questions/estimation
- Invariance Rules
 - *Relevant operations*: addition, subtraction (change number).
 - *Irrelevant operations*: displacement, rearrangement (do not change number)
 - Use these rules to correctly classify which transformations affect number



Gelman, 1972

Experiments

Gelman, 1972

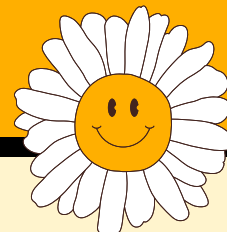
Experiment 1: Subtraction vs. Displacement

- 96 children (ages 3–6)
- Subtraction → strong surprise, search, “missing mouse”
- Displacement → little/no surprise, explained as movement
- Children recognized reversibility



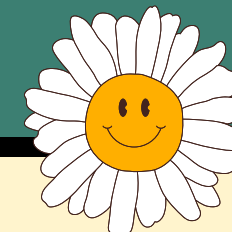
Experiment 2: Addition vs. Displacement

- 32 children (ages 3–4.5)
- Addition → surprise, doubt, “extra mouse”
- Displacement → still winner, no surprise
- Explanations used addition/subtraction logic
- Children recognized reversibility



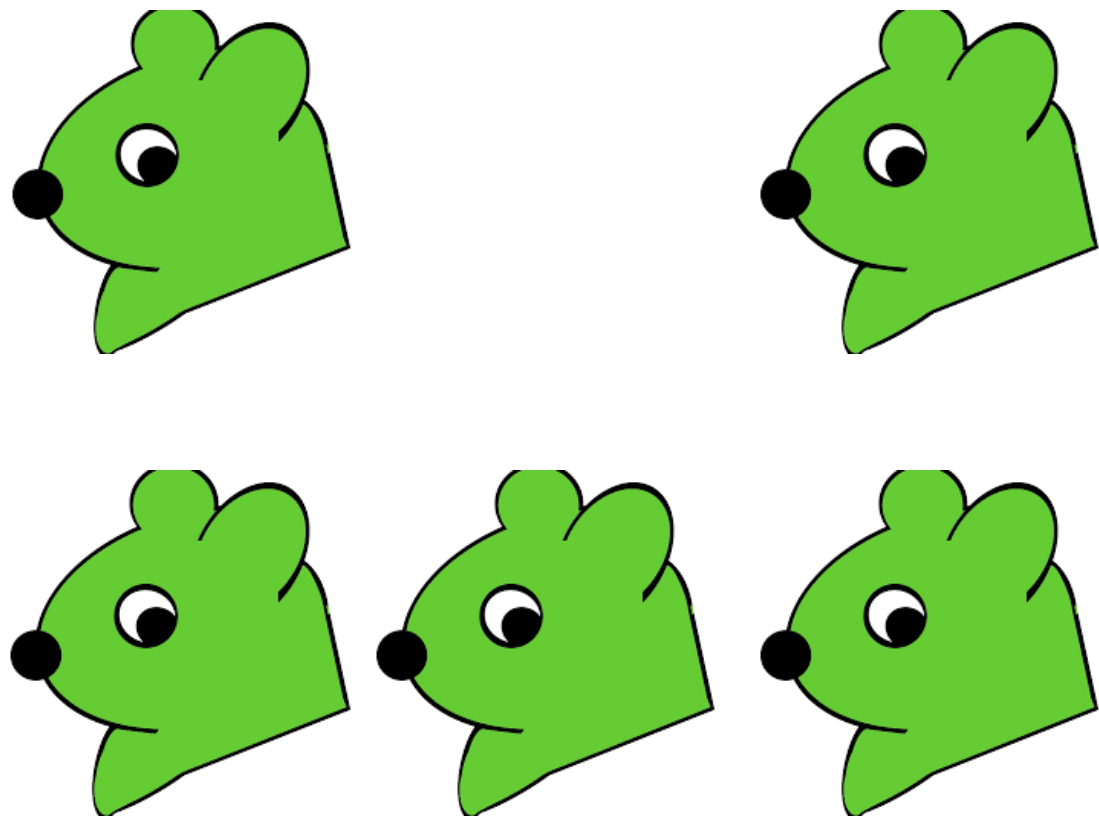
Control: Standard Conservation Task

- Classic Piaget rows of 3 chips
- 3-year-olds: almost always judged unequal
- 4-year-olds: often failed too
- Correct answers rare, explanations not logical
- Shows conservation failure even for small numbers



Experiments

Gelman, 1972



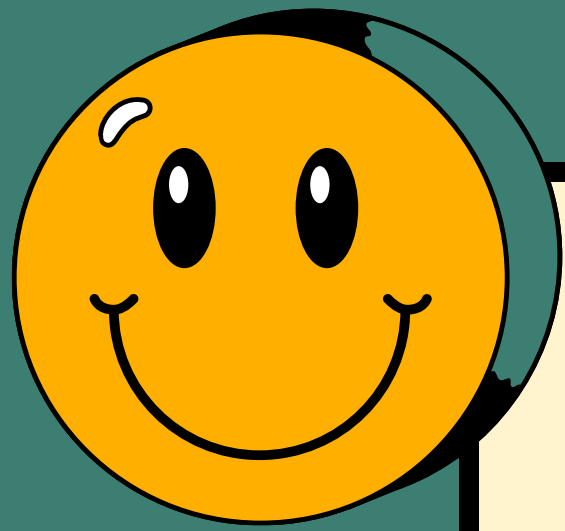
Logic of Design

Redundant Cue
in Phase II
Transformation
Direction or
Locus of Change

SCHEMATIC ILLUSTRATION OF PHASE II & III DISPLAYS

		Phase II		Phase III	
	Group Label	Winner	Loser	Previous Winner	Previous Loser
LENGTH	SUBTRACTION from end	Group LSE	○ ○ ○	○ ○	○ ○
		Group LSM	○ ○ ○	○ ○	○ ○
	DISPLACEMENT shorten	Group LDS	○ ○ ○	○○○	○ ○
		Group LDL	○ ○ ○	○ ○ ○	○ ○
DENSITY	SUBTRACTION from end	Group DSE	○ ○ ○	○ ○	○ ○
		Group DSM	○ ○ ○	○ ○	○ ○
	DISPLACEMENT shorten	Group DDS	○ ○ ○	○○○	○ ○
		Group DDL	○ ○ ○	○ ○ ○	○ ○

FIG. 1.—Schematic presentation of the eight Phase II–Phase III display conditions used in experiment 1.



Discussion

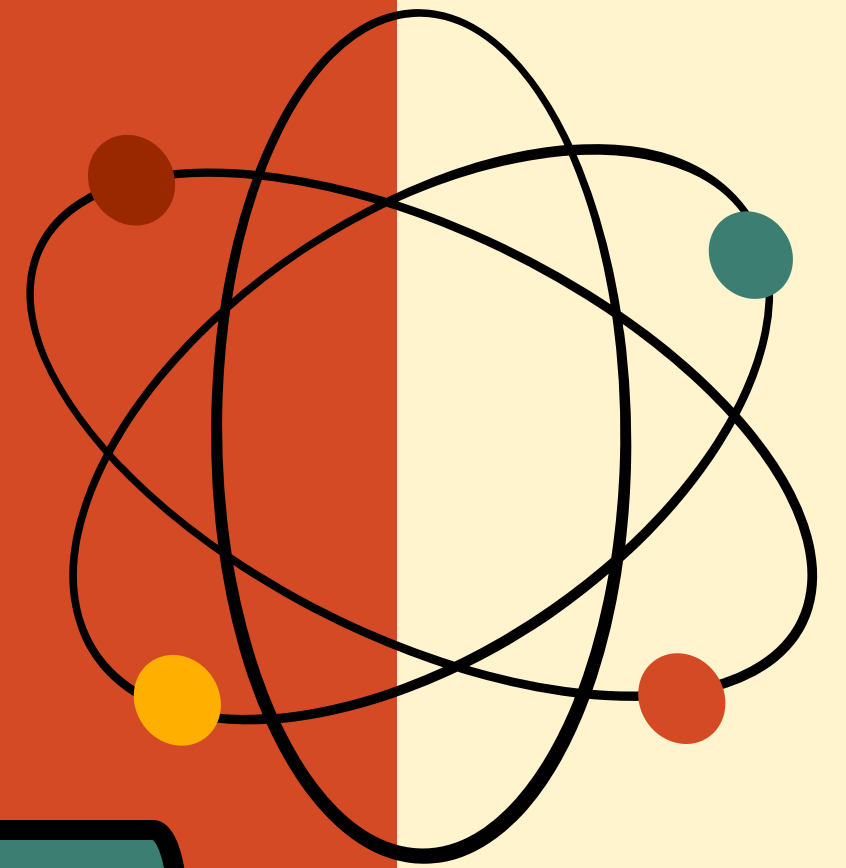
- Findings:
 - Very young children **can**:
 - Treat small numbers as invariant under displacement
 - Correctly classify addition/subtraction as relevant operations.
 - Suggest reversibility (e.g., adding undoes subtraction).
- Contradiction with Piaget:
 - Conservation failure \neq absence of logical capacity
 - Likely due to language confusion, attentional shifts, or estimation demands
- Implication:
 - Children possess logic system for small-number invariance before reaching “concrete operations”

Gelman, 1972



Bridging Themes

Cross cutting theme=building on Piaget's conservation tasks













Elkind, 1961:

- True replication of Piaget
- Used verbal learning and recall
- Focused on explanations and reasoning

Gelman, 1972:

- Challenged Piaget's methods and findings
- Used reinforcement and took out verbal recall
- Focused on logic rules "built-in" to the task

Type of conservation	Starting configuration	Transformation	Final configuration
Liquid quantity	 Is there the same amount of water in each glass?	Pour water from one glass into a shorter, wider glass.	 Now is there the same amount of water in each glass, or does one glass have more?
Number	 Are there the same number of pennies in each row?	Stretch out the top row of pennies, push together the bottom row.	 Now are there the same number of pennies in each row, or does one row have more?
Length	 Are these sticks the same length?	Move one stick to the left and the other to the right.	 Now are the sticks the same length, or is one longer?
Mass	 Does each ball have the same amount of clay?	Roll one ball so that it looks like a sausage.	 Now does each piece have the same amount of clay, or does one have more?
Area	 Does each cow have the same amount of grass to eat?	Spread out the squares in one field.	 Now does each cow have the same amount to eat, or does one cow have more?



"Sausage" Experiment Activity

- Get into groups of 3-4
- Shape your clay into two equal/identical balls
- Roll one ball into a "sausage" shape and keep the other the same
- As a group:
 - Reflect on what kinds of explanations children of different ages might give
 - Romancing: "my uncle said so"
 - Perceptual: "it's longer, thinner vs. thicker, wider"
 - Specific: "you didn't add or take away"
 - General: "no matter the shape, it doesn't change the amount"
 - Discuss the rules/logic needed to understand the task