Situating Cognition through Conceptual Integration

Robert F. Williams
Lawrence University
Appleton, Wisconsin

www.lawrence.edu/fast/williaro
Understanding Human Cognition

Classical View

Internal symbol processing

Formal syntactic operations

Reference to world or possible worlds
Understanding Human Cognition

Classical View

SHIFT

Situated View
Understanding Human Cognition

Situated View

Coupling of internal and external in an interactive process.

Mediated by:
- internal plans or programs
- functioning of body / fit to environment
- artifacts and structure in the setting
- dynamics of events
- interaction with other agents
  ...
Distributed Cognition
(Hutchins 1995, 2001)

A “classical” view…
- Cognitive processes are those involved in memory, decision-making, inference, reasoning, learning, etc.
- Cognitive processes are characterized by the propagation and transformation of representations.

…with a “situated” twist:
- Cognitive processes may be distributed across:
  - internal and external structure;
  - members of a social group;
  - multiple scales of time.
- Cognitive “functional systems” operate by bringing representational media into coordination with one another.
Example: Ship Navigation
(Hutchins 1995)

Drawing a line on the chart executes a computation that depends on:

- the cultural history of people and tools whose activity went into the making of the chart
- the activities of the navigation team that measured the bearing reproduced in the line
Cognitive Functional Systems

How are these interrelated?

Computation (Coordination)  Conceptualization (Integration)

How are these interrelated?
Sample Domain: Counting Objects

How many?

“one, two, three…”

Coordinating action

#
How many?

“one, two, three…”

Touching objects

...
System #1: Coordination

“one”  “two”  “three” ...

Successful

Unsuccessful

Video montage of counting by touching

Video montage of miscoordination or losing track
**System #1: Conceptualization**

**SOURCE-PATH-GOAL** image-schematic structure:
- Counting path must incorporate every object, each only once

Trajector (TR = tip of finger) marks conceptual boundary:
- From Source to TR = Objects already counted
- From TR to Goal = Objects yet to be counted

When TR reaches Goal, last label uttered becomes total count.
Functional System #2

How many?

“one, two, three…”

Moving objects

...
System #2: Coordination

Video montage of counting by moving
System #2: Conceptualization

PROXIMITY / CONTAINER image-schematic structure:
- Spatially distinct groups for already-counted and to-be-counted objects
- Moving object from location #1 to location #2 changes its categorization
- When last object moved, TBC container becomes empty (anchor disappears)
- When that happens, last label uttered becomes total count
How many?

Functional System #3

Names of objects being counted
“[a], [b], [c] …”

Raising fingers

Objects not present in the setting

#
System #3: Coordination

Video montage of counting objects not present
System #3: Conceptualization

Fingers become proxies for objects being counted:
- Fingers raised or touched as objects named
- Every object must be named, each only once

Conceptual distinction marked by:
- Distinct finger state (e.g., raised = already counted) -or-
- Position of TR as in system #1

After last object named, total count determined by:
- Finger pattern recognition and naming -or-
- Re-counting the finger proxies (reciting counting labels)
Functional Systems for Counting

TOUCHING OBJECTS

Already counted "one" "two" "three" To be counted S TR G?

MOVING OBJECTS

To be counted 

Alread counted "six" "four" "two"

USING FINGER PROXIES

Already counted [a] [b] [c] To be counted

Already counted [a] [b] [c] To be counted

Conceptual aspects:
1. Addition of image-schematic structure (SOURCE-PATH-GOAL, PROXIMITY, CONTAINER)
2. Material anchoring of spatially distinct conceptual categories
Counting as Situated Practice

Video of counting on the clock
Transcript (1)

4 Teacher: now another way that we say it

5 (1.0)

6 is we count by fives

7 (0.3)

8 when we move this,

9 from number to number—there’s five minutes

10 between each number

11 (0.6)
so if we were going to count by fifes it would be:

12

13

14 five

15 S:

16

17 Ss:

18 Teacher:

19

20 Ss:

21 Teacher:
Prompting for a New Space

now another way that we say it
Activating the Counting Input

Counting by Fives

is we count by \textit{fi:ves}
Conceptual Mapping #1

“five, ten, fifteen…”

when we move this,
Conceptual Mappings #2 and #3

“five, ten, fifteen…”

from *number* to *number* =
Conceptual Mapping #4 (and #5)

“five, ten, fifteen…”

there’s **five minutes** between each **number**
Transition to Running the Blend

so if we were going to count by *fives* it would be:
Running the Blend: Counting on the Clock

“five, ten, fifteen…”

days

hours

minutes

SSS

G

S “five”

S “ten”

S “fifteen”

(0.5) five

(0.6) ten

(0.4) fifteen
Conceptual Integration Network

Counting by Fives

Time Measurement

Counting on the Clock
Twin Aspects of Functional Systems

Computation
- Cognitive functional systems operate by bringing media into coordination with one another. (Hutchins)
- Humans make these systems function by:
  - Generating structures, and
  - Bringing structures into coordination.

Conceptualization
- The operation of functional systems may depend on:
  - imposing specific image-schematic structure, and
  - anchoring conceptual distinctions in blended mental spaces.
- Situated instantiation of a functional system may require novel mappings from conceptual inputs to structures present (or absent) in the setting.
References


