Two Theories of Home Heat Control

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"Human beings strive to connect related phenomena and make sense of the world."

FOLK THEORY

CHARACTERISTICS
- Shared by a social group
- Acquired from everyday experience or social interactions.
- Uses abstractions which
  - apply to many analogous situations
  - enable predictions
  - guide behaviour

INFERRED USING METHODS DEVELOPED BY
- Lakoff and Johnson
- Quinn

EXPANSION OF COGNITIVE ANTHROPOLOGY FROM FOLK CATEGORIES TO MORE COMPLEX STRUCTURES
- Sets of propositions - (D'Andrade + Kay)
- Inference rules - (Cole & Scribner + D'Andrade + Hutchins)
- Cognition in everyday activities - (Holland + Lave & Rogoff + Murtaugh & Faust & De la Rocha)
- Connections in discourse - (Agar + Rice)

RELATED COGNITIVE STRUCTURES
- NAIVE THEORY (diSessa + McCloskey + Caramazza & Green)
- MENTAL MODELS (deKleer & Brown + Gentner & Stevens + Johnson Laird)
- NAIVE PROBLEM REPRESENTATION (Larkin)
- INTUITIVE THEORY (McCloskey)

"The non-recognition of conflicting systems and the persistence of the folk system both resemble phenomena at a cultural boundary."

INSTITUTIONALIZED THEORY

CHARACTERISTICS
- Used by specialists
- Acquired from scientific literature or controlled experiments
- Contrasts folk theory

"Folk theory is resistant to change."

TWO THEORIES OF THERMOSTATS

Majority of the population holds a combination of these two theories.

FEEDBACK THEORY

WHAT?

The thermostat senses the temperature and turns the furnace on/off to maintain an even temperature → More closely related to expert theory.

HOW? → Theory posits that the furnace runs at a single constant speed.

VALVE THEORY

WHAT?

The thermostat controls the amount of heat. → HOW? → Temperature is not maintained by the thermostat itself, rather it is a balance set by the human operator.

THERMOSTAT SETTING IS CHANGED WHEN THE DESIRED TEMPERATURE CHANGES.
- When waking/going to sleep
- When entering/exiting the house
- Around mealtime.

↓ BY USING

A temperature-activated switch that can be on/off but cannot control the amount of heat from the furnace.

DRAWBACK → Does not correspond to the mechanism inside the device.

THE EXPERTS PERSPECTIVE

Heating experts consider the valve theory incorrect even when it provides its users with about the same number of useful predictions as the feedback theory.

WHY?

After training, experts possess a full, institutionally sanctioned theory, which can be arrived at from the feedback theory by simply adding details and adjacent systems.

IN CONTRAST → Arriving from the valve theory requires a conversion.

→ Experts evaluate folk theories from this perspective.

"The folk theory that is endorsed by the experts may not work as well in practical day-to-day application."

INDICATES → A theory that is useful for designing thermostats is not guaranteed to be a good theory for using them.

FUNCTIONALITY OF THE TWO THEORIES

HOW WELL DOES EACH FOLK THEORY MEET THE GOALS OF ITS USERS?

MANAGEMENT EFFORT & THERMAL COMFORT

Higher temperature provides faster warmup. → DENIED BY FEEDBACK THEORY

OUTCOME ← ASSUMPTION

Greater comfort would be realized if the thermostat were set high.

↓ WHY?

A person entering a cold house from outside will not feel warm when the air first reaches the correct temperature.

"Correct action in both cases follows logically from the valve model."

ASSUMPTION → Thermostats do not have feedback mechanisms

VALVE THEORY → APPROACH

When it is cold outside, you must turn the heat up.

↓ LEADS TO

Correct management

↓ WHY?

Infiltration and distribution asymmetries

ENERGY USE → PREDICTION

More energy/fuel is consumed at higher settings than at lower ones.

↓ WHY?

Higher inside temps cause more heat loss through the shell of the house.

"When the operation of the system is made visible, the folk, on their own, choose feedback theory."

PROS OF CONVERTING FROM VALVE TO FEEDBACK MODEL
- (1) Save management effort (not adjusting often)
- (2) Occasionally save energy (not leaving it set high)

CONS OF CONVERTING TO FEEDBACK MODEL
- Eliminates the theoretical rationale for night setback.
- Settings predict that savings from setback would be cancelled by later setup.

MONICA PODDAR
WEEK 10: READING