Learning through verbalization (2): Understanding the concept of "schema"



Undergraduate Cognitive Science courses

. Solving problems













Rules:





When Wednesday + Tuesday = Friday, what is Tuesday + Friday?

Z. Strategy choice

"What strategy would you use to solve many day problems?"



Memory: Rote memorization

Table: Look-up tables

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"To add a Sunday, the addend is the answer." "To add a Monday, choose the next day of the addend,"

"To add a Saturday, choose the previous day of the addend."

"Effectiveness of rules" are generalize-able only after ample practices.



Answer patterns: Coding criteria Count-up:

"13+2=15" and figure out its correspondent in the alphabet as 'o.'

Transfer:

Generate and apply an isomorphic rule like "To add 'b', choose the next-next letter of the addend."







"m + b = ?"

Count from 'a' to 'm(13)' and 'b(2)', get



Sparing practices does not affect the micro-generation of a schema.

Instructions for abstraction





Coding categories Concrete: Specific procedures only

Moderate: Strategies and their effects



School of Computer & Cognitive Sciences Chukyo University, Japan Naomi Miyake, Hajime Shirouzu & Yoshio Miyake

• Ample practice with reflection solicits natural generalization.



A short demonstration with a highly abstracted explanation might appear to save time, but could impair the quality of learning.

Class 1 "What kind of knowledge were your rules?" **Class 2** "Explain how to solve the day arithmetic to your friends." **Class 3** "What is the most important point of the day's lesson?"

Abstraction levels of summaries



e.g.) "With rules, we can solve the problems faster."

High: Commonality of strategies

e.g.) "Without much thinking, I solved the alphabet problem with a day arithmetic rule. If we had done alphabets first, I would have applied the alphabet rule to the day arithmetic."

Concrete experience is the basis for significant reflection.