

EFFECTS OF SEMANTIC CONTENT ON LOGICAL REASONING WITH NEGATION

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The purpose of this study was to investigate how the semantic contents of natural language statements with quantifiers interact with the ability of people (with little formal training in logic) to negate these statements.

Reasoning with negations is important in mathematics and in everyday life (Antonini, 2001). Although there is a wide body of research about negation with conditionals (if p then q), negation with quantifiers (all, some, none p 's are/are not q) have not received the same attention. From research on formal rule training, we learned that it does not automatically transfer across problem isomorphs in reasoning with conditional negations (Wason, 1966). In the case of negations with quantifiers, we hypothesized that semantic content of statements interacts with people's ability to negate them, and that people perform better in statements with plausible negations.

An instrument with sixteen statements was developed with four sets of (four) statements in mixed order: i. statements with totally symbolic content (e.g., all x 's are y), ii. statements with nonsensical content (e.g., all morgies are brig), iii. sensible statements with true negations (e.g., all teenagers are lazy), and iv. sensible statements with false negations (e.g., all mammals breathe). For each type, statements with four quantifiers were prepared (all, some .. are, some .. are not, none). Undergraduate students taking computer science logic were invited to write negations for each sentence at the beginning of the semester. Results showed that most students consistently used the incorrect "opposite" (rather than contradictory) scheme (Antonini, 2001). Others tended to create plausible negations of sensible statements, although these negations were technically incorrect. Students were more likely to come up with correct negations when the negations were plausible.

References

- Antonini, S. (2001). Negation in mathematics: Obstacles emerging from an exploratory study. *Proceedings of the 25th International Conference For The Psychology of Mathematics Education*, Vol. 2, pp. 49-56.
- Wason, P.C. (1966). Reasoning. In B.M. Foss (Ed.), *New Horizons In Psychology*, Harmondsworth, England: Penguin.