

Betting as a Pathway to the Law of Large Numbers

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Self-construction of Strategies for Initiating Conceptual Change

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Background

Conceptual change

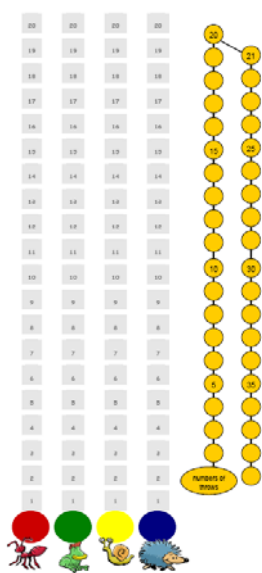
■ Vertical view:

- How can individual prior conceptions be overcome and further developed to appropriate ones? (Aspinwall & Tarr, 2001)

■ Horizontal view:

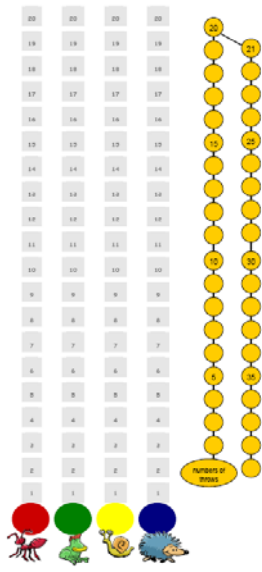
- How can learning environments support the extension of prior conceptions, and how can learners be enabled to choose the adequate conceptions in varying contexts? (Prediger, 2008; Abrahamson & Wilensky, 2007)

Learning environment



- **Guiding design principle:** complementing and enriching students' individual prior conceptions
- **Activity:** guessing outcomes of chance experiments within a game situation (Amit & Jan, 2007; Aspinwall & Tarr, 2001; Fischbein, 1982)
- **Focus:** development of strategies in order to win the game
- **Learning goal:** distinction between short-term and long-term behavior

Research questions



- Which strategies do the students use at the beginning, and which prior conceptions can we reconstruct behind them?
- How do the students change and/or enrich their repertoire of strategies?
- How do students become aware of the conditions when their bets are most suitable?
- What might support the change of strategies and conceptions in the classroom situation?

Empirical findings

Steps in Maurice's learning pathway:

- First step:
 - "My strategy: I pick the one that somebody else has already picked. And I take my special throwing technique."
- Second step:
 - "Always bet on ant because she is the champion in our group."
- Third step:
 - "Always bet on ant because the die has more red spots (7), frog (5), snail (5), hedgehog (3). The ant doesn't always win because for small distances, the hedgehog, snail and frog could also win sometimes. And for longer distances, the others need luck."

Empirical findings

Picture of the whole class:

Initially written betting strategies	Frequency
Social strategy (look for other's choices)	3 x
Influencing strategy	5 x
Bet on red ant, only theoretically justified	5 x
Bet on red ant, only empirically justified	4 x
Bet on red ant, empirically and theoretically justified	4 x
Bet on red ant without reason	2 x
Bet on other animal, empirically based	3 x
No written betting strategy	4x

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Because there are more red stickers, I take ant more often.

Empirical findings

Picture of the whole class:

Initially written betting strategy	Frequency
Social strategy (look for other's choices)	5 x
Influencing strategy	5 x
Bet on red ant, only theoretically justified	5 x
Bet on red ant, only empirically justified	4 x
Bet on red ant, empirically and theoretically justified	4 x
Bet on red ant without reason	2 x
Bet on other animal, empirically based	3 x
No written betting strategy	4x

I take ant because it is often first.

Empirical findings

Whole class interaction:

- Productive diversity of strategies and ideas

Excerpt from classroom discussion:

Teacher: Yes and, eh, Laurent just said something. What did Laurent say? I chanced to hear it (small pause), well, say it again (Laurent murmurs). Laurent, what did you say?

Laurent: Nothing (teacher laughs).

Sara: You said that it depends on the die.

Laurent: There were always more reds on it than other colours.

Several students: Yes!

Conclusion and outlook

- Powerful strategies from the beginning
- Distinction between short-term and long-term behavior
- Deeper understanding of the development of strategies
- Analysis of small group discussions might shed light on the turning points in the processes of conceptual change
- Complementation of the analysis of the learning processes by a social perspective (Cobb et al., 2001)



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