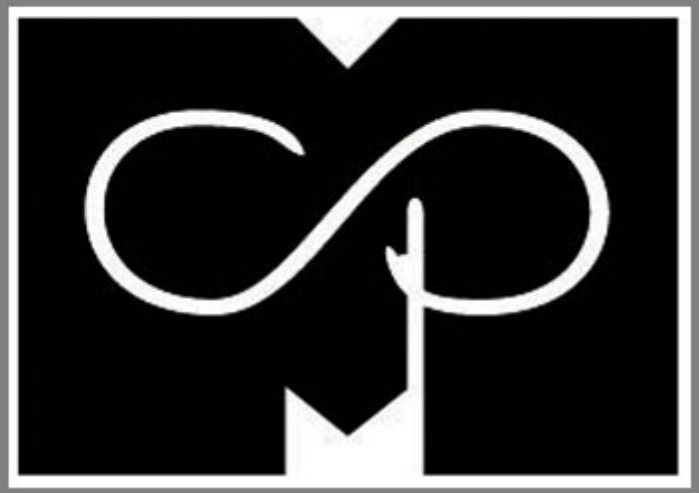

MCP

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NEWARK

Analysis and Inference to Students' Approaches about Development of Problem-Solving Ability

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Question

- How does students' problem-solving ability develop over time and what are some ways in which these skills might be nurtured along a developmental trajectory?

Objects

- 350 students in grades 5 and 8.
- Their approaches to 3 problems concerned proportional reasoning, geometry and visualization and probability (running laps, shaded triangle, probability 0 and 1).

Framework

- Silver (1985): nature of successful problem solving
  - **Pattern recognition**
  - **Representation**
  - **Understanding**
  - **Memory Schemata**

Problem and Approach

- Alice can run 5 laps around a track in the same amount of time that Carol can run three laps. When Carol has run 12 laps, how many laps has Alice run?

Approaches \ grade	**5th**	**8th**
Add 2 or subtract 2	25.8%	20.6%
Non-goal oriented operation among numbers	32.4%	9.5%
She is always 2 laps behind	7.0%	1.6%
Drawing a table	14.3%	17.5%
3 * 4 = 12 5 * 4 = 20	16.8%	23.8%
3 / 5 = 12 / x	0	19.0%
Sample size	244	63

Summery

5th	8th
Multi-representations	Numerical/ verbal
Concrete approach	Abstract approach
Misinterpreting problems	Better understanding to problems
Give an answer without reasoning/ process	No answer/ give answers along with the reasoning/ process
Unsystematic computation	More systematic computation
Creative examples	Standard examples
Less readable	More readable

Conclusion

- The results indicate an improvement in the area of “understanding of problems” from 5th to 8th grade.
- Increasing preference to more "mathematical" approaches (i.e. equations and formulae) indicated that more students were familiar with those strategies and were able to apply them based on the understanding of the problems.
- The memory schemata in the context of probability content were found to be poorly developed.
- Standardized approaches and textbook representations were noted most frequently in higher grades.

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