

# The Development of Planning Abilities in School Aged Children

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## Introduction

- We wanted to test children on their abilities to solve the traveling salesperson problem (TSP) which is the dilemma of choosing one route from a number of possibilities.
- How do these abilities differ between 4,5,6, 7, and 8 year olds?
- We observed the different strategies that each age group used.
- Local Strategies- thinking only in terms of the next move
  - Nearest Neighbor- choosing the closest point first even if it is not the best choice in the long run
  - Grouping- tendency to travel to a group of nodes before a single node
- Global Strategies- considering the end location and executing a route based on the end point (this is consistent with planning ahead)

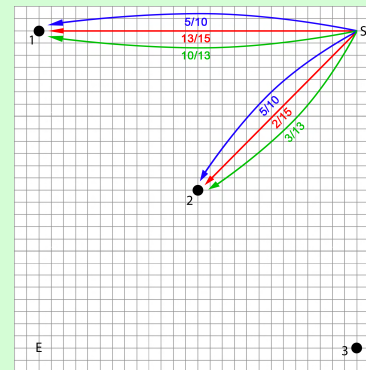
## Methods

- Participants
  - 11 Four year olds
  - 16 Five year olds
  - 8 Six year olds
  - 5 Seven to eight year olds
- Testing Sites
  - CSDC in Durham, NH
  - Growing Places in Durham, NH
  - Ages and Stages in Hampstead, NH
  - Moharimet Elementary School in Madbury, NH
- Protocol
  - Each child is tested in two conditions, on a game board and in a field environment with soccer cones.
  - Game Board
    - The child picks a character to play with. In random order, I ask the child to take the "shortest way" to pick up 3 game pieces placed in a configuration on a board and then to go to the end location. We play through 15 different configurations.
  - Soccer cones
    - The child completes a similar task, except this time it is life size. They must walk to the soccer cones instead of move a game piece. This condition requires the child to collect three whiffle balls and bring them to an end location. Through this "game" I can observe the way the children are planning routes.

## Data

We can make assumptions about the cognition behind each solution based on the order of the nodes the children select.

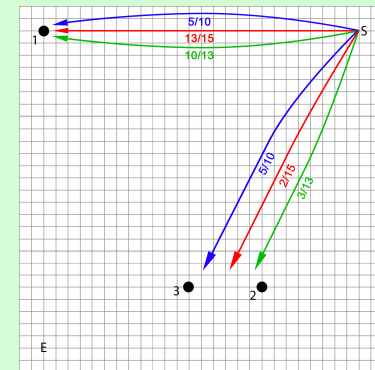
### First Choices on Nearest Neighbor Layout



This figure shows how the problem was solved differently between 4 year olds, 5 year olds, and 6-8 year olds, dealing specifically with nearest-neighbor thinking.

- 4 year olds: Nearest Neighbor strategy
- 5 year olds: Planning ahead
- 6-8 year olds: Planning ahead

### First Choices on Grouping Layout



This figure shows how children solve problems with two nodes grouped separately from the third. We wanted to see if there was a tendency to move to the group before the single node.

- 4 year olds: Solved with grouping
- 5 year olds: Many solved with grouping, but more planned ahead than in the 4 year old group.
- 6-8 year olds: Planning ahead

## Results

Even though the data hasn't been fully analyzed, we are already seeing valuable patterns.

- Four and five year olds are using different strategies, such as nearest neighbor, than the older participants.
- Different age groups appear to be thinking differently about the TSP problems.

## Conclusion

Although it was a triumph to collect this many children participants during the summer months with our available resources, more data would make the patterns much stronger. If the data doesn't prove to be significant enough to stand alone, we may combine our data with data from related child development studies.