It's more complicated than driving to the grocery store

How do animals search for food? Why would different animals have different strategies for searching for food?

When you are trying to answer a scientific question, you have a choice of either running an experiment or doing an observational study. In an observational study, the scientist observes the subject (in our case, flies) in its natural environment. In an experiment, the scientist puts the subject in a controlled environment (usually in a lab, but today in a classroom!) in order to see how it will react to specific situations.

When you are trying to learn something about an animal, what would be better about running an experiment? What would be better about doing an observational study?

When animals search for food, they can search randomly. What do we mean by random?

Coin-toss experiment: If you toss a fair coin a number of times, 50% (½ or half) of the time you are going to get a Head and the other 50% of time you are going to get a Tail. This means you cannot predict very well what a certain toss is going to produce. This is random. However, if it is not a fair coin you can get either too many Heads or too many Tails (say 75% or more) and it is not a random outcome.

When an animal is (or you are) searching, it can make one of 2 possible choices at every step, 1) Turn Right, or 2) Turn Left. If the search is random, then you should see a similar number of these choices occurring.

If you roll a 6-sided die a dozen times, how many times would you expect to roll each number?

How would you search for Easter eggs? Is it smart to start searching randomly at first? Why?

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Is it smart to change your strategy after you find the first egg? If so, how would you change your strategy?

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<u>Materials:</u>

- Houseflies
- Sugar water
- Square Petri dishes with fitted grids
- Timer or stopwatch
- Ruler

Pencil and paper

<u>Exercise 1: Student Search</u>

Instructions:

Before you perform this experiment with a fly, you will test two different search strategies in two different kinds of food patches. You will be given two grids that represent food patches but you do not know the location of the food items. You will take 24 steps on the grid, moving one square at a time, using a random and a non-random search. There are two possible moves on each step. 1) Turn Right 2) Turn Left

Random search strategy (By tossing a coin):

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<u>Non-Random search strategy:</u>

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Map your two search patterns on the two grids below

Random:

1a	1b	1c	1d	1e	1f
2a	2b	2c	2d	2e	2f
3a	3b	3c	3d	3e	3f
4a	4b	4c	4d	4e	4f
5a	5b	5c	5d	5e	5f
6a	6b	6c	6d	6e	6f

Non-Random:

1a	1b	1c	1d	1e	1f
2a	2b	2c	2d	2e	2f
3a	3b	3c	3d	3e	3f
4a	4b	4c	4d	4e	4f
5a	5b	5c	5d	5e	5f
6a	6b	6c	6d	6e	6f

Now put the answer key that shows the distribution of food in the two patches (marked with X) on your search patterns. How many food items did the two strategies discover?

Patch A: Random Strategy__________Non-Random Strategy______________

Patch B: Random Strategy__________Non-Random Strategy______________

How would you describe the two food patches? Did a certain search strategy work better for each patch? Why might this be?

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Exercise 2:

Now we will run the experiment with the fly. The arena represents a patch where we place a drop of sugar water as food. Two group members will record all the turns the fly makes, and two will record the square the fly is in at each 10-second interval.

Here you will write down every time the fly turns Right (R) or Left (L). Be sure that you write down the directions according to the *fly's perspective.* (If you are having trouble with this, just imagine yourself as the fly). Make sure you note when the fly finds the food, so that you can count the number of left and right turns before the fly finds the food and after.

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Number of Right Turns (before finding food):_______________ Fraction:

Number of Left Turns (before finding food): ________________ Fraction:

Number of Right Turns (after finding food):________________ Fraction:

Number of Left Turns (after finding food):__________________ Fraction:

On this grid note the position of the fly at each recording time, starting from 1 and continuing up to 24.

1a	1b	1c	1d	1e	1f
2a	2b	2c	2d	2e	2f
3a	3b	3c	3d	3e	3f
4a	4b	4c	4d	4e	4f
5a	5b	5c	5d	5e	5f
6a	6b	6c	6d	6e	6f

Now you can measure how far the fly walked between each time interval:

1) 2) 3) 4) 5) 6) 7)

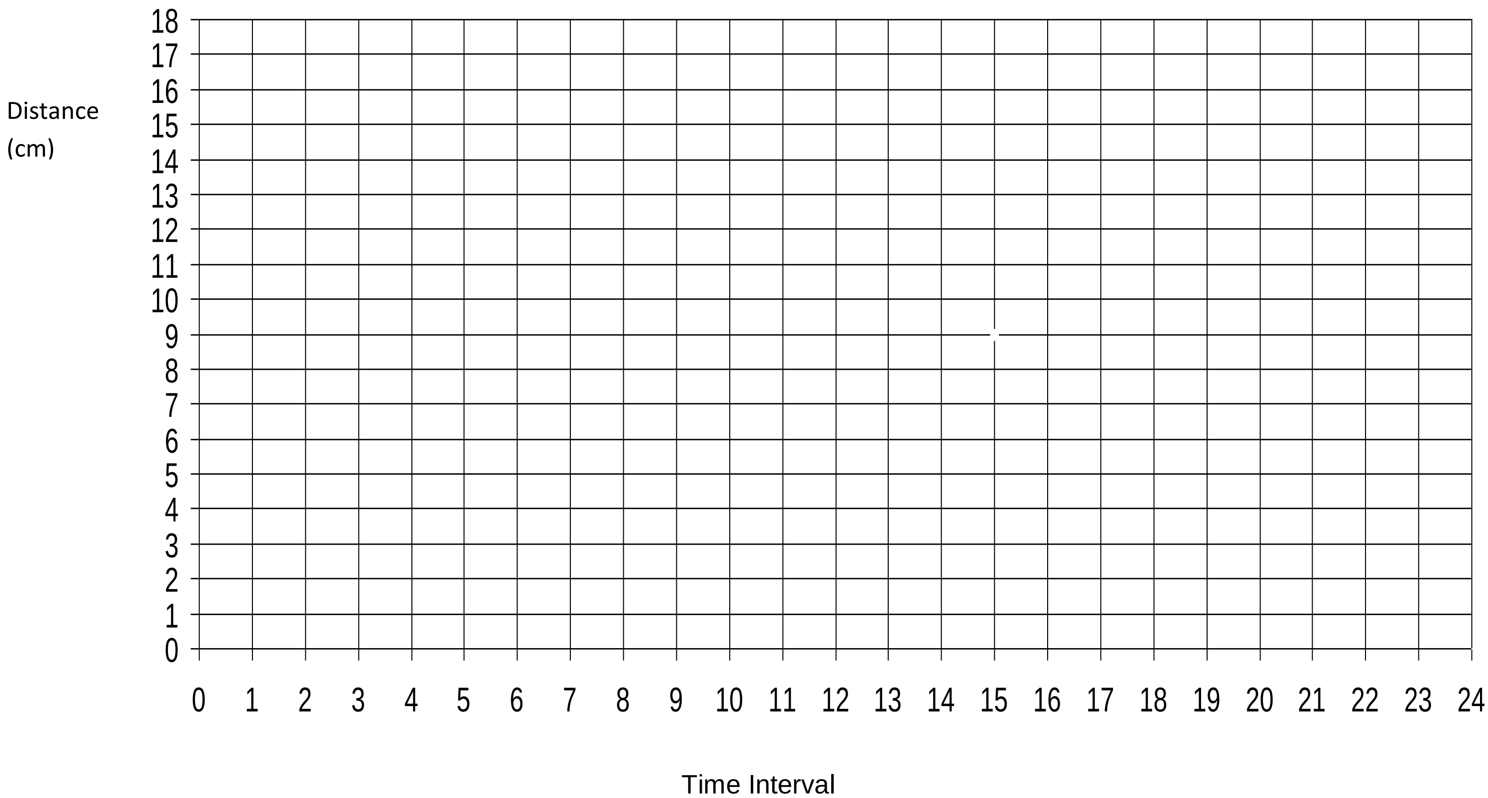
8) 9) 10) 11) 12) 13) 14)

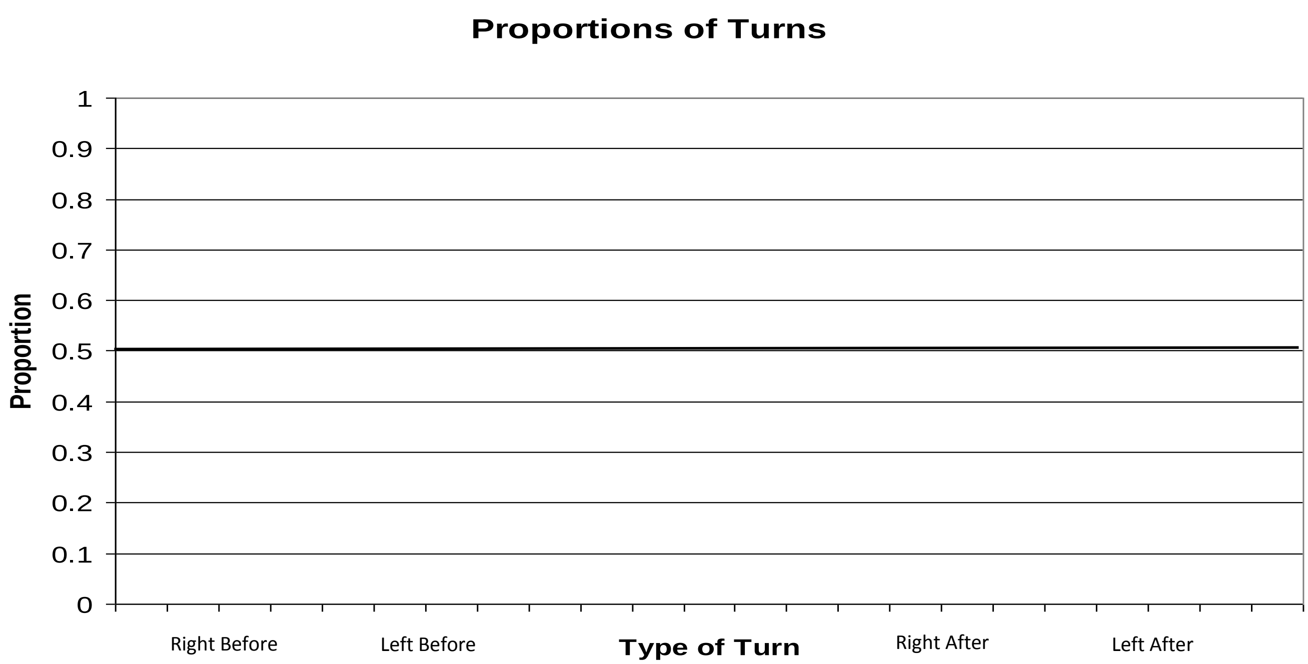
15) 16) 17) 18) 19) 20) 21)

22) 23) 24) 25) 26) 27) 28)

29) 30)

Plot the distance the fly traveled in each time interval. Draw a line on the time point when the fly found the food, then plot the points of all the distances you recorded on the previous page.





Did the distance the fly traveled in each time interval change after it found the food? If so, why do you think this happened?

Did the fly change the way it turned after it found the food? If so, why do you think this happened?