Quadrats and Transects in your Schoolyard

Bringing scientific procedures into your classroom doesn’t have to be intimidating! Along with other techniques, biologists use quadrats and transects to study life in a landscape. You can also collect abiotic data like shadows, soils, pH, and temperature.

Scientists need to collect data, and they need to collect it in a way that represents the landscape well, without using too many resources. Rather than counting every single object in a landscape, we will sample and make our best estimates.

The more samples you collect, the more representative of the actual population they represent, but it takes more time. For a classroom situation, your minimum number of samples should be 10, but aim for more (think 20 transects around 10 meters, or 50 quadrats).

Remember, you can make this as simple or as complicated as you want to.

Figure 1: Photo of a quadrat, each small square represents 4% of the area within the larger square. Photo from flickr user Doug Beckers.
Quadrats
Quadrats are a square that scientists place on a landscape. By seeing what lives in a sample of squares, they can make their best estimate about the landscape as a whole.

Questions you could study with a quadrat would be:

- What percentage of our schoolyard is plant matter vs. non-living matter?
- What is the most abundant plant in our schoolyard?
- Is there more grass on the North or South side of the school?

Build it!
You can use plastic tent pegs with a measuring stick and string to tie off quadrats. You can also use hula hoops, scrap wood, or meter sticks. If you like, you can tie string onto the quadrat to make it a grid, allowing for easier percentage estimates. Try any straight materials – even cardboard will work!

Remember that each quadrat used in your classroom study should be the same size.

Try it!
Question: How much grass cover does our schoolyard have?

Methodology:

- Have students work in groups of 2-3 to build a quadrat. Ensure that every pair in the classroom has an equally sized quadrat.
- Discuss percent cover as a group and practice by using drawings on the board.
- Head outside and try one quadrat together as a class showing how to record the data. As you practice, you will come up with questions about sampling procedure that all students should follow. For example, if a plant touches the edge of the quadrat, do you count it? Does the quadrat need to go all the way to the ground, or can it sit on top of the plants? Assign one or two students to note down your data collection procedure.
- Once you feel like the students are confident in the data collection procedure, have them collect data in their groups of 2-3. Each group will gently toss their quadrat to be as random as possible. Do not allow the quadrats to overlap.
- Students will observe what is inside the quadrat and collect data. Check in with each group to see if there are common questions and to help as needed. As students finish one data sheet, they can head to another area of the schoolyard and sample again (new data sheet).

Record: Record the contents of each quadrat on a separate data sheet. Code the quadrats by the student’s initials, the date, and number (NB-20150729-01). For organism type, you can be general (living/non-living), categorical (grass/leafy plants/soil), or you can get really specific and use species names. Ensure the class is collecting data in the same way. Encourage students to take a picture or sketch the quadrat.

Analyze: Add in all of the student’s data and average the percentage grass cover in this case. Have students discuss how well/not well this might represent the schoolyard.
**Transects**
Transects are a straight line scientists stretch over an area they want to study. They can be very long! Every certain amount of distance, a scientist will see what is touching the line.

Scientists can use these to study a gradient. For example, if you want to study how roads effect the landscape, a scientist would put a transect perpendicular to the effect, to study how far away the object effects the landscape.

Questions you would study with a transect could be:
- I wonder if some plants are found closer to roads rather than further away?
- How far do clams live from the edge of the ocean?

**Build it!**
You can use a long measuring tape or a rope with markings to build your transect.

**Try it!**
Question: Do the same plants live close to the side of the school as in the middle of the school yard?

Methodology:
- Have students work in groups of 2-3 to build a transect. Ensure that every pair in the classroom has an equal length, 10m in this case.
- Discuss how the transect will be laid out, and where the 0 end will be (at the side of the school).
- Head outside and try one transect together as a class showing how to record the data. Lay the transect out perpendicular to the edge of the school. Pull the transect line very tight and lay it down so it is as straight as possible. Every 50 cm, record what type of plant is under or touching the line. As you practice, you will come up with questions about sampling procedure that all students should follow. Do dead leaves count as a plant? Assign one or two students to note down your data collection procedure.
- Once you feel like the students are confident in the data collection procedure, have them collect data in their groups of 2-3. Each group will set up their transect perpendicular to the side of the school, with the 0 end at the school. Make sure each transect is two big steps away from the next closest one.
- Students will observe what is along the transect and collect data. Check in with each group to see if there are common questions and to help as needed. As students finish one data sheet, they can head to another area along the school and sample again (new data sheet).

Record: Record the plant at each distance on the data sheet. If you are unsure of the type of plant, a description (and photo) will be useful. Encourage pictures and sketches. Describe the gradient you are looking at, for example, the side of the school is 0cm, and it looks like there is a worn patch from 100cm-500cm from the school.

Analyze: Consider drawing a map of your schoolyard and plot the transect data on top to see patterns. Use stickers or coloured dots to represent different groups. You can also combine the data at each transect point (for example, every meter) and see how the points compare.
Expand!

There are many ways to make these two processes more scientifically robust and complex, but first, start with the basics! You can try combining the two for interesting studies.

Modifications and their related questions:

- Use a quadrat or transect as a focus tool rather than a measurement tool.
  - How do ants behave in this area?
- Combine quadrats with transects for point-intercept studies.
  - Does road water runoff affect biodiversity along the gradient?
- Repeat sampling weekly/monthly/seasonally
  - Does the amount of daylight affect the abundance of plants?
  - Remember to use the same procedure and method each time you go into the field. You can choose study sites or randomize your sites – just keep it consistent!
- Create a gradient to study a transect over time
  - How far will the nutrients in this compost spread? How long will it take?
- Study how accurate your samples are, and learn about statistics.
  - Spread a known number of items on the floor in the gym or the classroom. Have students randomly sample quadrats: try 1, 5, 10, 20, and 50. Using the area of the classroom and the area of your sample, you can estimate the total population and percent cover with the average numbers you found in each quadrat. Compare this to the actual percent cover and population. Which sample size is the most accurate? At what point are you taking too many samples?
  - Try with different sized quadrats to see how size affects your sample. If you are sampling books on the floor of the classroom, what happens if your quadrat is the same size as one book? Have students discuss and come up with an optimum size for the classroom.
- Have students come up with their own question in the schoolyard and choose the most appropriate measuring tool. Encourage them at each step of the scientific process:
  - Make observations
  - Think of an interesting question
  - Formulate a hypotheses
  - Come up with your testable predictions
  - Gather data and test your prediction – create your own data collection tool
  - Refine, alter, expand, or reject your hypotheses
  - Share your results and learn from others
  - Repeat as needed!

Figure 2: Dr. Simon Donner using a transect underwater to study coral abundance.
Figure 3: A point-intercept study from michellebiology.blogspot.ca
# Quadrat Data Sheet

Data collector(s):

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<thead>
<tr>
<th>Date:</th>
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Location of quadrat:

<table>
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<th>Abiotic observations:</th>
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Quadrat Number:

<table>
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<th>Data</th>
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<table>
<thead>
<tr>
<th>Organism Name or Type</th>
<th>Count found in Quadrat</th>
<th>% cover of Quadrat</th>
<th>Notes</th>
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**Additional Notes**

*Please include a sketch or photograph on the back of this sheet.*

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**Transect Data Sheet**

Data collector(s): 

Date: 

Location of Transect: 

Description of Gradient: 

Abiotic observations: 

Transect Number: 

### Data

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<th>What is touching the transect here? Name or description</th>
<th>Notes</th>
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**Additional Notes**
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