

Investigating the living conditions of woodlice

Student assessment in an inquiry-based module

Assessment of Inquiry

- *How do we assess inquiry skills?*
- *Written evidence?*
- *Which inquiry skills?*
- *How many skills?*
- *During inquiry or at the end*
- *How much teacher time and effort?*
- *Summative or Formative*
- *Grades*
- *Feedback*

Lesson 1 (single period)

- Open discussion in small groups
- Previous concepts/knowledge
- Asking testable questions
- Choosing a variable to investigate
- Drawing of experimental setup
- Equipment list
- Woodlice requirements!

Lesson 2 (Double session)

- Report booklets handed out
- Chamber construction, equipment distribution
 - Cardboard boxes
 - Trays
 - Lamps
 - Foodstuffs
 - Wood (fresh, decomposed, timber, sticks etc)
 - Cotton wool, paper towels, sand, soil etc...
- Experiments carried out
- Initial results gathered, analysed and presented

Lesson 3 (Double session)

- Re-formulating hypotheses
- Experimental re-design
- Replication
- Drawing conclusions
- Presenting data
- Written communication

An investigation into the living conditions of woodlice.

Group Codename:

Your task: to investigate the living conditions of woodlice.

Assessment: You will be assessed on the following aspects of the investigation:

- Formulating hypotheses
- Designing and planning your experiments
- Drawing conclusions
- Explaining unexpected results
- Reporting, comparing and discussing results
- Providing suggestions about how to improve the investigation.

Choosing your variable:

Variables: There are many variables that could affect the life of a woodlouse. Suggested variables for you to investigate are:

- Intensity of light
- Amount of moisture
- Food preferences

Discuss these variables in your group and decide which one you would like to investigate. Write your choice below.

Which variable have you decided to investigate?

.....

Formulating your hypothesis:

Now you have decided which variable you would like to investigate, use the space below to explain the *question(s) you are trying to answer (or the problem(s) you are trying to solve)*.

Questions to be answered:

.....
.....
.....
.....

Predictions: Use any scientific knowledge you already have, answer the following questions. Try and be as clear as you can in your answers.

What do you think will happen?

.....
.....
.....
.....
.....
.....
.....

Why do you think this will happen?

.....
.....
.....
.....
.....
.....
.....

Planning your investigation:

You have chosen one variable from the 3 suggested earlier. What other variables do you think might be important for woodlice?

.....
.....
.....

What will you do about these other variables in your investigation? Explain your answer in some detail.

.....

.....

.....

.....

.....

.....

.....

Equipment: List the equipment that you will need for your experiment(s).

.....

.....

.....

.....

.....

Plan Outline:
Outline your plan in the space below. Use a diagram if you think this would make your plan easier to explain (and understand!)

.....

.....

.....

.....

.....

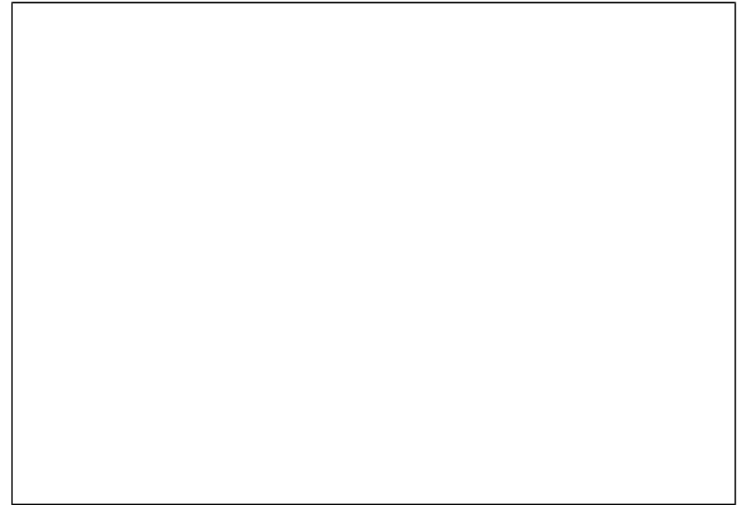
.....

.....

.....

.....

Diagram:



Procedure:

In this section, try to be as clear and specific in your language as possible, so that another student *should be able to carry out your experiment* after reading your methods.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

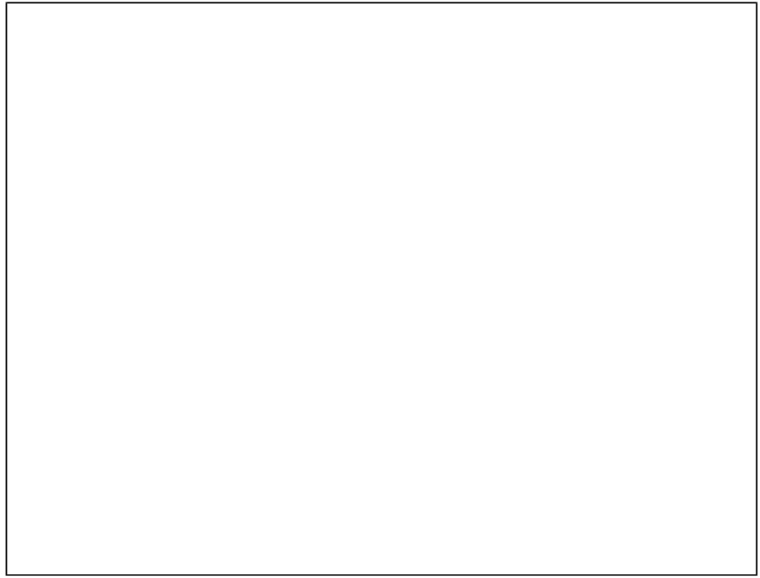
.....

.....

.....

.....

.....



Observations and Results: Take care in this section to present your findings in the *clearest* and most *presentable* way that you can.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

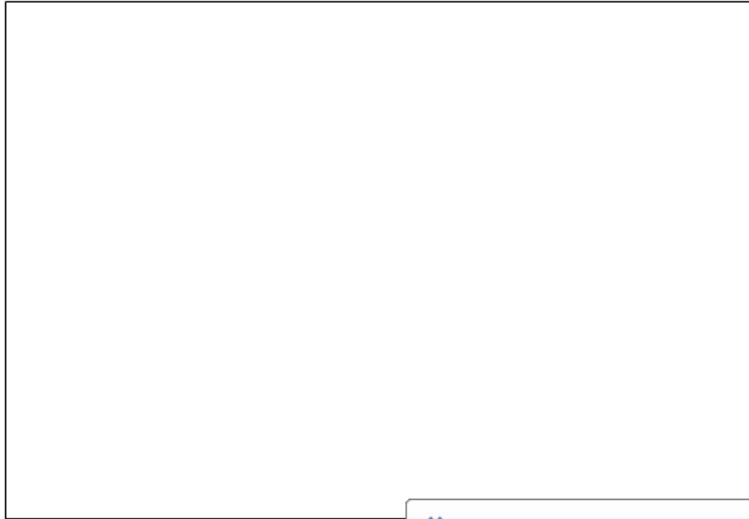
.....

.....

.....

.....

.....



Conclusions:

Did you identify any *patterns*? What *conclusions* can you draw from your results?

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Do your results agree with your predictions? Discuss any unexpected results or observations below.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

How do your results compare with other groups?

.....

.....

.....

.....

.....

.....

.....

.....

If you were to do the experiment(s) again, what would you do differently?

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Were there any questions thrown up by your results? If you were to carry on with your investigation, what further experiments might you do?

.....

.....

.....

.....

.....

.....

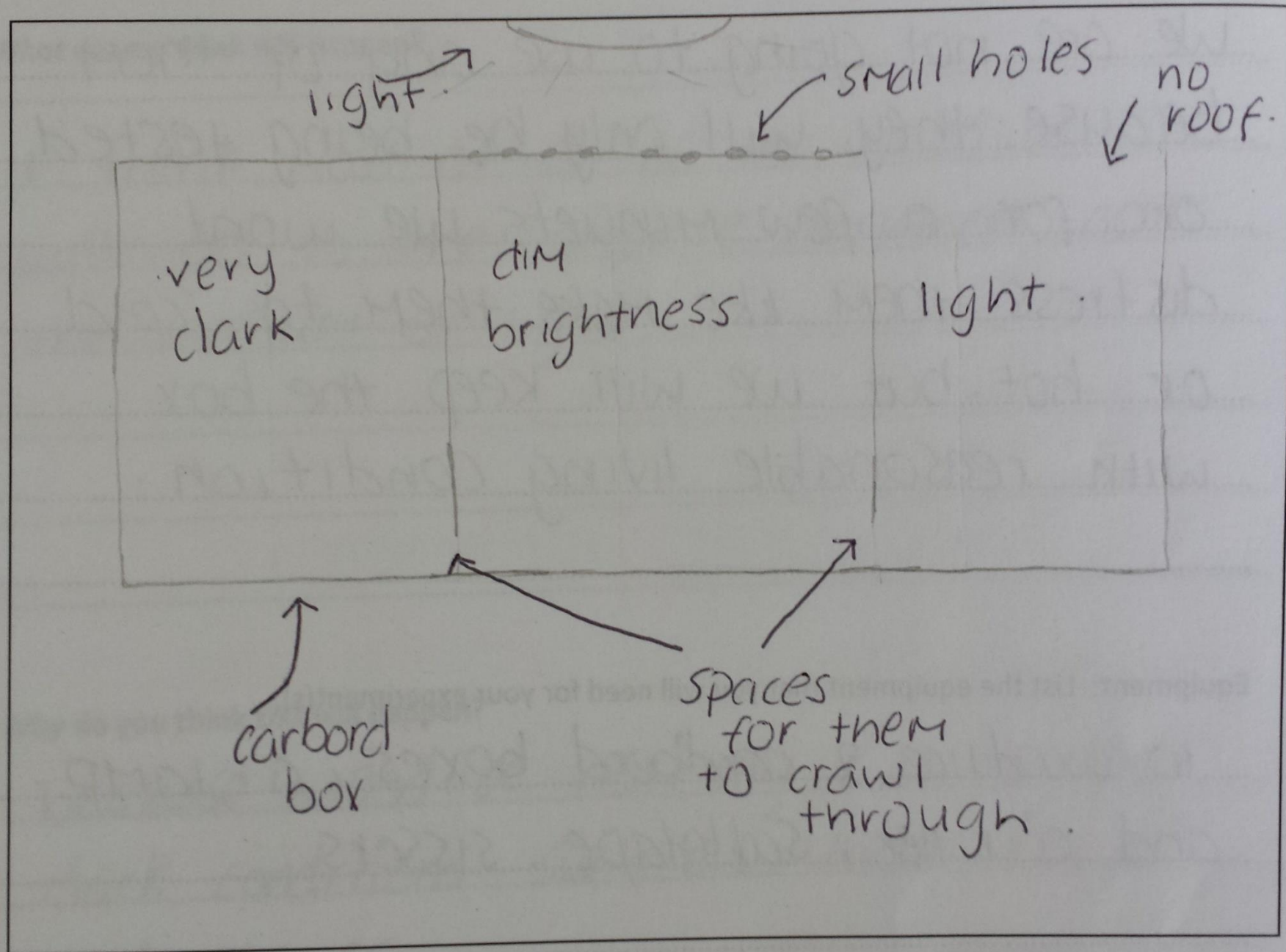
.....

.....

.....


.....

Diagram:




Day 1:


Salami



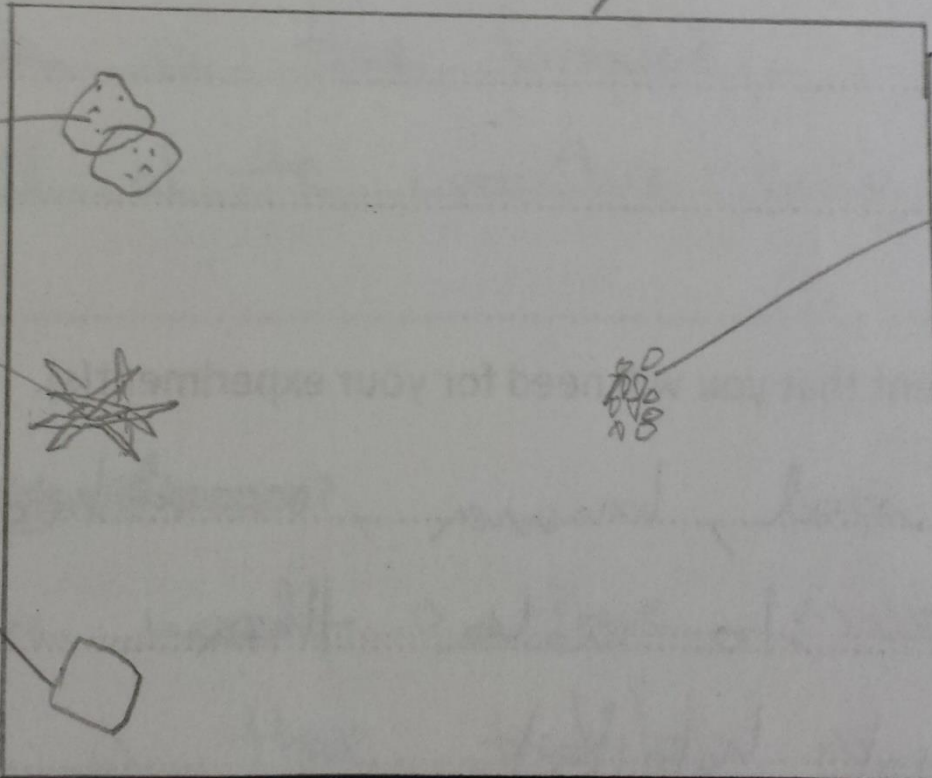
wood



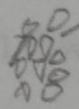
banana



cardboard box



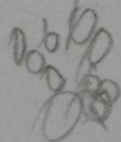
10 woodlice



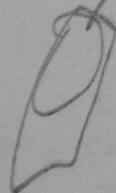
bread



woodlice



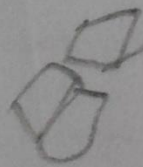
Sausage



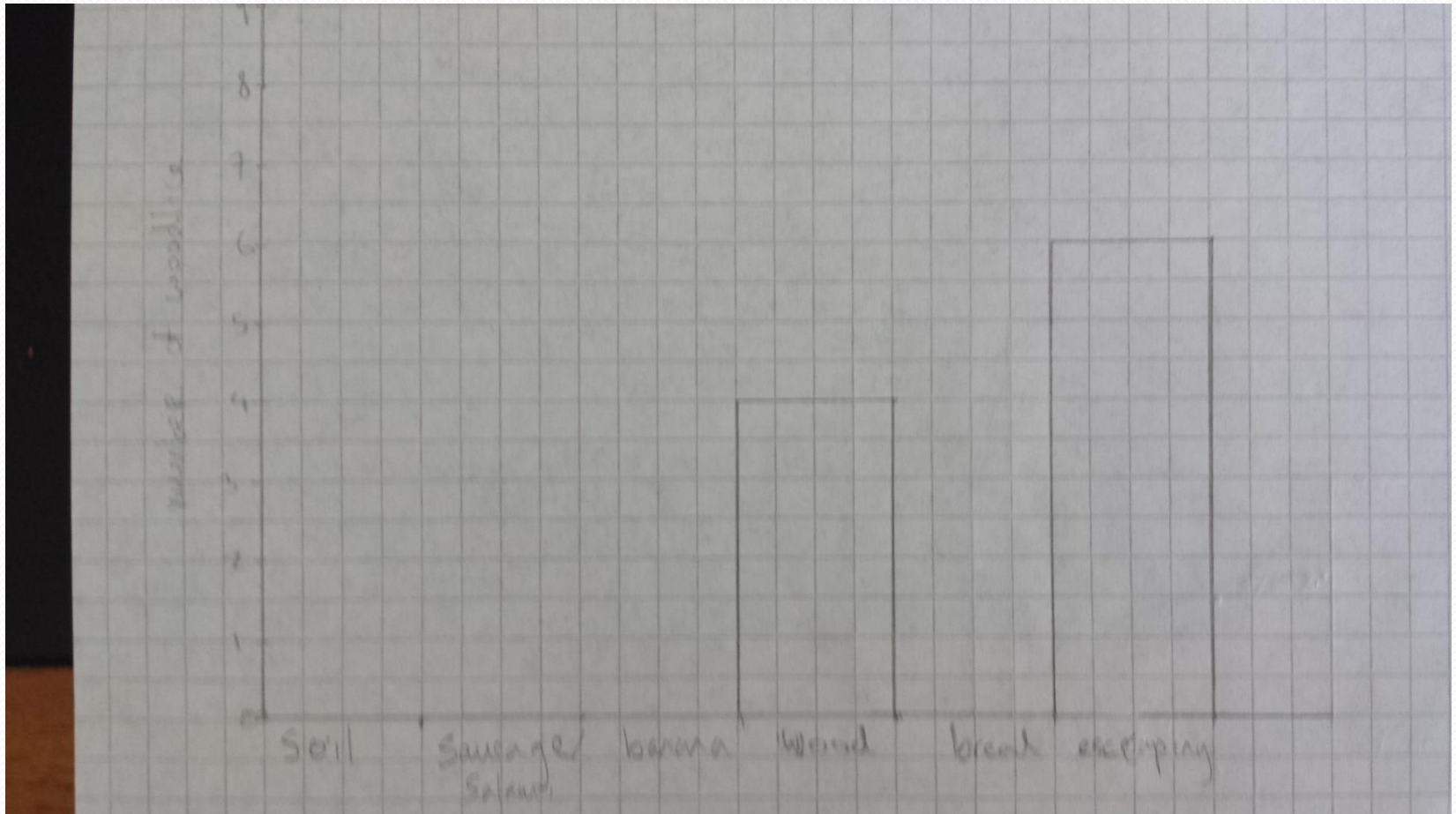
wood



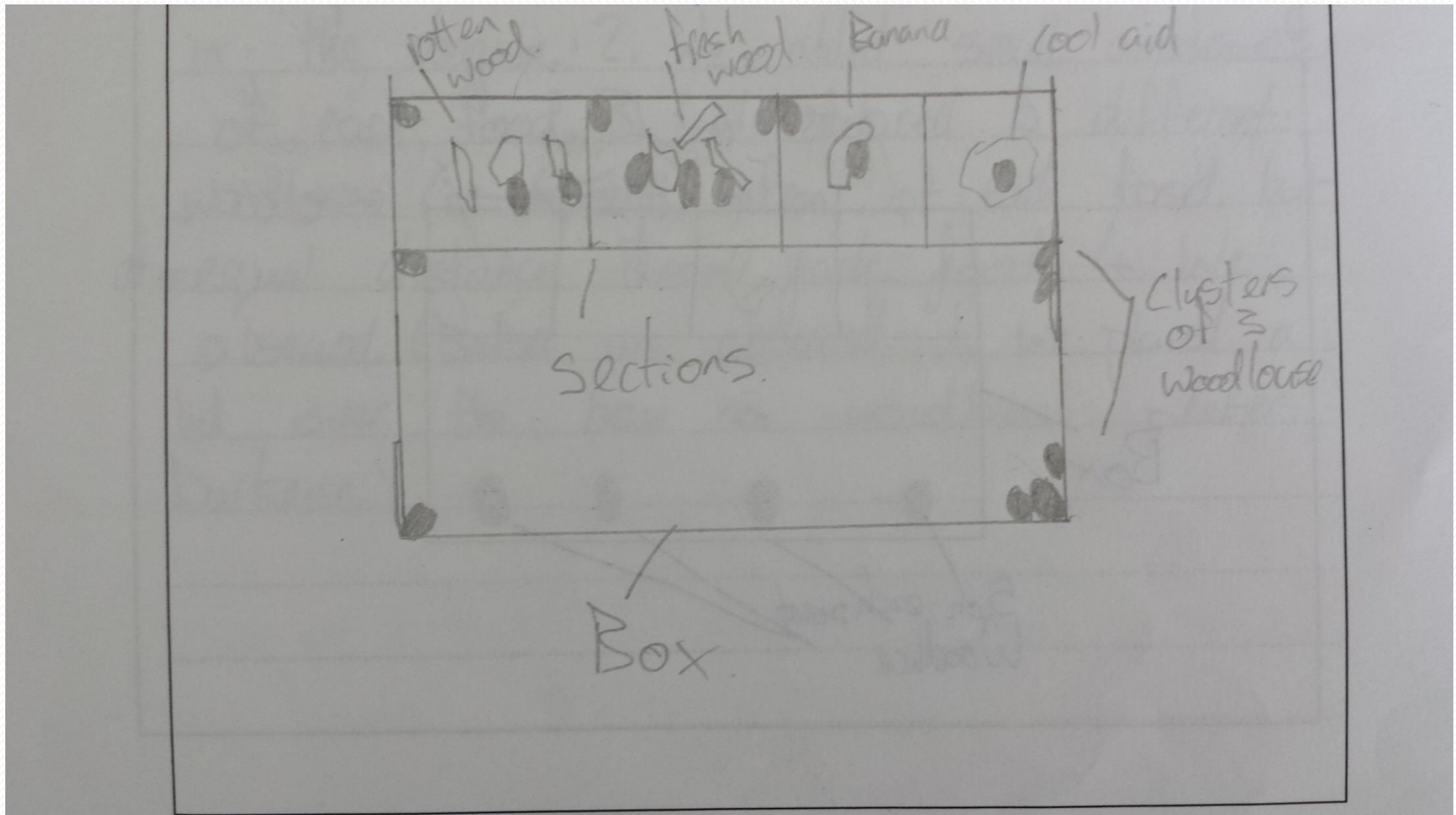
barbar



Results!



Experimental design

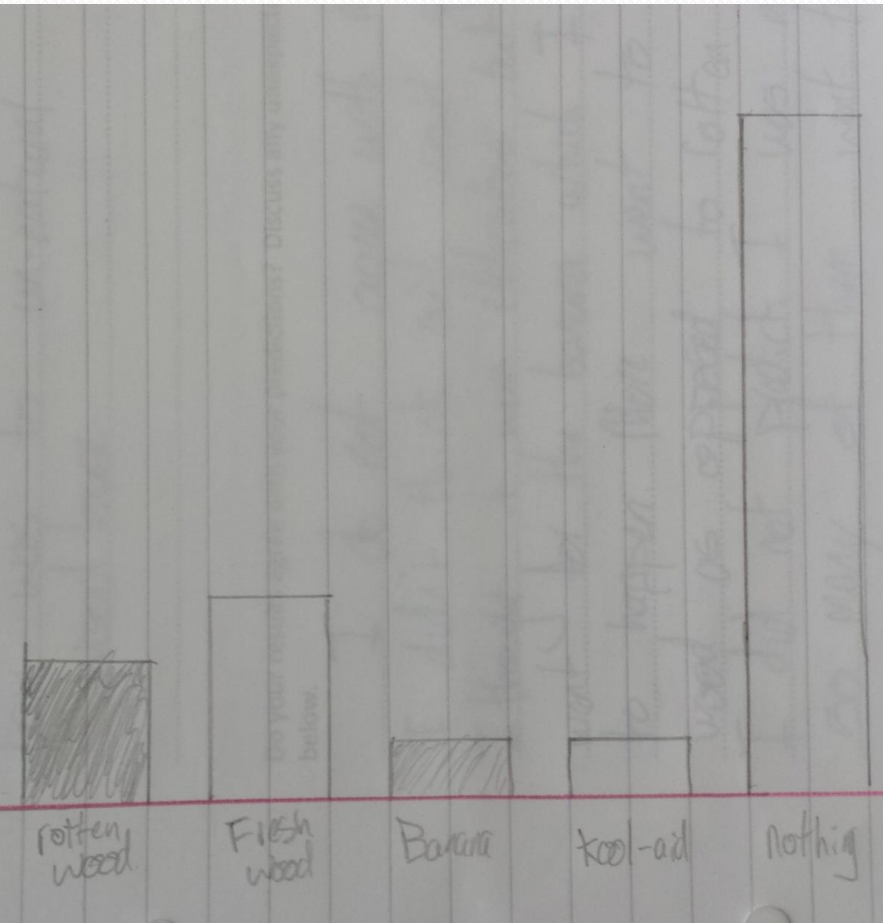


Did you identify any patterns? What conditions can you draw from...

Each time the weather
the caterpillar likes spaces
not like the open area
feed a natural habitat

No. of
woodlice
at each
thing.

13
12
11
10
9
8
7
6
5
4
3
2
1
0



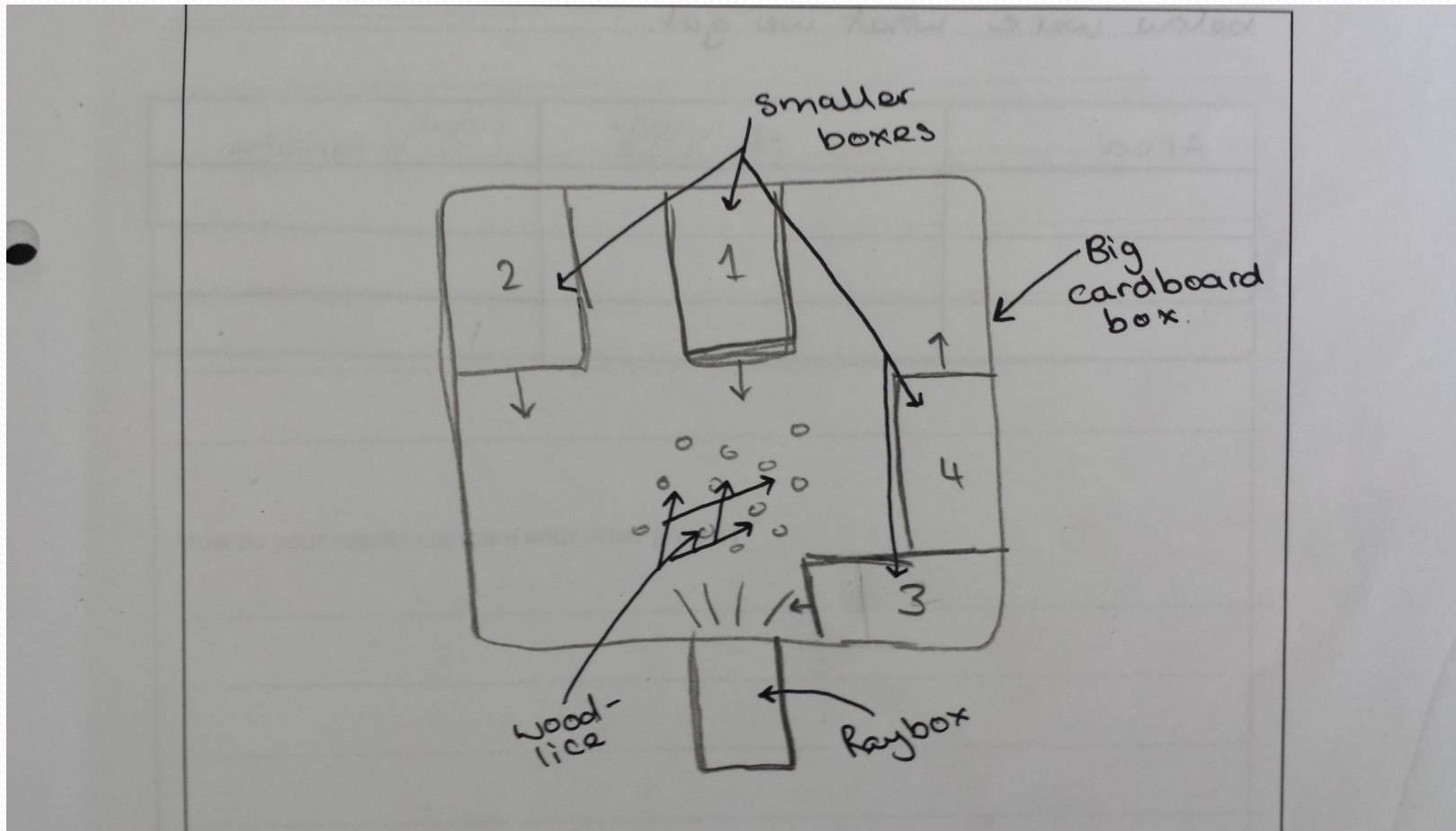
Do your results agree with your predictions? Discuss any anomalies below.

I do not agree with
I did not predict that I
would be the highest while I
do happen that woodlice
would be attracted to rotten
I did not predict I was
so many of them

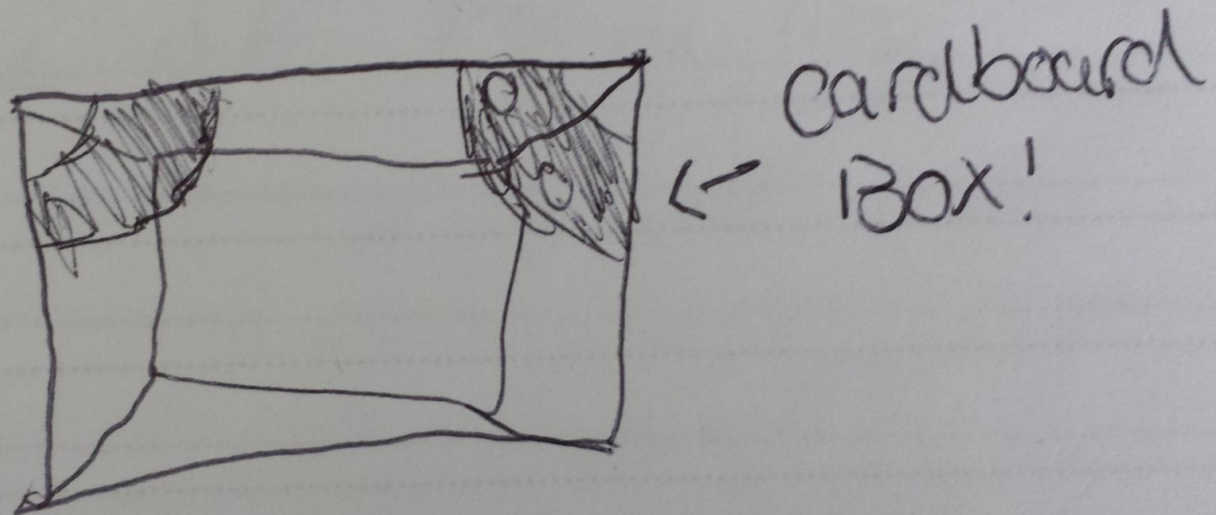
How do your results compare with other groups?

Our results are
similar to other groups other
I think we would have

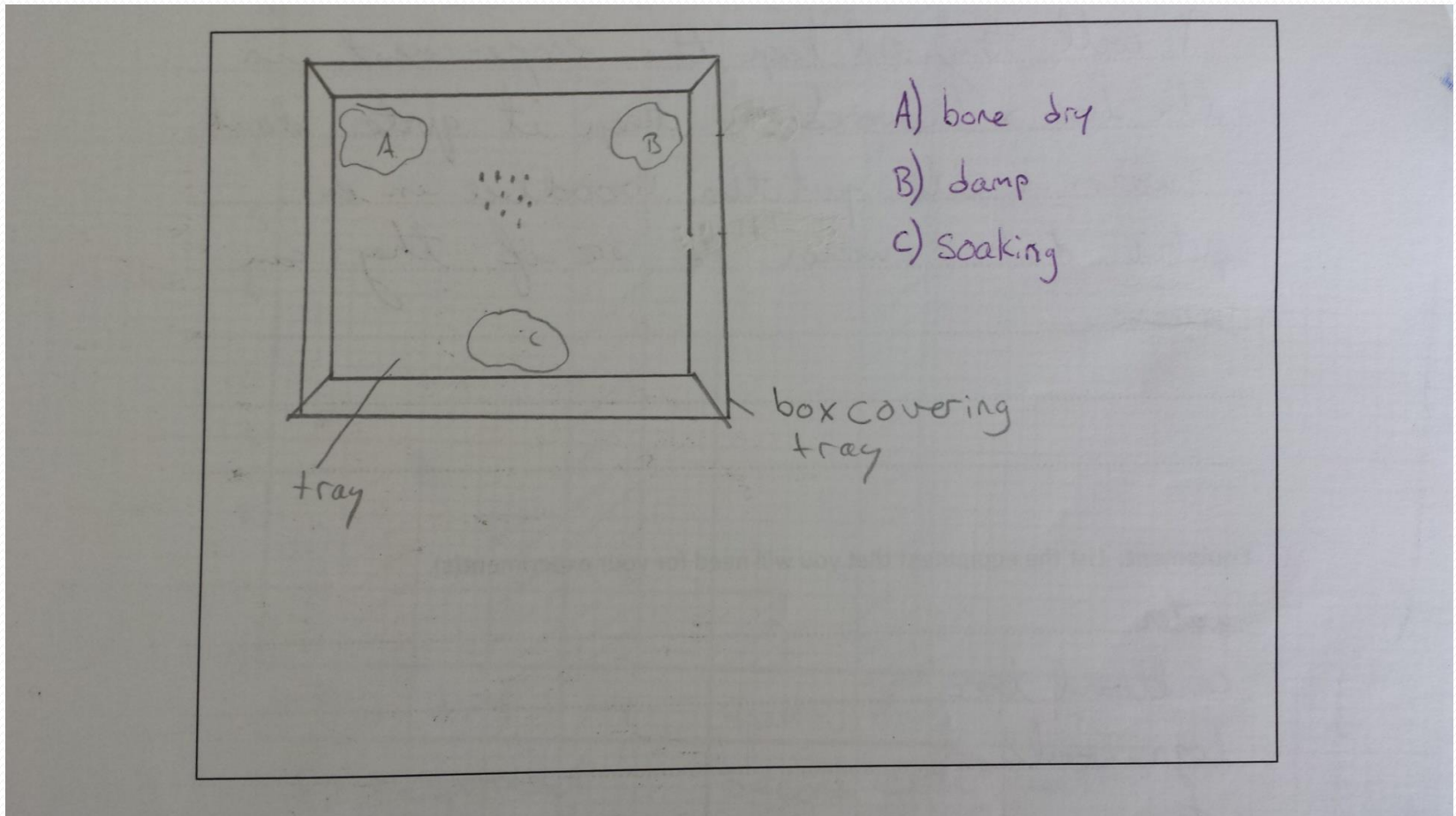
The woodlice hotel



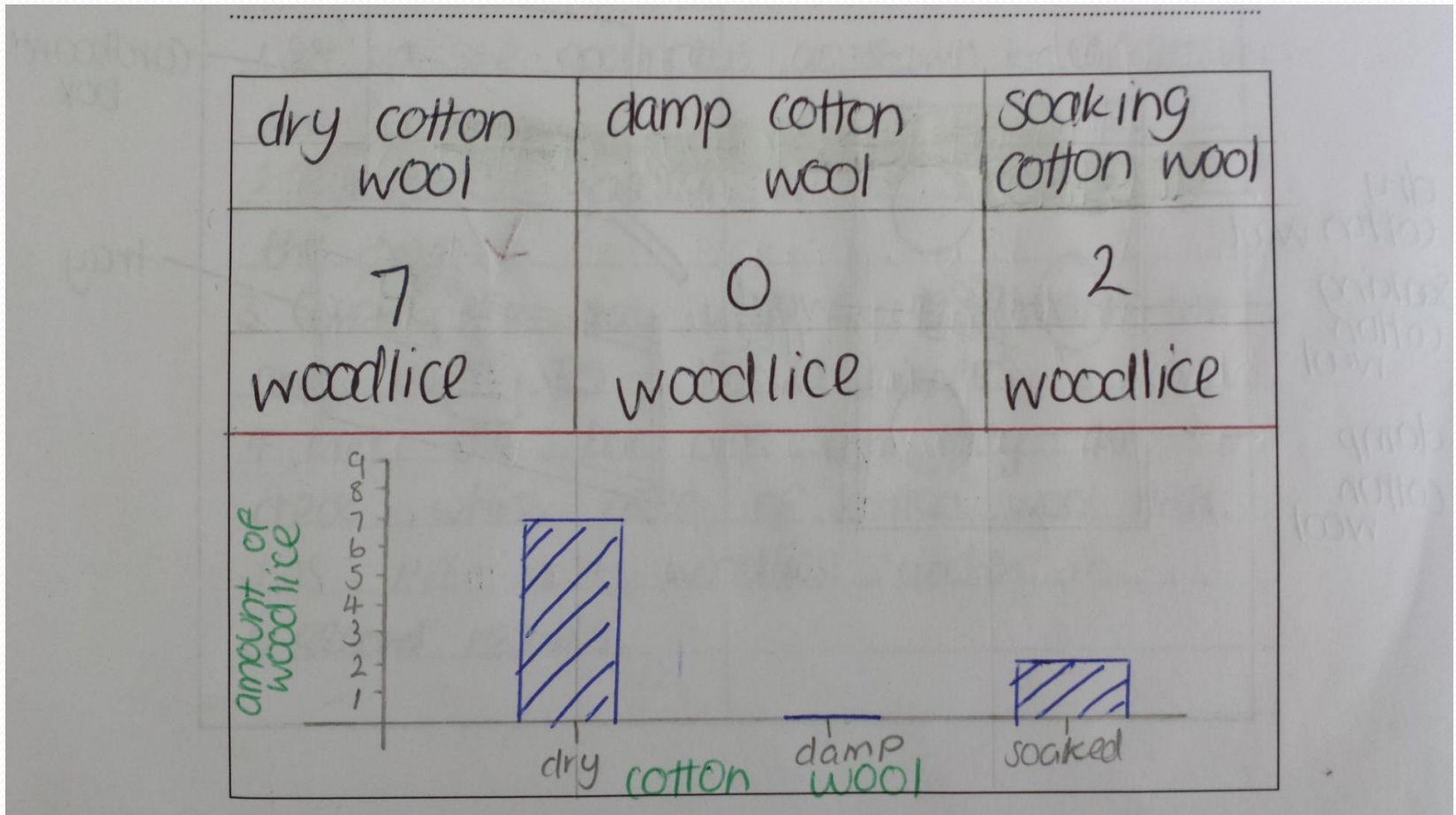
Difficult to replicate?



The cotton wool trap



Conclusion?



Developing a hypothesis

Which variable have you decided to investigate?

The food preferences of Woodlouse.

Formulating your hypothesis:

Now you have decided which variable you would like to investigate, use the space below to explain the *question(s) you are trying to answer (or the problem(s) you are trying to solve)*.

Questions to be answered:

(rather) Out of 4 types of food, which is the one they prefer the most?
Out of rotting wood and fresh wood which do they prefer?

Predictions: Use any **scientific knowledge** you already have, answer the following questions. Try and be as clear as you can in your answers.

What do you think will happen?

The wood louse will first go for the rotting wood, and maybe the fresher wood, but it would not go for the banana or the ~~bread~~ cool-aid

Why do you think this will happen?

Wood louse are decomposers so they would like the rotting wood, they might go for the fresh wood because it is now dead because it isn't attached to the tree anymore. They won't go for banana ~~or bread~~ because they are still fresh. As it isn't a common food at the undergrowth, I think the cool-aid will be over looked.

Which variable have you decided to investigate?

Amount of moisture

Formulating your hypothesis:

Now you have decided which variable you would like to investigate, use the space below to explain the *question(s)* you are trying to answer (or the *problem(s)* you are trying to solve).

Questions to be answered:

In what level of moisture do they prefer to live in?

Do wood lice prefer dry wood or wet wood?

Predictions: Use any scientific knowledge you already have, answer the following questions. Try and be as clear as you can in your answers.

What do you think will happen?

That the wood house will go to
the damp wood as they like
water but if there is too much
they could drown.

Why do you think this will happen?

They like water as they are crustaceans
but too much water could
drown them so they will choose
the damp wood.

Communication

What do you think will happen?

I think the woodlice will
be attracted to human food but will
be bottom feeders and eat rubbish.

Why do you think this will happen?

I think they will be bottom feeders
because I can't imagine them being
able to get any other food

Confusion

Questions to be answered:

What conditions of temperature and humidity do woodlice prefer to inhabit?

Predictions: Use any **scientific knowledge** you already have, answer the following questions. Try and be as clear as you can in your answers.

What do you think will happen?

I think that the woodlice will be drawn to the area where it is most humid. ~~and~~ Normally they are found in the nature in heated and moist places.

Mixed-up variables

You have chosen one variable from the 3 suggested earlier. What other variables do you think might be important for woodlice?

The material which they are living in or under is very important they like to live in bark.

What will you do about these other variables in your investigation? Explain your answer in some detail.

I will make all the other variables stay the same so the results are most accurate. We will keep the light the same by having a lamp over all the areas. We will keep the materials all the same in each area too.

Some issues

- Dependent learners
 - Many students wanted instructions
 - “What do I do now?”
- Written evidence is not necessarily indicative
 - “Filling-in” report booklets
 - Data presentation
 - Changes in experimental design and hypotheses
- Misunderstanding the nature of science
 - “But what’s the actual answer...”

The problem of assessment

- It is necessary to assess while inquiry is underway.
- It is difficult to collect data on every student
- Assessing students initial attempts versus final outcomes
- Parroting, aping, copying
- Teacher dependence on summative grades

Improvements

- Separate worksheets for each day
- Choose which aspects of inquiry you want to assess
 - Analysing and interpreting data
 - Re-formulating a hypothesis after testing
 - Experimental design
- Whole group discussion session
 - Sharing data and conclusions after initial experiments
- Clipboard assessment template
 - Continuous in-class assessment of individuals/groups
- Students need feedback and practice regarding inquiry

Assessment of Inquiry

Some key aspects of inquiry-based learning (*Harrison 2014*)

- Students are engaged with a difficult problem or situation that is open-ended to such a degree that a variety of solutions or responses are conceivable.
- Students have control over the direction of the inquiry and the methods or approaches that are taken.
- Students draw upon their existing knowledge and they identify what their learning needs are.
- The different tasks stimulate curiosity in the students, which encourages them to continue to search for new data or evidence.
- The students are responsible for the analysis of the evidence and also for presenting evidence in an appropriate manner which defends their solution to the initial problem

Teachers on Assessment

Harrison (2014)

“The project teachers reported that they feel that they gain far more evidence of student performance by collecting evidence during the inquiry activities than from marking reports of the inquiry. They have realized that only a limited number of skills can be assessed if the evidence is only sourced from the written report....”

Formative assessment

Harrison (2014):

“Through a formative approach, the teachers were able to find out which inquiry skills students can do well and which they had problems with. They were then able to use this assessment data to scaffold the next stage in learning for their students.”