

# Thoughts for Teachers – Northwestern Crows

With this investigation, keeping the goals clear in the minds of students will be very useful. The investigation attempts to answer the following question:

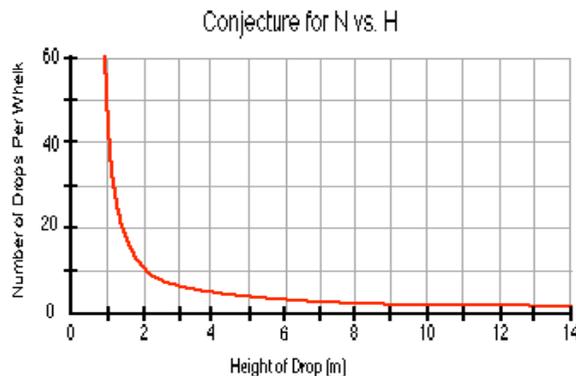
Why do northwestern crows fly consistently to a height of 5 meters?

Students will offer several possible reasons for this observation including that the crows are optimizing the amount of work to break open a whelk. The amount of work depends on the weight of the whelk, the number of times it has to be dropped, and the height from which it is dropped. The fact that the number of drops will depend on the height is a second goal of this investigation.

What is the relationship between the number of drops and the height of the drop?

## Making Sense of Mathematics

Students can make sense of the asymptotes from the context [Connection to Standards]. Students quickly conjecture that the number of drops approaches 1 as the height of the drop increases. Most students agree that dropping a whelk from a small height near 0 will require numerous drops - and possibly it will never break. Certainly, if the whelk is dropped from 0 meters, it will never break. The potential existence of a vertical asymptote is also quickly accepted. If a whelk is dropped from 1 mm, the whelk may also never break. Thus, the vertical asymptote may not be at 0. **The placement of a vertical asymptote is another question students should be encouraged to write down and reflect back on after the investigation is complete.** Commonly conjectured graphs look like the following:



The conjecturing of a graph is **essential** to this investigation. The conjectured graph motivates the use of a hyperbolic function to model the data. The conjectured model is necessary to do more robust statistical analysis and to investigate the work analytically.