Use of NetLogo in ecology eduacation

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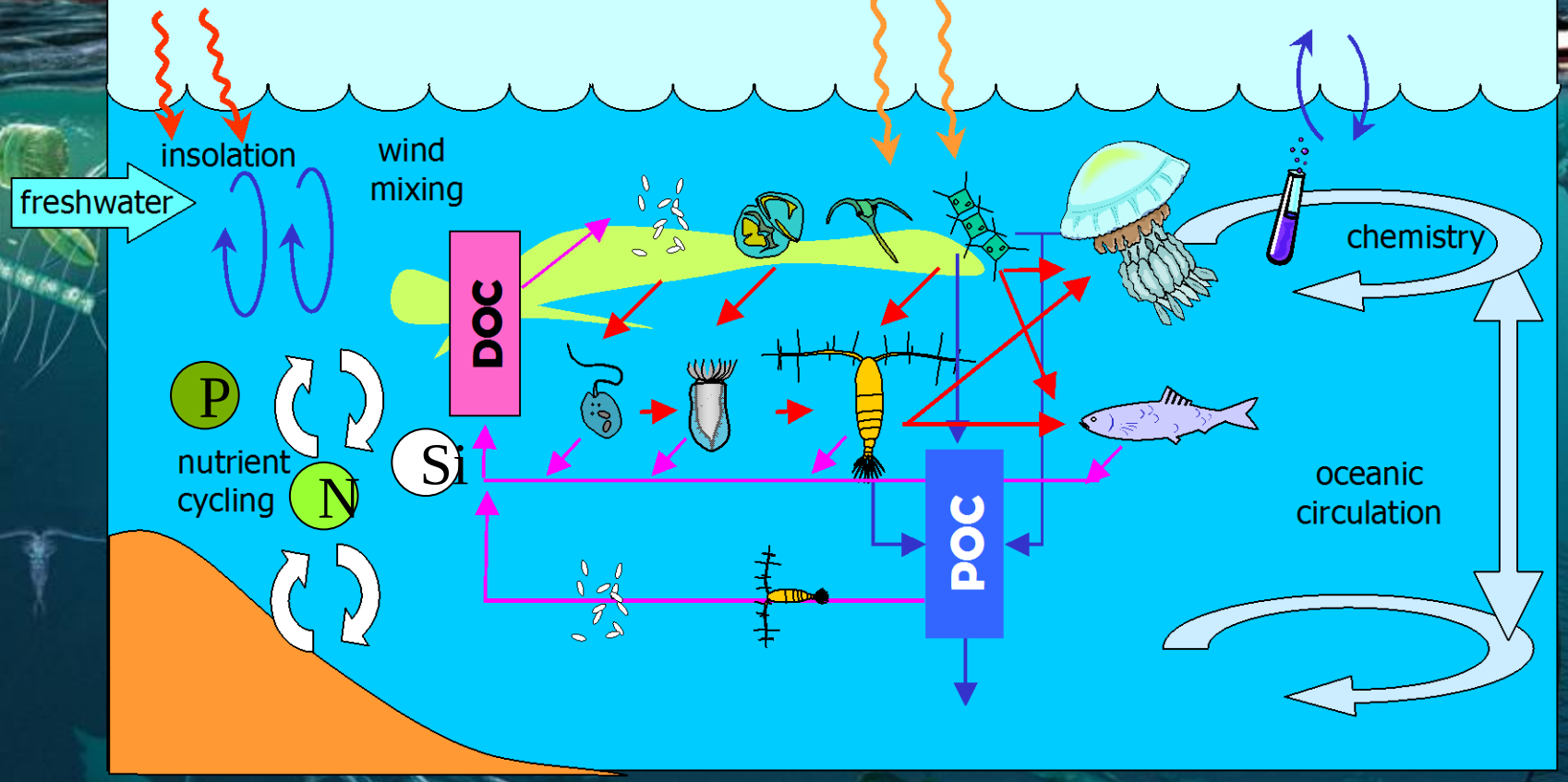
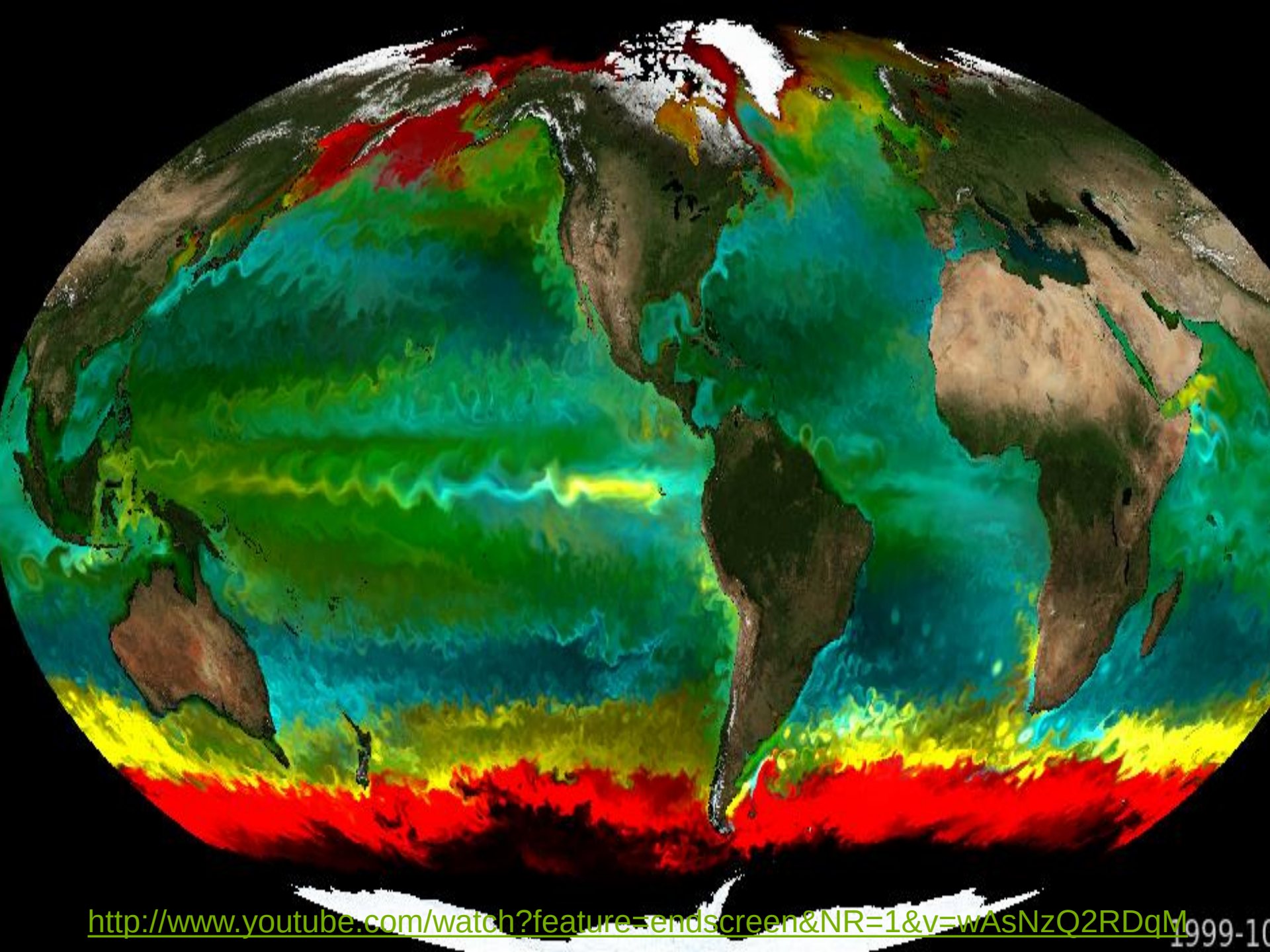
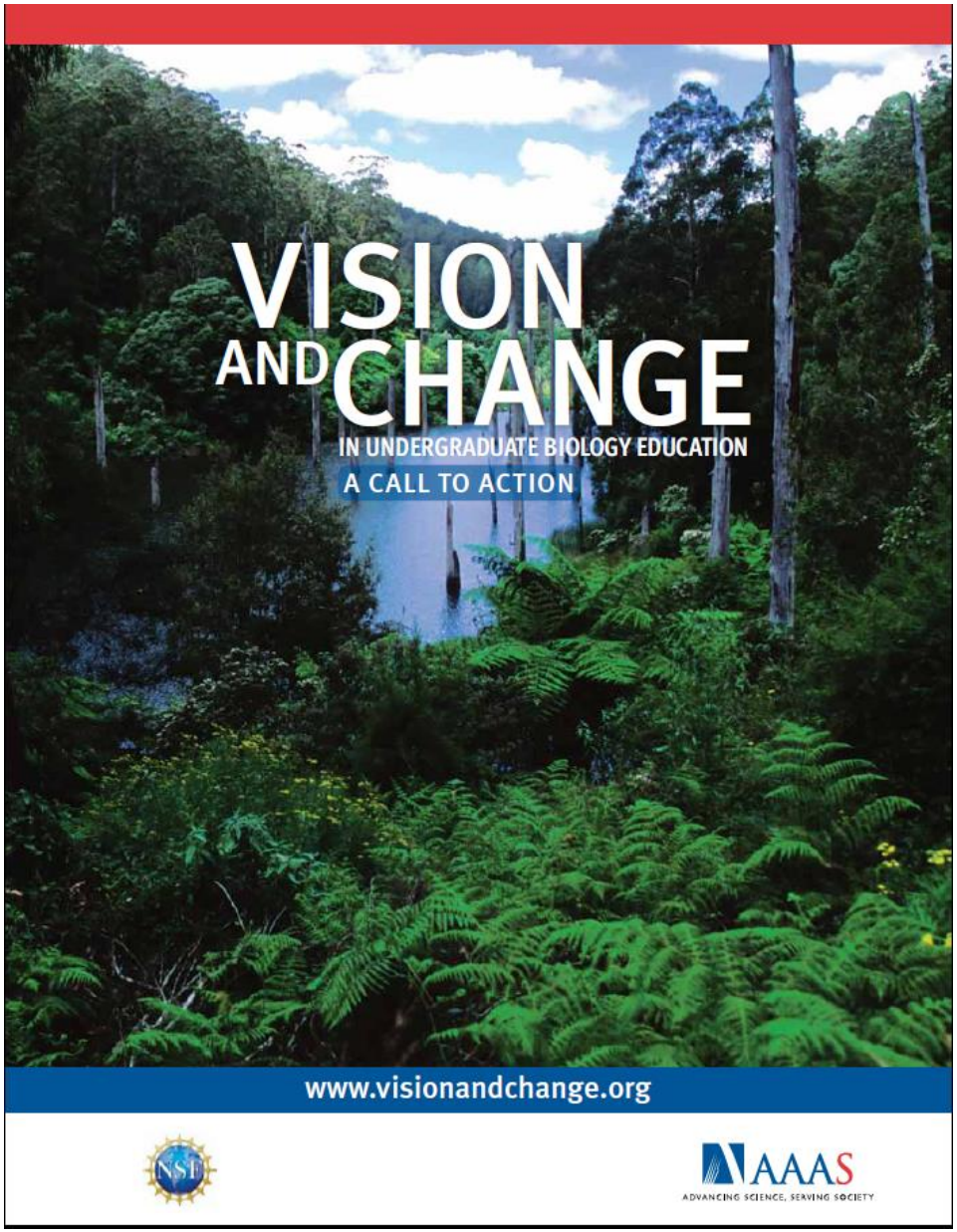
Global Climate Change

- atmospheric temperature increase
- increased precipitation
- changing albedo
- increased frequency of extreme events





http://www.youtube.com/watch?feature=endscreen&NR=1&v=wAsNzQ2RDqM



AAAS/NSF
2009/2011

Table 2.1: Core Competencies and Disciplinary Practices. A competency-based approach to undergraduate biology education focuses on demonstrating analytical, experimental, and technical skills as measurable outcomes of student learning. Biology literacy is defined primarily in terms of acquired competencies, demonstrated within the context of fundamental biology concepts.

Core Competency	Ability to apply the process of science	Ability to use quantitative reasoning	Ability to use modeling and simulation	Ability to tap into the interdisciplinary nature of science	Ability to communicate and collaborate with other disciplines	Ability to understand the relationship between science and society
Instantiation of Ability in Disciplinary Practice	Biology is an evidence-based discipline	Biology relies on applications of quantitative analysis and mathematical reasoning	Biology focuses on the study of complex systems	Biology is an interdisciplinary science	Biology is a collaborative scientific discipline	Biology is conducted in a societal context
Demonstration of Competency in Practice	Design scientific process to understand living systems	Apply quantitative analysis to interpret biological data	Use mathematical modeling and simulation tools to describe living systems	Apply concepts from other sciences to interpret biological phenomena	Communicate biological concepts and interpretations to scientists in other disciplines	Identify social and historical dimensions of biology practice
Examples of Core Competencies Applied to Biology Practice	Observational strategies Hypothesis testing Experimental design Evaluation of experimental evidence Developing problem-solving strategies	Developing and interpreting graphs Applying statistical methods to diverse data Mathematical modeling Managing and analyzing large data sets	Computational modeling of dynamic systems Applying informatics tools Managing and analyzing large data sets Incorporating stochasticity into biological models	Applying physical laws to biological dynamics Chemistry of molecules and biological systems Applying imaging technologies	Scientific writing Explaining scientific concepts to different audiences Team participation Collaborating across disciplines Cross-cultural awareness	Evaluating the relevance of social contexts to biological problems Developing biological applications to solve societal problems Evaluating ethical implications of biological research

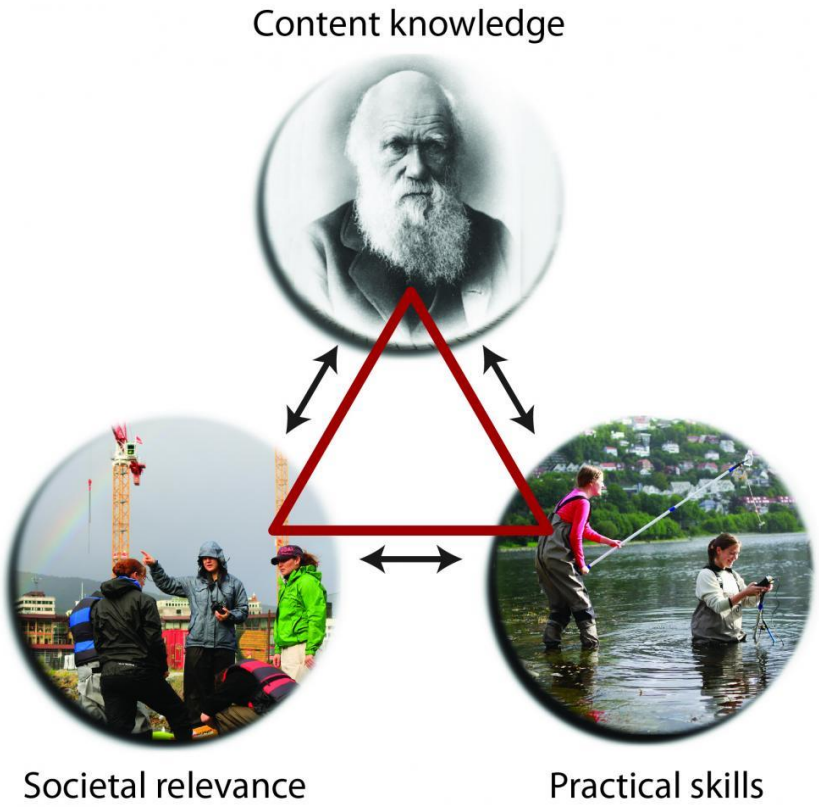
Learning to read but not to write?

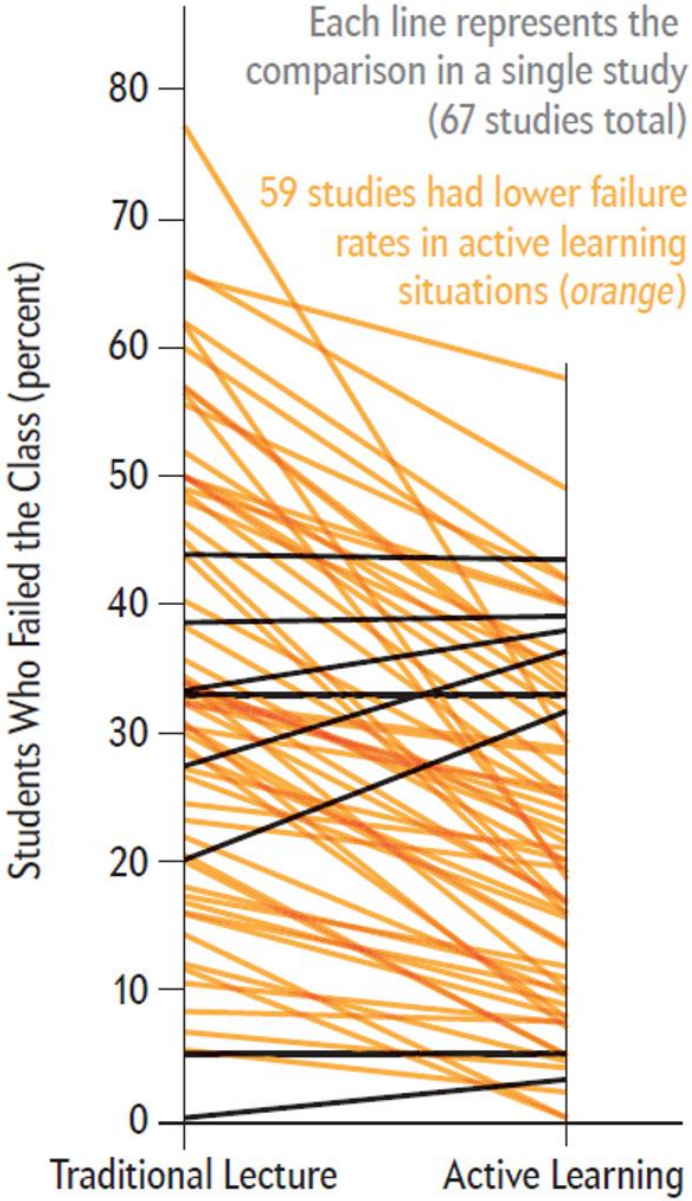
Young people today have lots of experience … interacting with new technologies, but a lot less so of creating [or] expressing themselves with new technologies. It's almost as if they can read but not write.

- Mitch Resnick, MIT Media Lab, 2013

http://www.ted.com/talks/mitch_resnick_let_s_teach_kids_to_code.html

http://scratch.mit.edu/





Freeman & al 2014. Active learning increases student performance in science, engineering, and mathematics. PNAS 2014;111:8410-8415

NetLogo – agent-based models

The Holling disk equation (Holling type II)

Assume the predator has two alternative activities, *searching for* or *handling* prey:

$$T = t_s + t_h$$

Time spent handling prey:

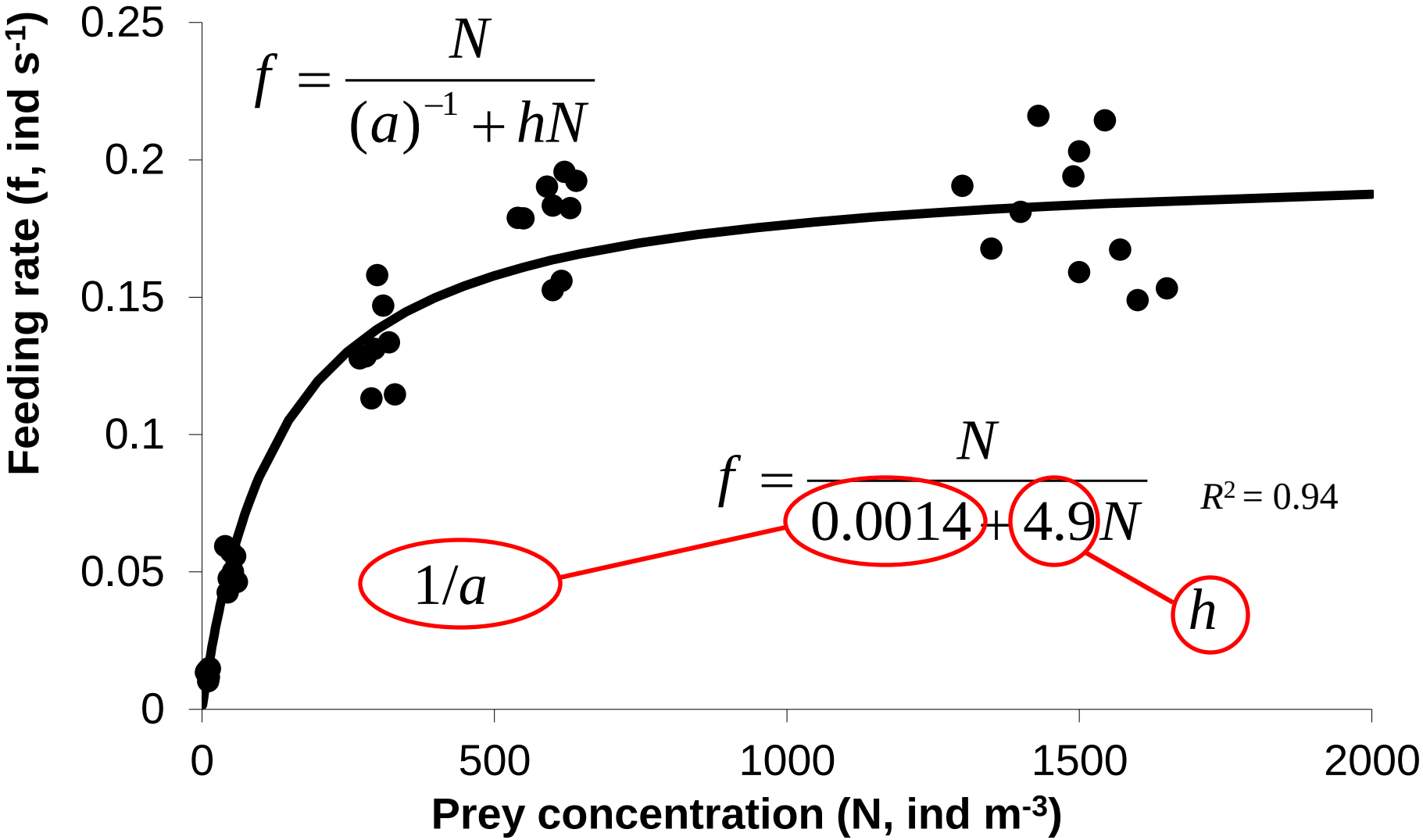
$$t_h = P_e h$$

Number of prey encountered in *t*:

$$P_e = aNt_s = AvNt_s$$

a: search rate [m^3 $predator^{-1}$ sec^{-1}] = *A* [m^2] × *v* [m $predator^{-1}$ sec^{-1}]
N: prey density [prey m^{-3}]
h: handling time of one prey [sec $prey^{-1}$]
P_e: prey encountered while searching [prey $predator^{-1}$]
t: time spent on various activities [sec $predator^{-1}$]

Parameters with biological meaning



Task 2 – models of animal foraging

- Analytical model compared with a spatially explicit simulation
- Writing in IMRAD (paper) format
- Graphical illustrations
- References
- Code in an appendix

- Video instructions
- https://screencast.uninett.no/relay/ansatt/st10873uib.no/2015/04.02/1115067/NetLogo_Video03_Holling_disk_-_20150204_202125_39.html

Task 4 Salmon lice and aquaculture

- Here we will study how changes in density and mortality of hosts that are intensively farmed, as compared to conditions in wild host populations, may affect the evolution of parasite life history and virulence.
- Why and how can intensive aquaculture (where both host density and mortality are higher than in wild host populations) drive evolutionary changes in life history and virulence of fish parasites?
- IMRAD
- Video instructions: https://screencast.uninett.no/relay/ansatt/ame086uib.no/2015/03.03/1705133/Netlogo_model_-_20150303_154234_38.html

Questions

- We must reduce the number of lectures to give room to more active learning methods?

- The learning process must become more like science – learning by doing and learn new things as you need them?

- How to provide good feedback to students on their projects?