

*Transforming an Ecology Class to
Focus on Key Ecology Concepts and
Practices using an Assessment-Driven
Design Approach*

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Outline for my talk

Deciding on key course learning outcomes



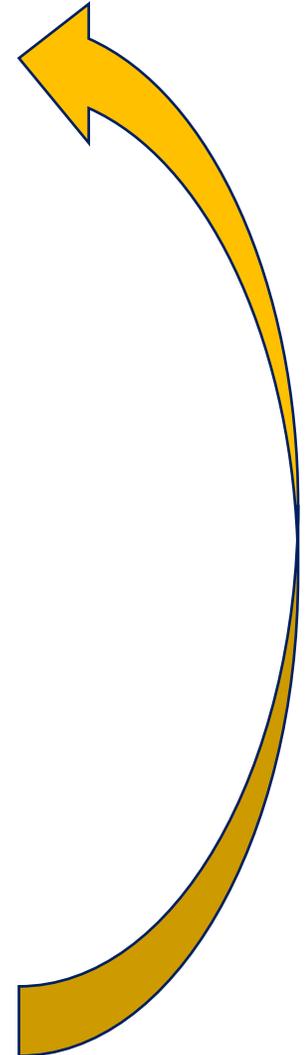
Teaching and curriculum development



Assessing student mastery of learning outcomes



Course revision and improvement



Four learning outcomes:

1. Using models to describe and predict population dynamics
2. Interpreting and explaining primary data
3. Constructing scientific arguments using evidence
4. Utilizing peer editing to improve scientific writing

Nuts and bolts of overall scientific process

- Set up a study or review to answer a question
 - Does Earth orbit the sun?
 - What's the effect of rain on student use of public transit?
- Collect data
- Interpret the data:
 - **Claim**: a statement of conclusion that responds to the original question
 - **Evidence**: appropriate scientific data that support the claim
 - **Reasoning**: a justification that links the claim and evidence

Advantages of assessment rubrics

- When students don't meet expectations what are they doing wrong?
- Are there common misunderstandings amongst students?
- What specific aspects of an argument are difficult for students to master?

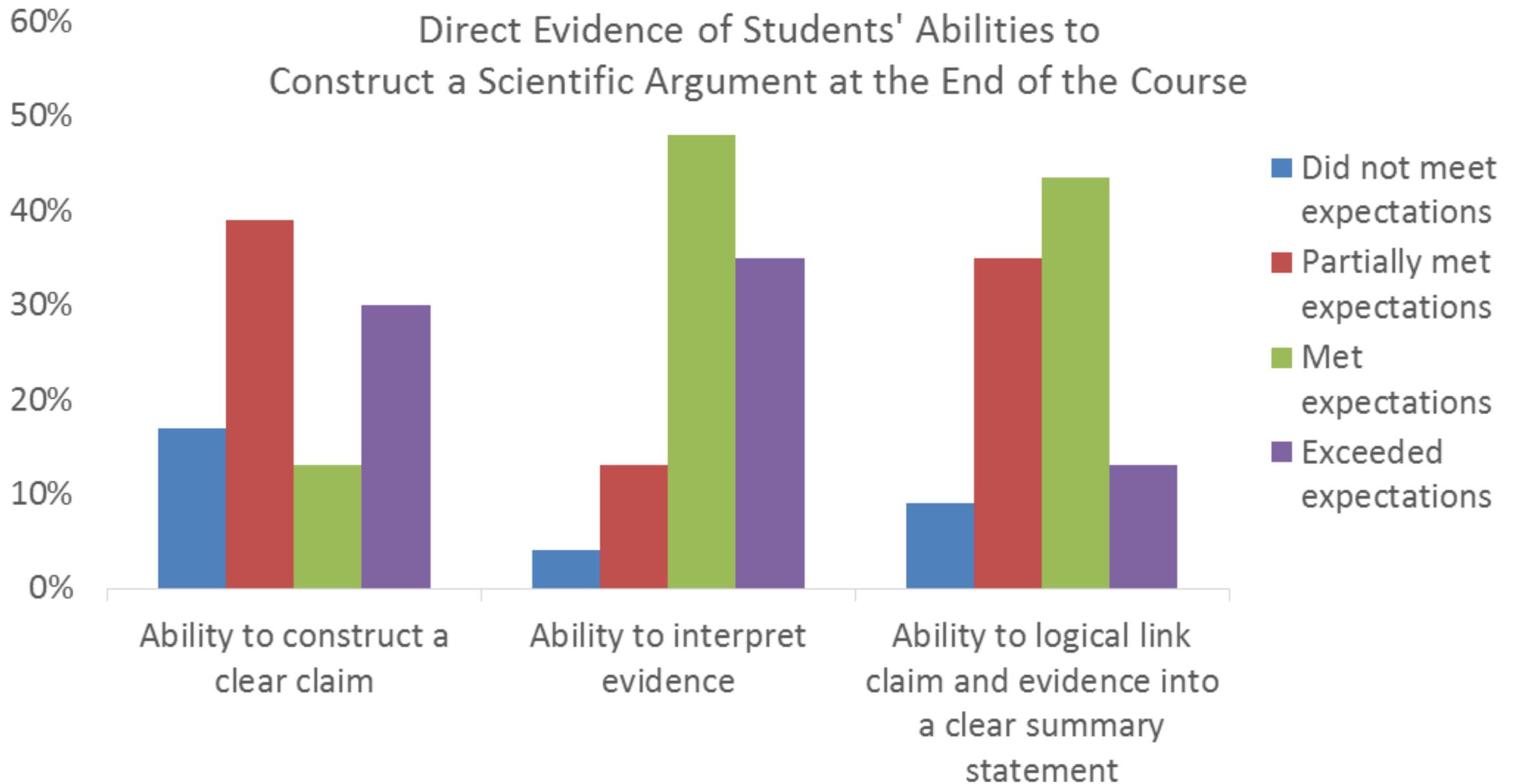
Criteria	Did not meet expectations	Partially met expectations	Met expectations	Exceeded expectations
Design a claim for observed data	Claim is false, vague, or not present	Claim is accurate but not ecologically realistic and writing lacks clarity	Claim is accurate and logical but more subtle elements are ignored	Claim is accurate, logical and well developed
Points	0	0.5	1	1
Provide evidence to support claim	Evidence is inaccurate, vague, or not provided	Evidence is accurate but interpretation is inaccurate (e.g. not ecologically realistic)	Evidence is accurate and logical but sentence structure is somewhat difficult to read	Evidence is accurate, logical and explained properly
Points	0	0.5	1	1
Use reasoning to link claim and evidence together	Reasoning for why evidence supports claim is vague, inaccurate, or missing	Reasoning technically links evidence to claim but is illogical	Reasoning links or explains why evidence supports claim but sentence structure is somewhat difficult to read	Reasoning links or explains why evidence supports claim accurately and logically
Points	0	0.5	1	1

Final exam prompt based on assessment rubric

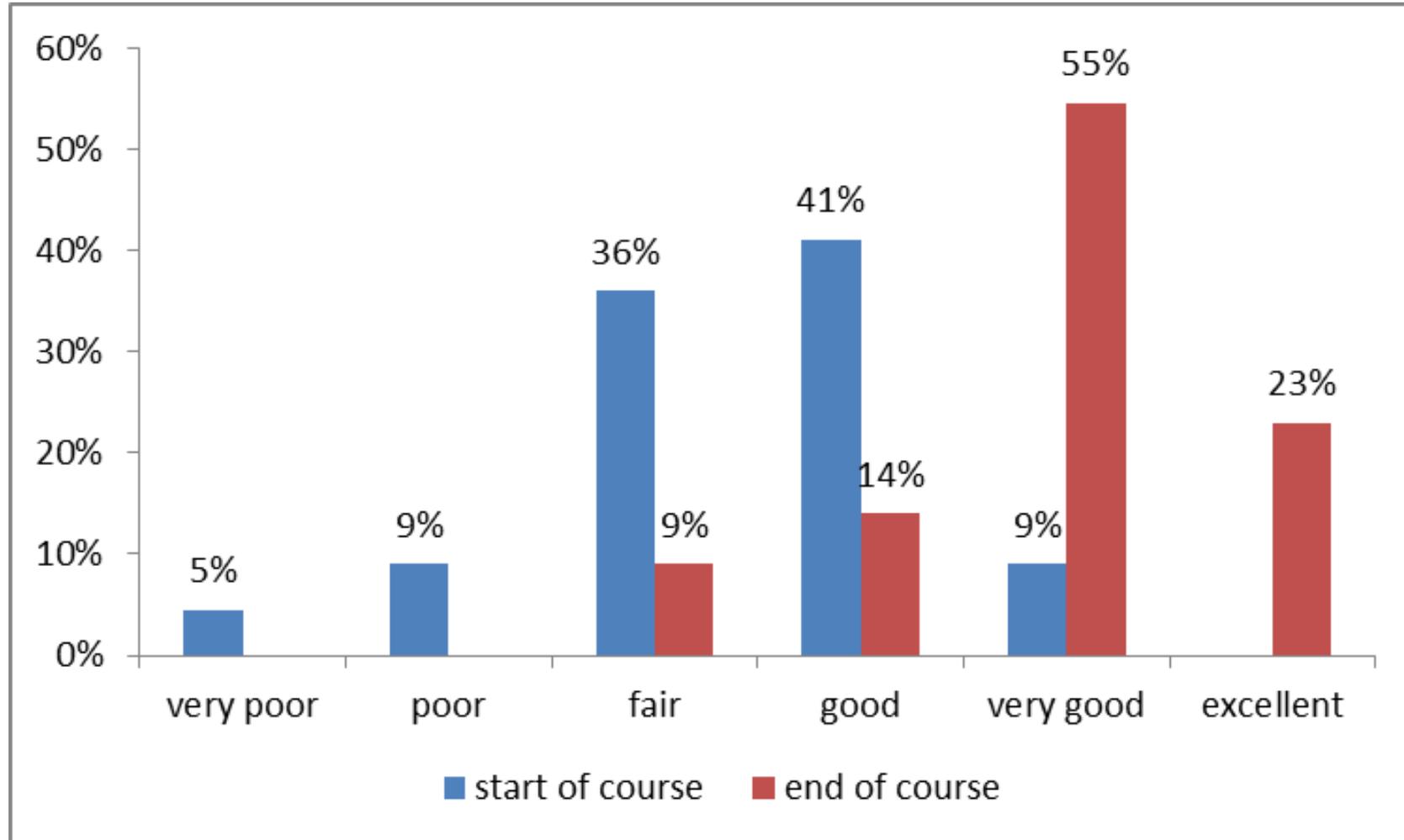
Explain the following results (be sure to specify your **claim**, provide **evidence** to support your claim, and use reasoning to logically **link** your claim and evidence). (*3pts*)

Abalone abundance	Otter abundance	Site	Year
100	200	Alaska	1995
50	100	Alaska	2000
60	200	California	1995
120	400	California	2000

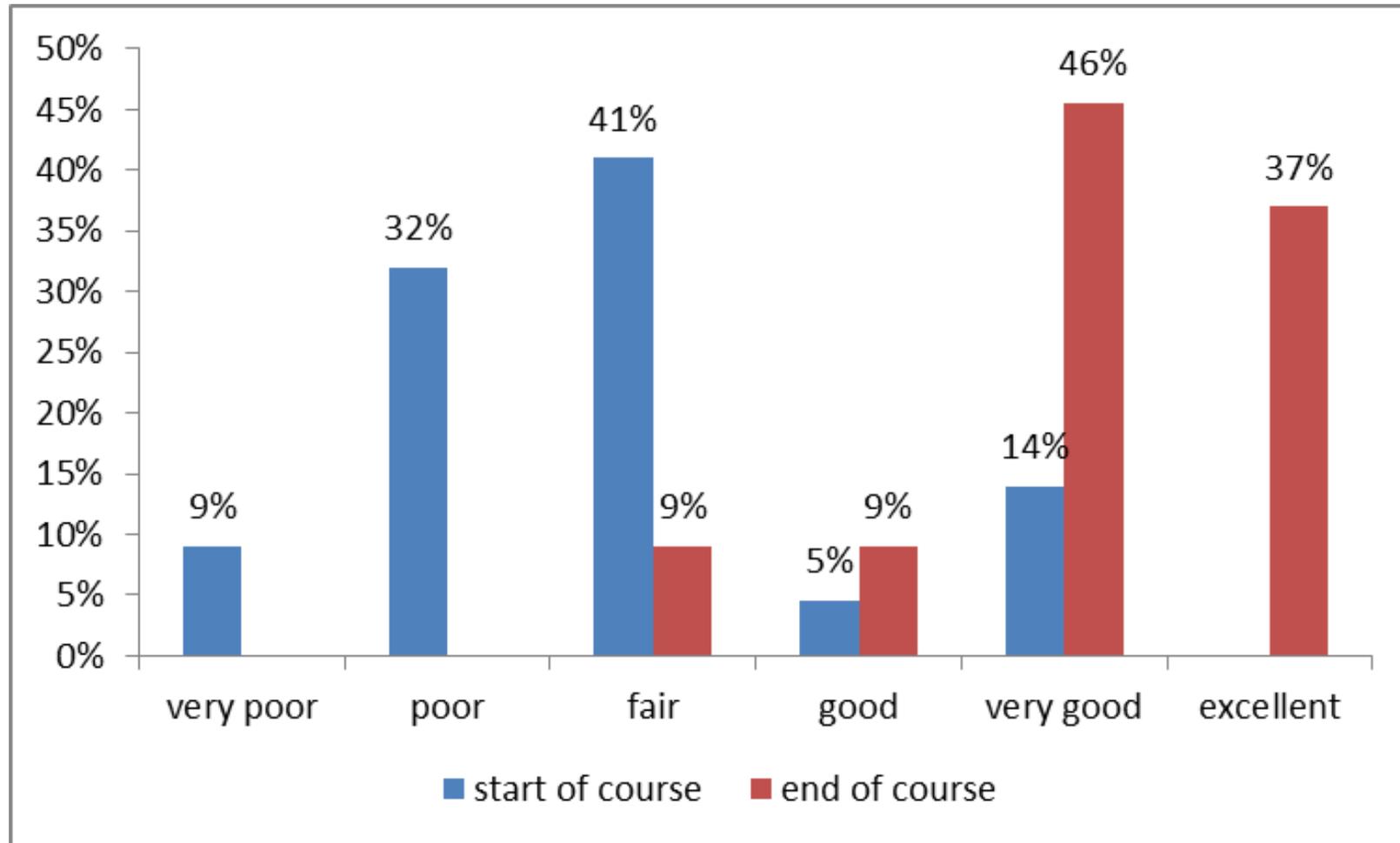
Direct Evidence of Students' Abilities to Construct a Scientific Argument at the End of the Course



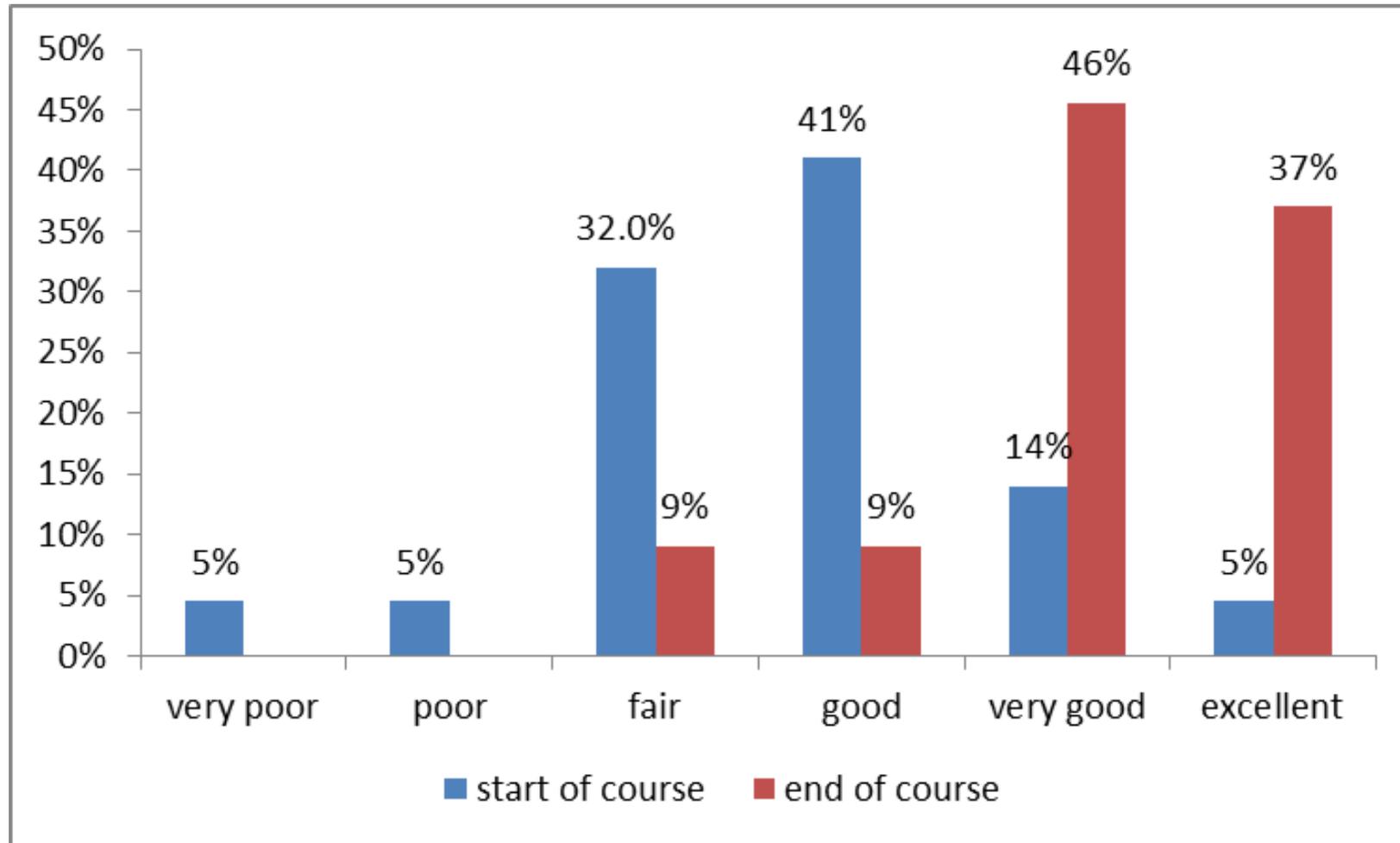
Students' self-assessment of abilities to *design a clear claim*



Students' self-assessment of abilities to *interpret evidence*



Students' self-assessment of abilities to *logically link claim and evidence*



Conclusions

- Essential scientific practices can be successfully taught and assessed in a classroom setting
- Assessment results allow instructors to diagnose (and improve) particular aspects of a course students still struggle with
 - E.g. connecting evidence to a claim with adequate reasoning
- Overall, the students as a group tended to *over-estimate* their abilities to construct a scientific argument.
 - Allows instructors to ask where is their a disconnect in what my students *think* they know
 - E.g. explicit instruction (and evaluation) of a scientific argument was new to students and resulted in over-estimation of this new found skill
- A copy of my full assessment report can be found online at:
jordanruybal.sites.ucsc.edu