Assessing the initial state of knowledge of first-year genetics students
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Motivation
No standard inventory of conceptual understanding in the biological sciences.
Inventories in other disciplines have helped motivate the need for reform in undergraduate science education (e.g., Force Concept Inventory, Astronomy Diagnostic Test, Conceptual Chemistry Test).

More vocabulary in introductory biology than in foreign language courses (Yager 1983).
Students find that they can get by with memorization of definitions and little understanding of the underlying concepts.
Exams in introductory science courses tend not to test conceptual understanding and rarely ask open-ended questions.

Genetics & Genomics
First semester for a new introductory genetics course for all students majoring in biology or biochemical sciences and prerequisite for higher-level biology courses.

- 75% first-year students
- 73% pre-med
- 61% female
- 56% have taken AP (mean score: 4.7)
- 1st or 2nd college science course for 74%

Survey instrument
Familiarity with terminology
Rate familiarity with 87 common terms in genetics from glossary of text and two distractors ("clastron" and "spooling") on a 1-5 point scale:
5 = Confident understanding
4 = Okay understanding
3 = Hazy understanding
2 = Word is vaguely familiar
1 = Totally unfamiliar

Definitions
Briefly define 18 terms on vocabulary list (including distractor "spooling")

Concept questions
One multiple choice, one free response, and one three-part data interpretation question.

Background information
High school and college science coursework, previous experience in biology, expected major, demographic information

Results
Students have a wide variety of backgrounds. Familiarity with terminology distributed among the class.

Post-test
At the end of the semester, a similar survey was administered to assess learning gains about the courses.
Students show much greater familiarity with vocabulary and increased ability to define terms.
Students still hold misconceptions about the nature of genetic material (>10% do not report that genetic material is identical between cells).

Future work
Complete analysis of aggregate post-test results.
Compare pre- and post-test responses for individual students.
Investigate correlations between survey responses, educational background, and class performance.
Use results to inform the development of a conceptual inventory which diminishes the impact of vocabulary.

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