Profile of common genetics misconceptions in 1st to 4th year undergraduate biology students
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Questions
• What conceptual knowledge and misconceptions do students in 1st, 2nd, 3rd, and 4th year have?
• Are given misconceptions predictive of others?

Do students understand the concepts?
Concept Inventory Test: 14 multiple-choice questions from validated conceptual inventory tests

Key Genetics Concepts Tested
- Inheritance of alleles and chromosomes
- Mutation: Effect on DNA, proteins, somatic vs. germ-line
- Phenotype: Genotype + Environment = Phenotype
- Complementation: 2 genes affecting phenotype
- Linkage: Effects assortment of alleles

Average % correct in 1st-4th year populations (standard deviations)

<table>
<thead>
<tr>
<th></th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>4th year</th>
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</thead>
<tbody>
<tr>
<td>PRE-test</td>
<td>30.0 (14.3)</td>
<td>31.1 (16.6)</td>
<td>42.4 (17.6)</td>
<td>54.0 (18.1)</td>
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<tr>
<td>POST-test</td>
<td>54.8 (21.3)</td>
<td>66.4 (22.3)</td>
<td>75.9 (18.1)</td>
<td>81.8 (11.8)</td>
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<tr>
<td>Avg. Change</td>
<td>33%</td>
<td>51%</td>
<td>53%</td>
<td>54%</td>
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Do 2nd year post-test 56% replication/ploidy 78% other concepts
Do 4th year test 29% replication/ploidy 80% other concepts

• Significant retention of conceptual understanding of most concepts after 2nd year.
• Strong misconceptions seen in 1st year do not reappear after 2nd year (among “other concepts”)
• Loss of conceptual understanding on ploidy & DNA replication-related concepts.

Concept inventories are a valuable tool to study retention and common misconceptions

What do we expect?
Unspoken instructor’s assumption #1: If students understand Concept X, it means they also understand Concept Y

Concept X: ploidy (a diploid cell has two copies of each chromosome); Concept Y: a chromosome composed of two sister chromatids is a replicated chromosome (misconception= it is not replicated).

Understanding of Concept Y is independent from understanding of Concept X

Concept X response


Acknowledgements: Trish Schulte, Carl Wieman, Sarah Gilbert. CWSEI-STLFs provided valuable feedback at all stages of the study. George Haughn, Ryan Viveiros, Jennifer Klans for giving class time to deploy the concept inventory. Biology students who volunteered to participate in the retention study.