An Alternate Approach to State Examinations in Science Education

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by
Association for the Cooperative Advancement of Science and Education
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NYS MST Standards

- **Standard 1:** Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.
- **Standard 2:** Students will access, generate, process, and transfer information using appropriate technologies.
- **Standard 3:** Students will understand mathematics and become mathematically confident by communicating and reasoning mathematically, by applying mathematics in real-world settings, and by solving problems through the integrated study of number systems, geometry, algebra, data analysis, probability, and trigonometry.
- **Standard 4:** Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.
- **Standard 5:** Students will apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.
- **Standard 6:** Students will understand the relationships and common themes that connect mathematics, science, and technology and apply the themes to these and other areas of learning.
- **Standard 7:** Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems and make informed decisions.

Standard 1

Component	Operational Learning Goal
Scientific Inquiry *Key Idea 1:* The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process. S1.2c differentiate among observations, inferences, predictions, and explanations	•Distinguishes Observation from Inference •Technical Description •Uses a 2x2 Classification Scheme to Organize Relevant Factors

Standard 1

Component	Operational Learning Goal
Scientific Inquiry *Key Idea 2*: Beyond the use of reasoning and consensus, scientific inquiry involves the testing of proposed explanations involving the use of conventional techniques and procedures and usually requiring considerable ingenuity. S2.1d use appropriate tools and conventional techniques to solve problems about the natural world, including: •Measuring, observing, describing, classifying, sequencing S3.2d formulate and defend explanations and conclusions as they relate to scientific phenomena S3.2e form and defend a logical argument about cause-and-effect relationships in an investigation S3.2f make predictions based on experimental data	•Distinguishes Observation from Inference •Technical Description •Uses a 2x2 Classification Scheme to Organize Relevant Factors

Standard 1

Component	Operational Learning Goal
Mathematical Analysis *Key Idea 3:* Critical thinking skills are used in the solution of mathematical problems. M3.1 Apply mathematical knowledge to solve real-world problems and problems that arise from the investigation of mathematical ideas, using representations such as pictures, charts, and tables. M3.1a use appropriate scientific tools to solve problems about the natural world	•Conceptualizes Density of Solid Objects •Conceptualizes Density of Liquids •Proportional Reasoning •Uses a 2x2 Classification Scheme to Organize Relevant Factors

Standard 3

Component	Operational Learning Goal
Mathematical Reasoning	•Conceptualizes Density of Solid Objects •Conceptualizes Density of Liquids •Proportional Reasoning •Uses a 2x2 Classification Scheme to Organize Relevant Factors

Standard 4

Component	Operational Learning Goal
Physical Setting *Key Idea 3:* Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity. PERFORMANCE INDICATOR 3.1 Observe and describe properties of materials, such as density, conductivity, and solubility. Major Understandings: 3.1a Substances have characteristic properties. Some of these properties include color, odor, phase at room temperature, density, solubility, heat and electrical conductivity, hardness, and boiling and freezing points. 3.1h Density can be described as the amount of matter that is in a given amount of space. If two objects have equal volume, but one has more mass, the one with more mass is denser. 3.1i Buoyancy is determined by comparative densities.	•Conceptualizes Density of Solids •Conceptualizes Density of Liquids

Standard 7

Component	Operational Learning Goal
Connections	•Technical Description •Uses a 2x2 Classification Scheme to Organize Relevant Factors

Operational Learning Goals

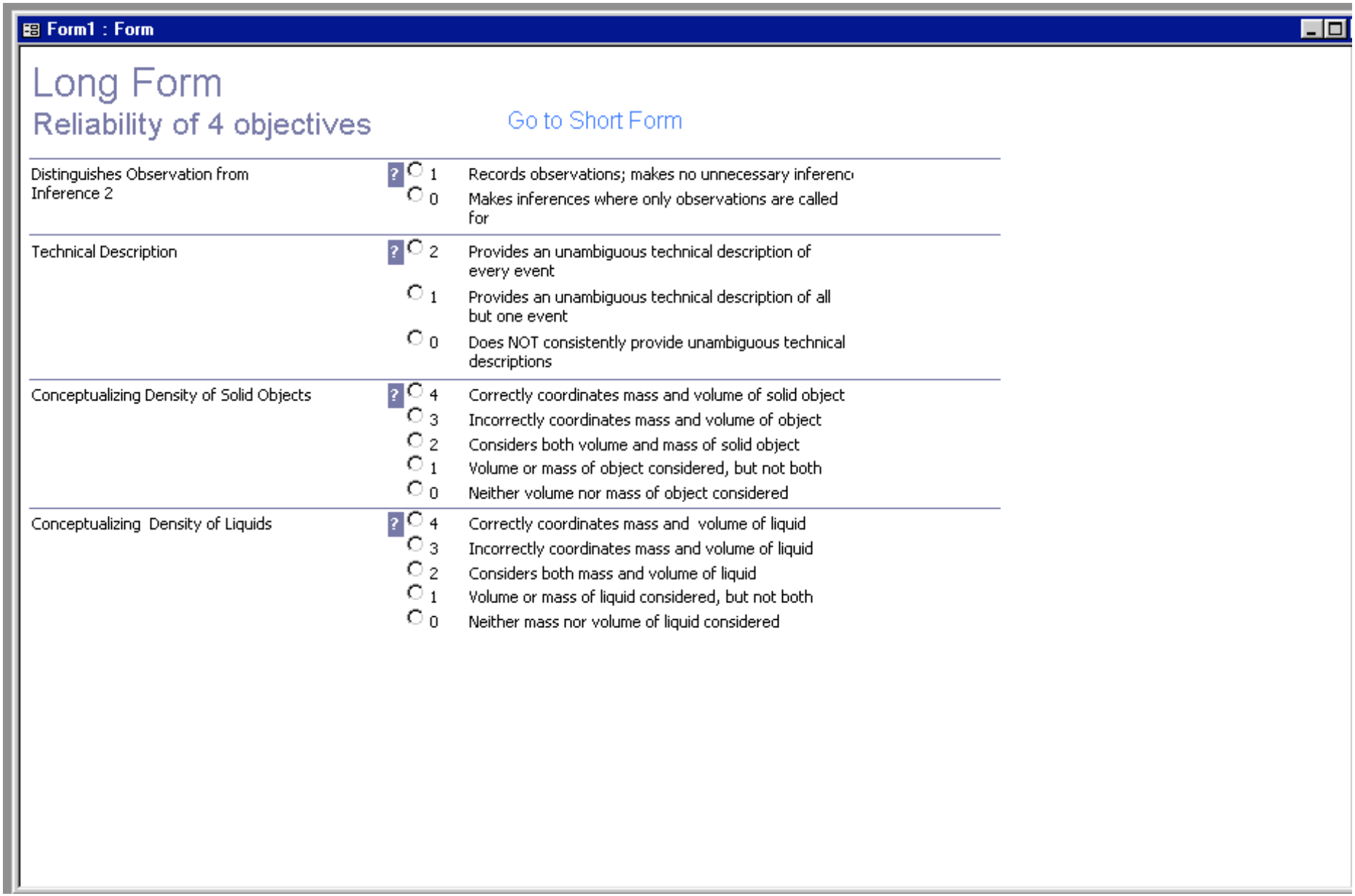
- Conceptualizes Density of Solids
- Conceptualizes Density of Liquids
- Technical Description
- Distinguishes Observation from Inference
- Proportional Reasoning
- Uses a 2x2 Classification Scheme to Organize Relevant Factors

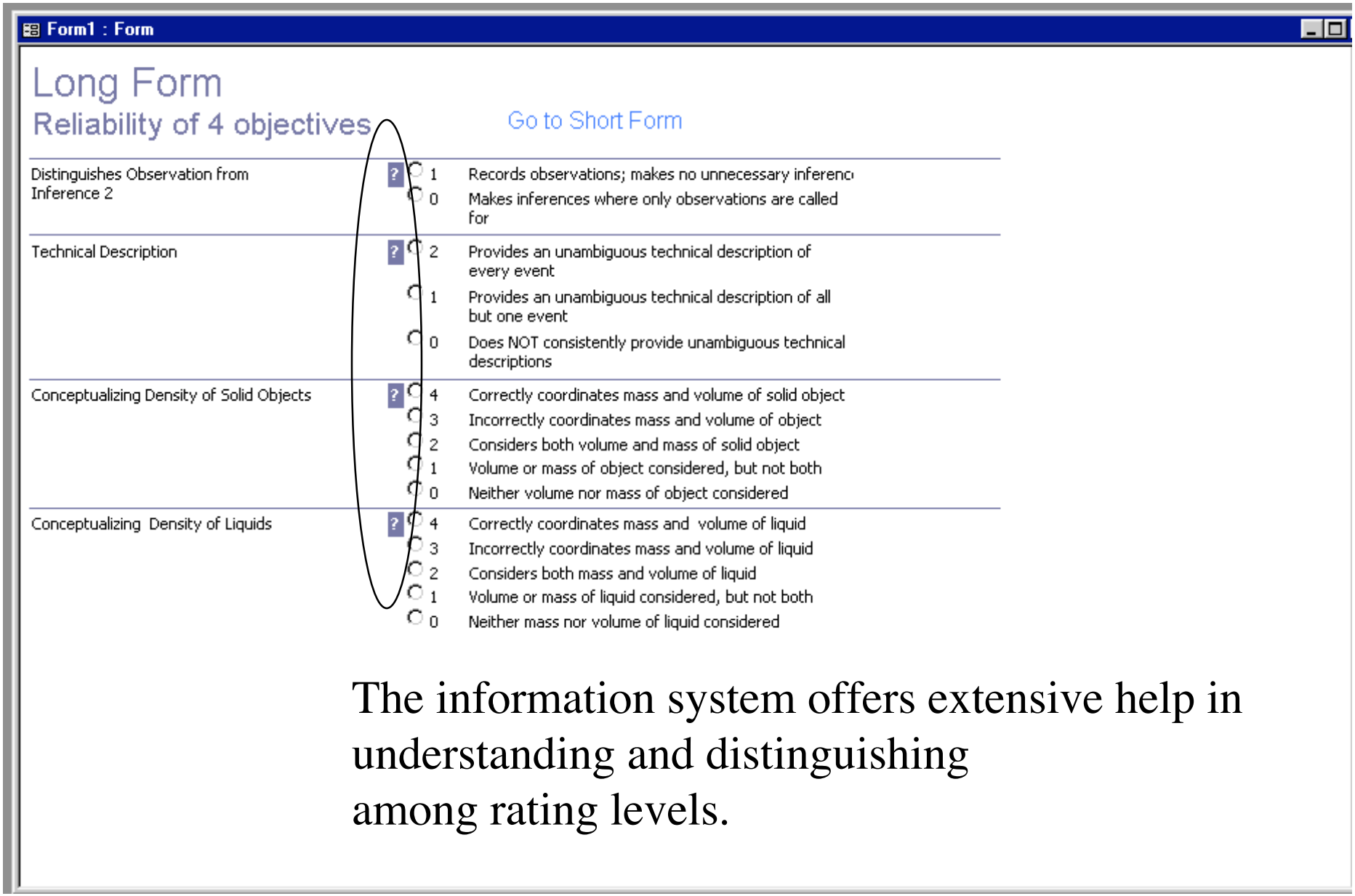
Density of Solid Objects

Coordinates Mass and Volume of Solid Objects

2. **Correctly** coordinates mass and volume of solid objects
1. **Attempts** to coordinate mass and volume of solid objects
0. **Does not coordinate** mass and volume of solid objects

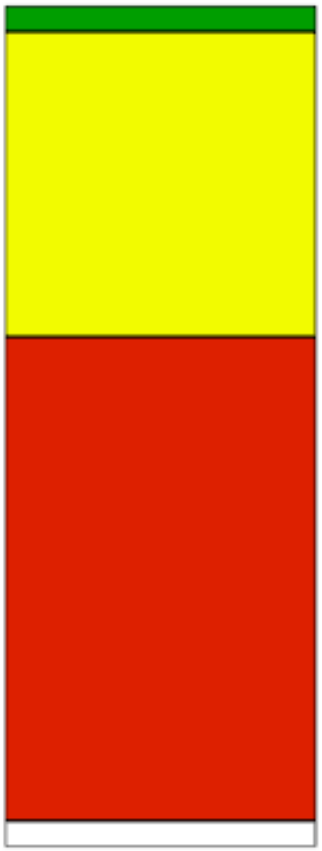
NR. No Rating


Form1 : Form
Long Form
Reliability of 4 objectives
Go to Short Form
Distinguishes Observation from Inference 2
1
Records observations; makes no unnecessary inferenc
0
Makes inferences where only observations are called for
Technical Description
2
Provides an unambiguous technical description of every event
1
Provides an unambiguous technical description of all but one event
0
Does NOT consistently provide unambiguous technical descriptions
Conceptualizing Density of Solid Objects
4
Correctly coordinates mass and volume of solid object
3
Incorrectly coordinates mass and volume of object
2
Considers both volume and mass of solid object
1
Volume or mass of object considered, but not both
0
Neither volume nor mass of object considered
Conceptualizing Density of Liquids
4
Correctly coordinates mass and volume of liquid
3
Incorrectly coordinates mass and volume of liquid
2
Considers both mass and volume of liquid
1
Volume or mass of liquid considered, but not both
0
Neither mass nor volume of liquid considered

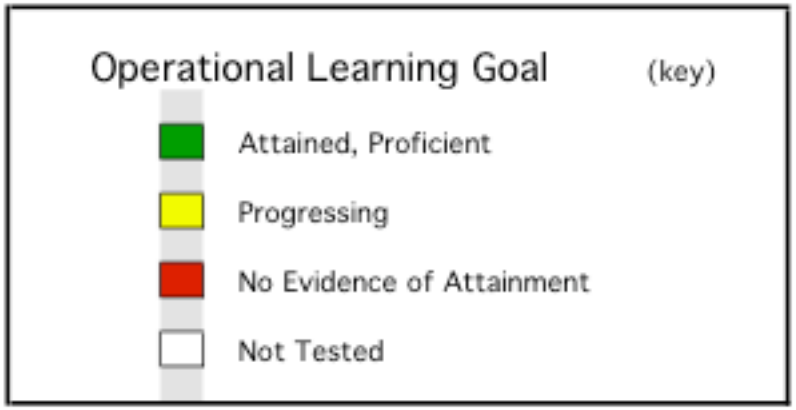


The information system offers extensive help in understanding and distinguishing among rating levels.

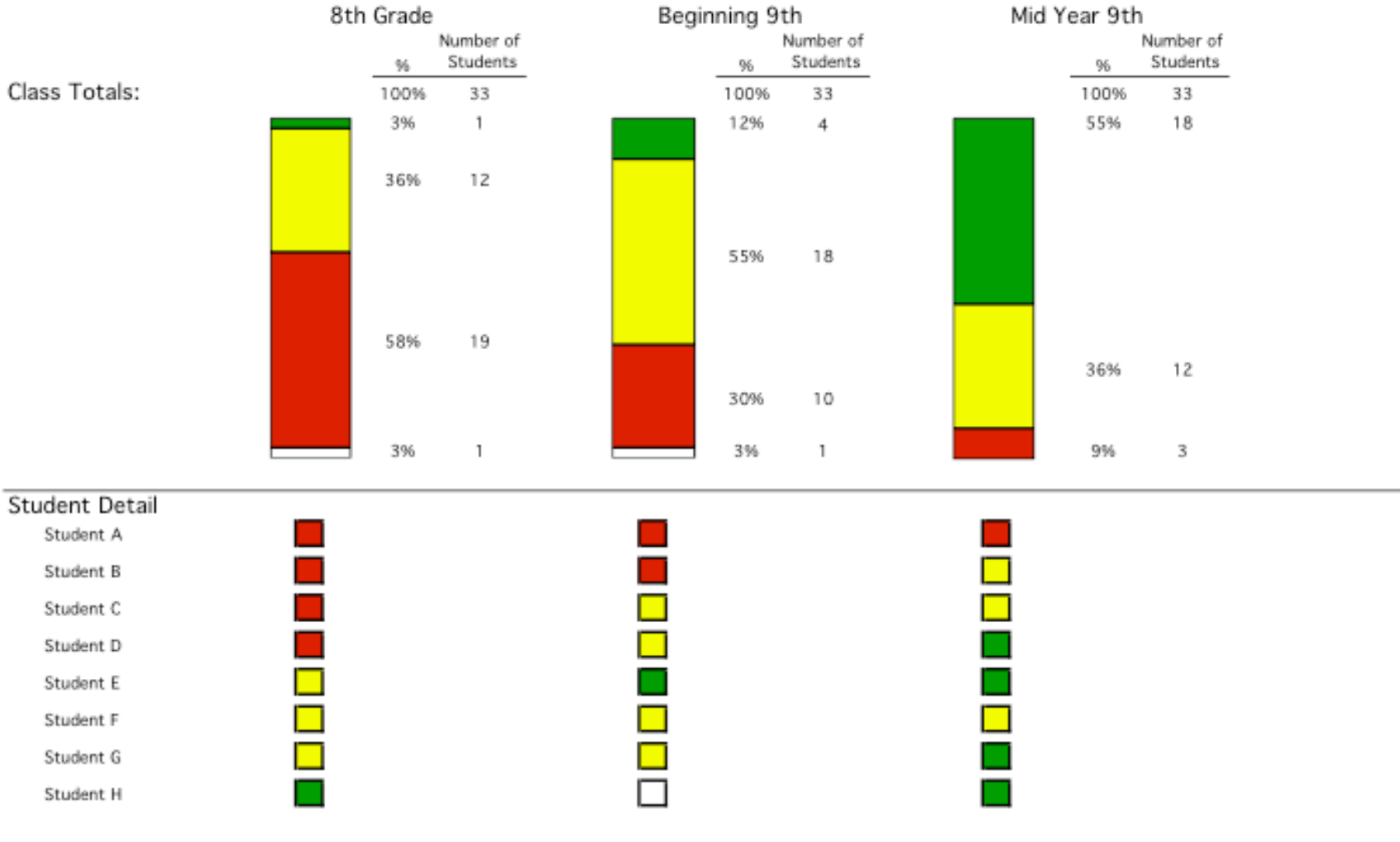
Density of Solid Objects
Performance of a Class
Aggregation: All Students



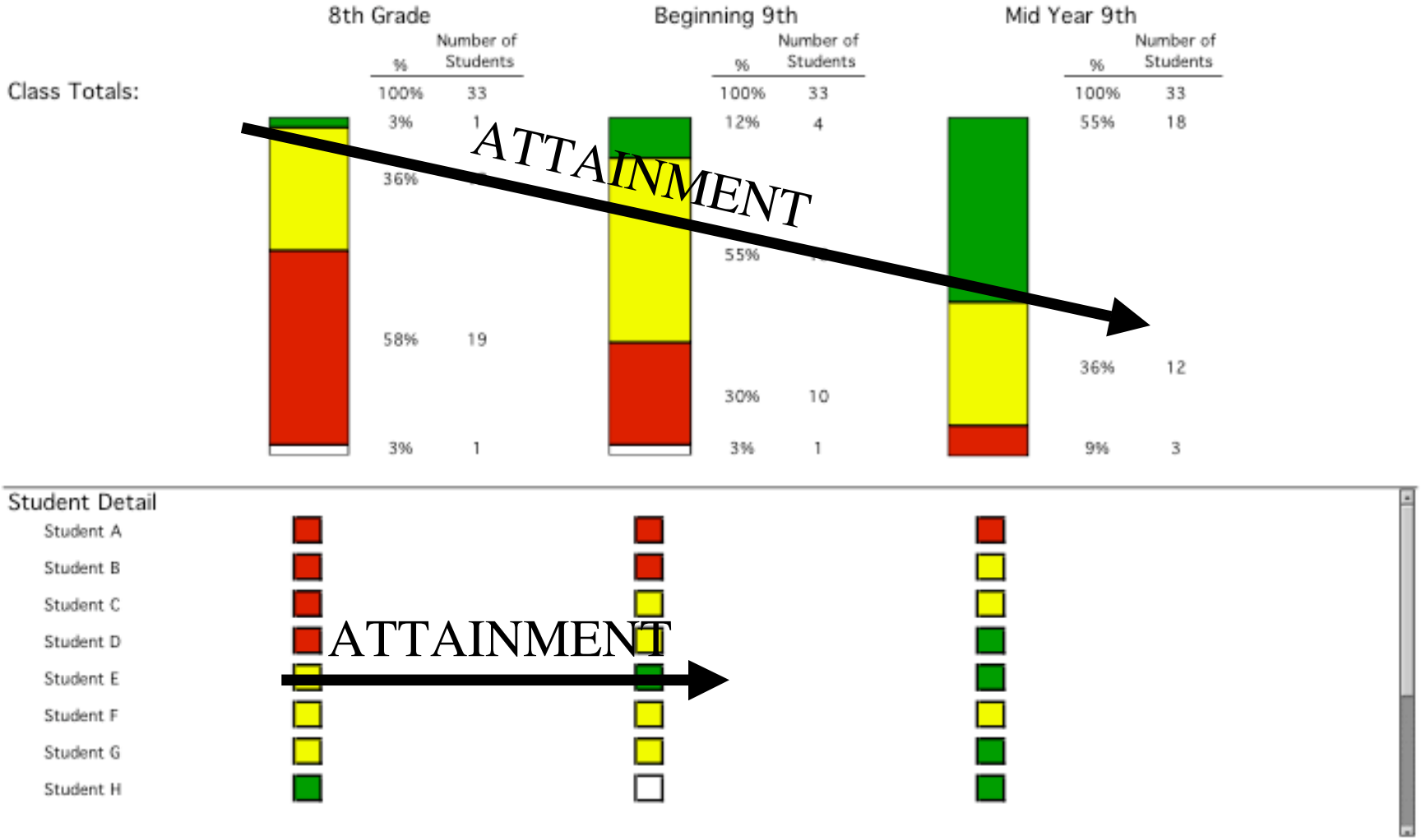
	Percentage of Students	Number of Students
Attained, Proficient	3%	1
Progressing	36%	12
No Evidence of Attainment	58%	19
Not Tested	3%	1



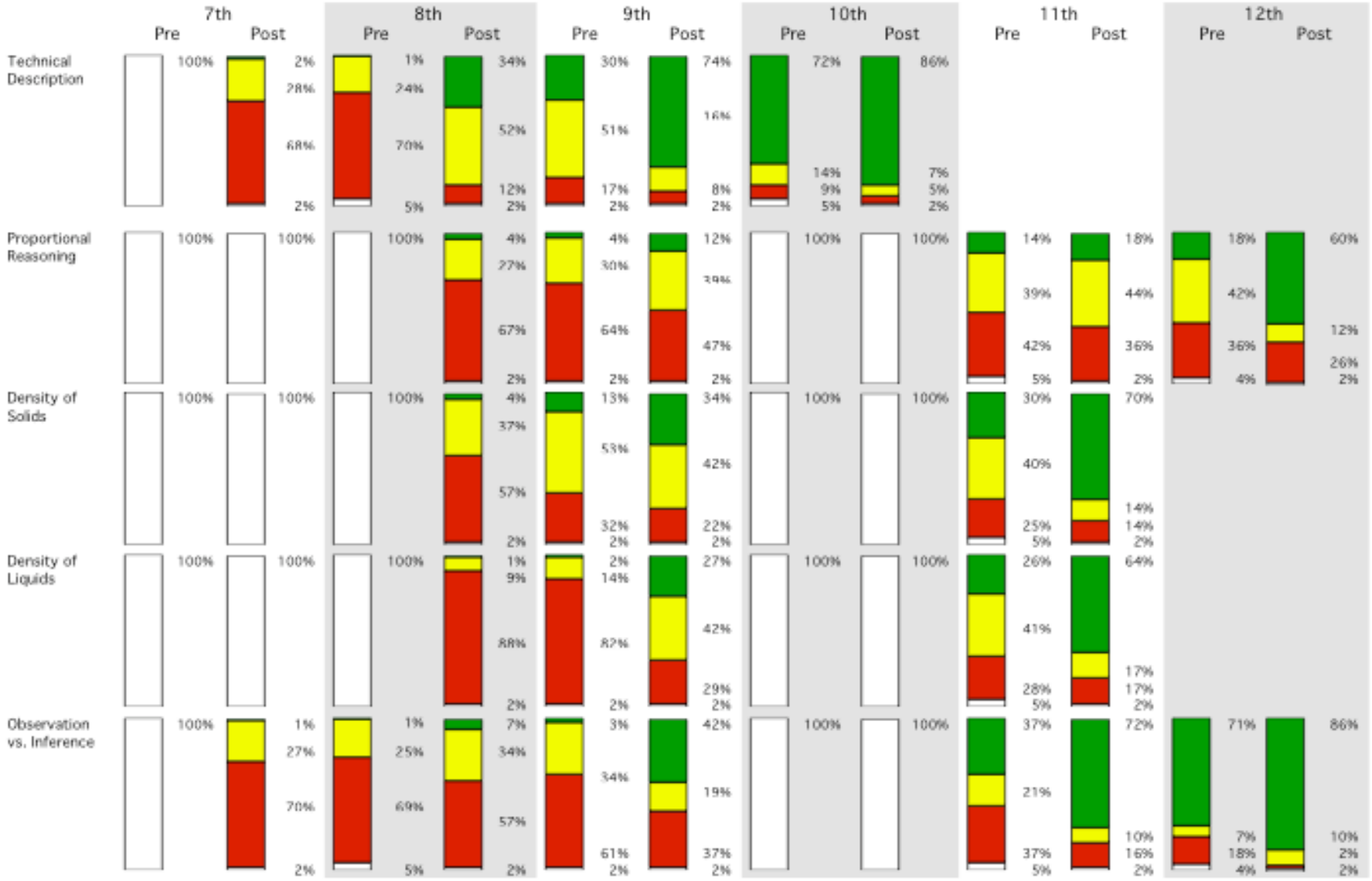
Density of Solid Objects
For Classroom Planning
Aggregation: All Students



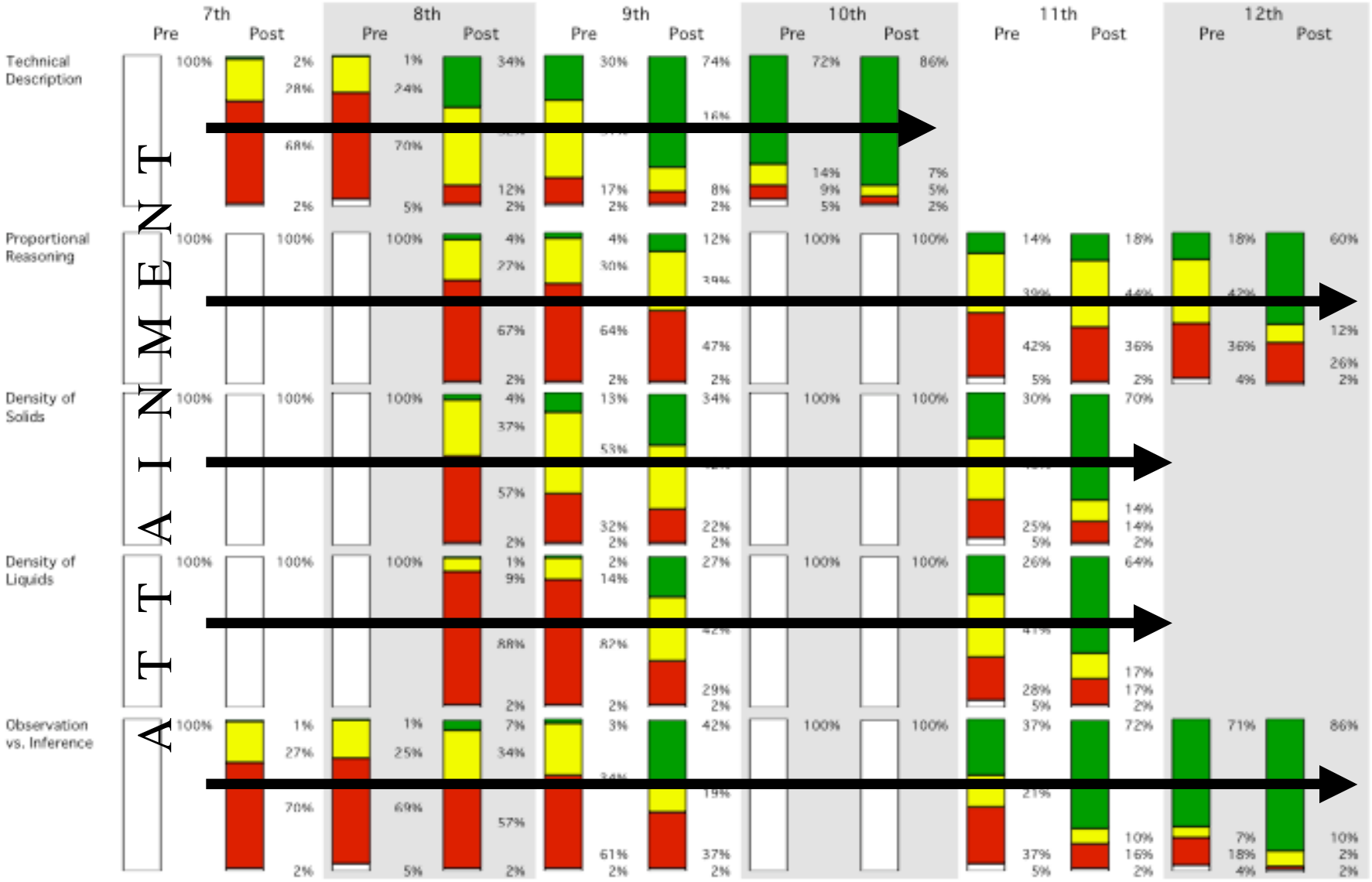
Density of Solid Objects
For Classroom Planning
Aggregation: All Students



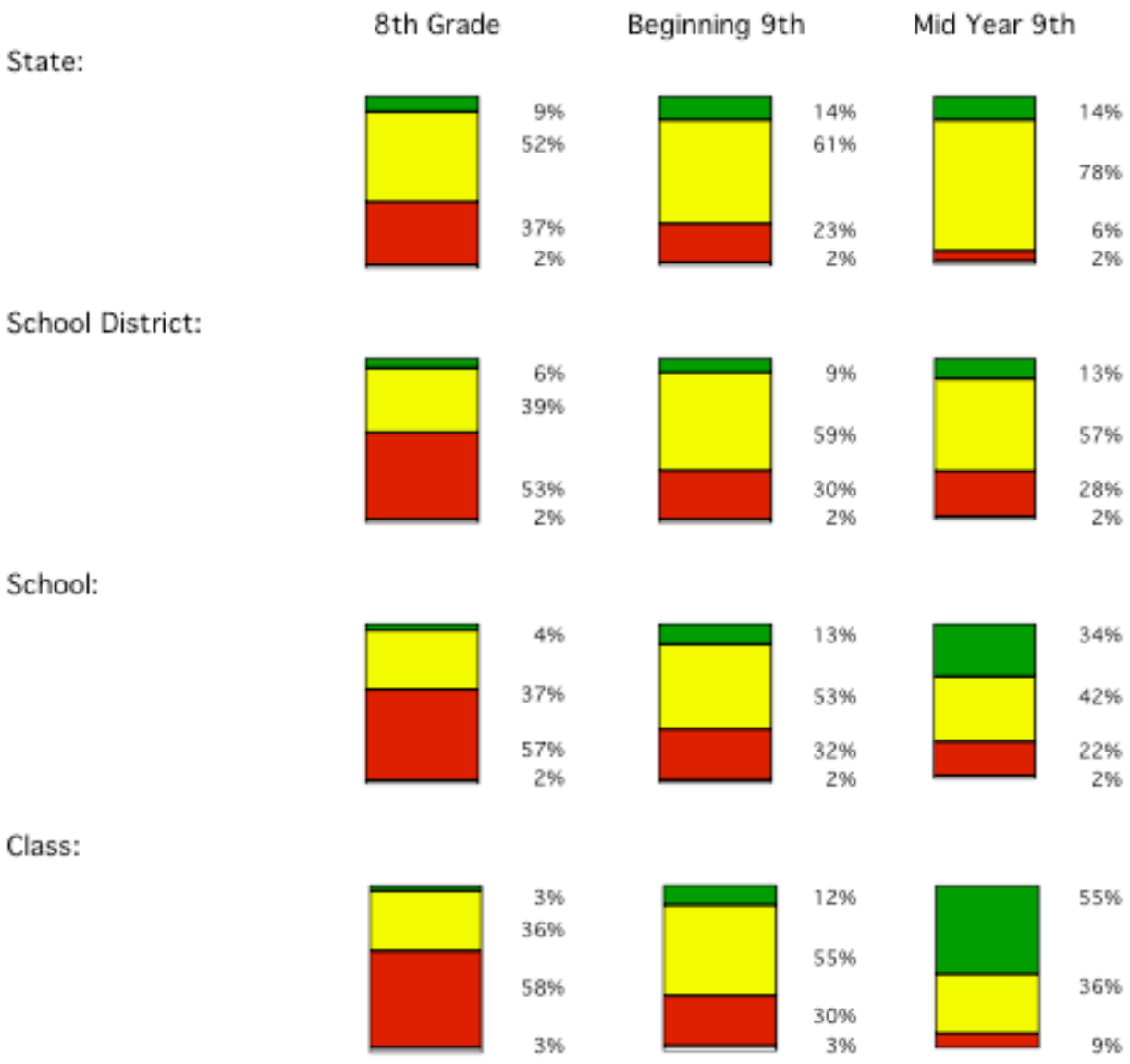
Multiple Learning Goals
School Level
Aggregation: All Students



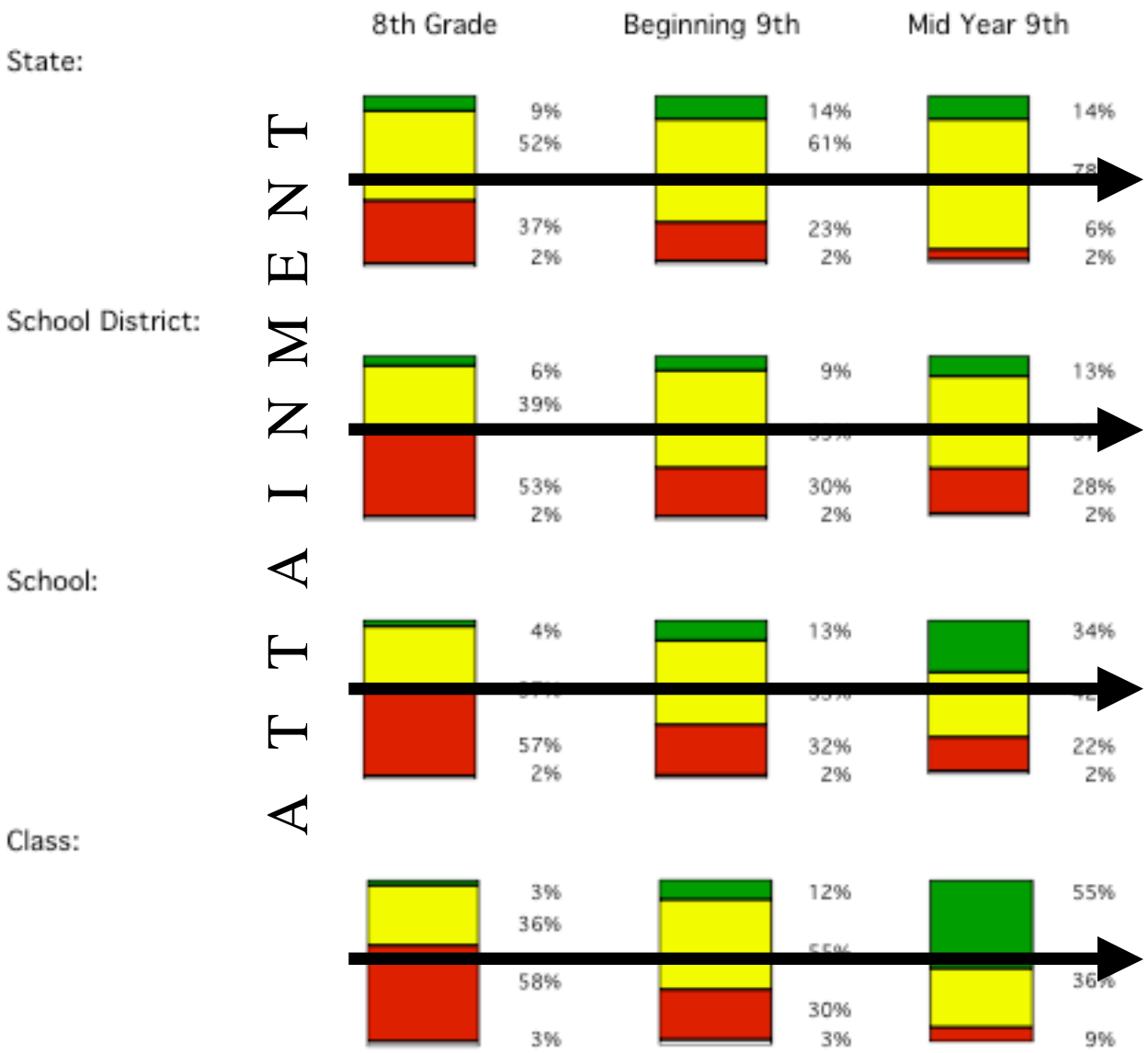
Multiple Learning Goals
School Level
Aggregation: All Students

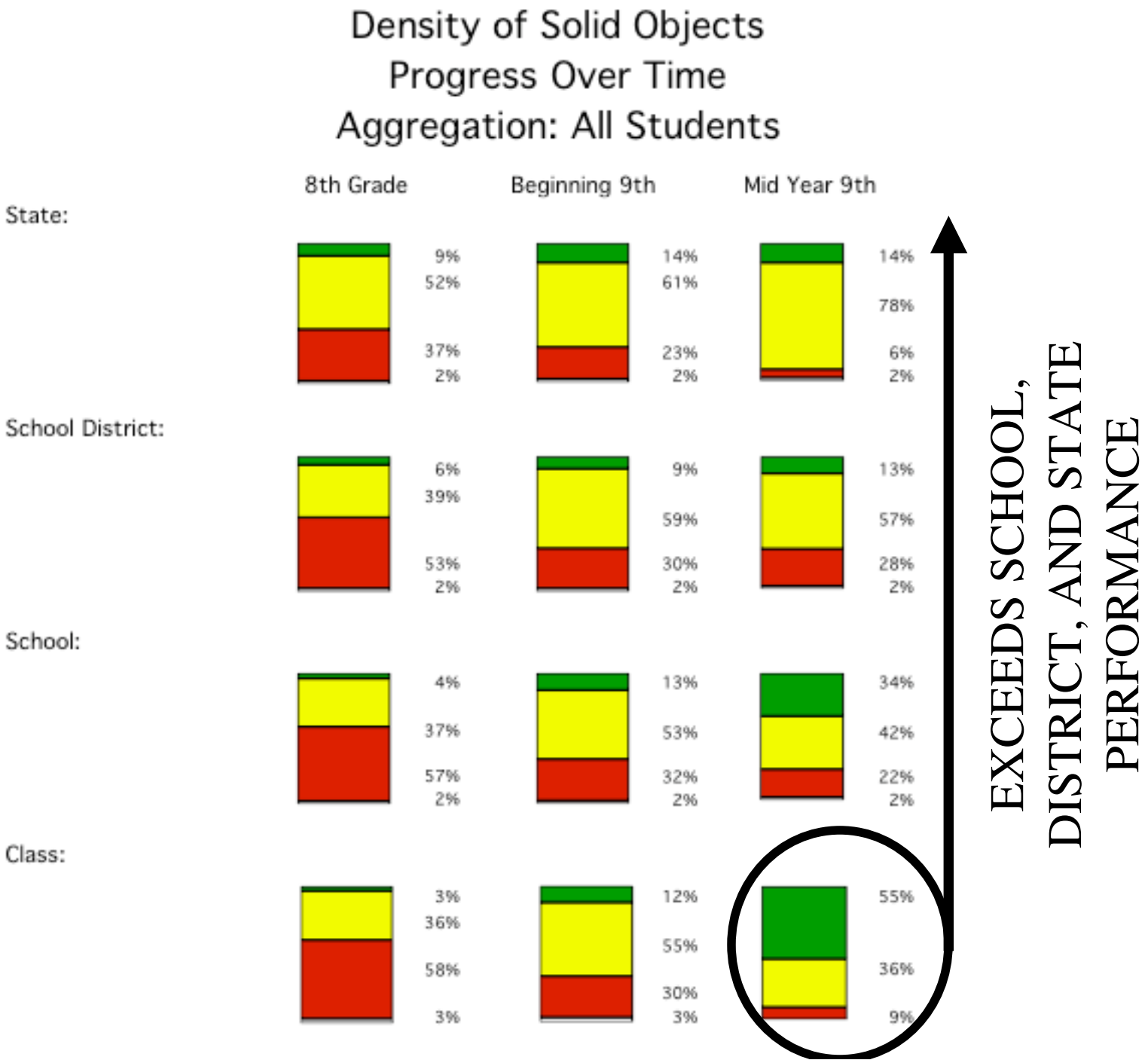


Density of Solid Objects
Progress Over Time
Aggregation: All Students



Density of Solid Objects
Progress Over Time
Aggregation: All Students




Density of Solid Objects
Progress Over Time
Aggregation: All Students
8th Grade
Beginning 9th
Mid Year 9th
State:
9%
52%
37%
2%
14%
61%
23%
2%
14%
78%
6%
2%
School District:
6%
39%
53%
2%
9%
59%
30%
2%
13%
57%
28%
2%
School:
4%
37%
57%
2%
13%
53%
32%
2%
34%
42%
22%
2%
Class:
3%
36%
58%
3%
12%
55%
30%
3%
55%
36%
9%
EXCEEDS SCHOOL, DISTRICT, AND STATE PERFORMANCE