Developing a System of Assessment for NGSS in California

Stanford NGSS Assessment Project (SNAP)

Jonathan Osborne

Who is SNAP?

Directed by Jonathan Osborne, Ray Pecheone (& helen quinn)

Assisted by:

- Nicole Holthuis
- Susan Schultz
- Jill Wertheim
- Anne Tweedy
- Preetha manon
- Paolo Martin

Advisors

Jim pelligrino	University of chicago	Eric steinhauer	ets
Mark wilson	ucb	Alicia alonzo	michigan State
Caleb cheung	oakland school district	Steven pruit	achieve
Chris harris	sri	diane hernandes	cde
Michal lomask	educational consultant		

Maik Wailpuski	University of Essen, germany
Mary Whitehouse	University of york, UK
Mike timms	acer, australia

Papers

Paper 1:**The Challenges posed by the Demands of NGSS and possible solutions**

Jonathan Osborne

Paper 2: What Assessments Exist and How Well do they meet the needs of NGSS

Jill Wertheim

Paper 3: The Promise and Challenge of Eliciting and Measuring Evidence of Three- Dimensional Learning

Nicole Holthuis & Susan Schultz

Paper 4: Assessing Scientific Practices: Issues and Challenges drawn from the example of Argumentation.

Bryan Henderson

The Challenges posed by the Demands of NGSS and possible solutions

Stanford NGSS Assessment Project (SNAP)

Jonathan Osborne

SNAP'S GOAL

SNAP'S GOAL IS TO ADVANCE THE CONCEPTIONS OF SCIENCE ASSESSMENT REQUIRED TO IMPLEMENT AND SUPPORT NGSS AND SCIENCE TEACHING AND LEARNING IN CALIFORNIA BY: A) CONSTRUCTING, VALIDATING, AND DISSEMINATING EXEMPLARY TASKS AND ASSESSMENT TEMPLATES; AND B) DEVELOPING A SET OF POLICY RECOMMENDATIONS FOR A SYSTEM OF ASSESSMENT THAT MATCHES THE ASPIRATIONS OF NGSS.

TO USE THE POLICY RECOMMENDATIONS AND ASSESSMENTS AS A BASIS FOR A SUSTAINED DIALOGUE WITH POLICY MAKERS, ASSESSMENT DEVELOPERS, PROFESSIONAL DEVELOPMENT PROVIDERS, SCHOOL/DISTRICT ADMINISTRATORS, TEACHERS, AND PARENTS AND COMMUNITY LEADERS.

FUNDED BY THE S.R. BECHTEL JR. FOUNDATION FOR 2015-16

US DEPARTMENT FOR EDUCATION RECOMMENDATIONS OCT 2015

Principles for Fewer and Smarter Assessments

In the vital effort to ensure that all students in America are achieving at high levels, it is essential to ensure that tests are fair, are of high quality, take up the minimum necessary time, and reflect the expectation that students will be prepared for success in college and careers

Testing should be a part of good instruction, not a departure from it

Cover the full range of the relevant state standards

Elicit complex student demonstrations or applications of knowledge

Provide an accurate measure of student achievement

Provides an accurate measure of student growth

Traditional Items

1: Structure of an Atom

Which of the following best describes an atom?

A Protons and electrons grouped together in a random pattern

B Protons and electrons grouped together in an alternating pattern

C A core of protons and neutrons surrounded by electrons

D A core of electrons and neutrons surrounded by protons

Traditonal Questions

Item #5: Cork Floats

The following table shows properties of four different sample materials. One of these material is cork, a type of wood that floats in water

Physical Properties

Sample Number	Mass	Volume
1	89 g	10 mL
2	26 g	10 mL
3	24 g	100 mL
4	160 g	100 mL

Given that the density of water is 1 g/mL, which of the samples is most likely cork?

A 1
B 2
C 3
D 4

Major Changes in NGSS

Learning is **3 Dimensional**

- Disciplinary Core Ideas
- Scientific Practices
- Cross-Cutting Concepts

Outcomes Specified as a **Performance Expectation**:

MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

Recommended "System of Science Assessments"

	PART 1: EXTERNAL FEDERALLY MANDATED ASSESSMENTS	
Grade	**Component A: Multi-item types** • Variety of item types including selected and constructed response • Computer scored	**Component B: Performance Tasks** • Two short performance tasks • Scored by trained group of teachers • Matrix assigned
1		
2		
3		
4		
5	Administered	Administered
6		
7		
8	Administered	Administered
9		
10		
11	Administered	Administered

Recommended "System of Science Assessments"

	PART 2: PERIODIC CLASSROOM PERFORMANCE ASSESSMENTS	
Grade	**Component C: Stand-alone Performance Tasks** • Shorter • Optional • State/District-developed? • Teacher scored • Use of tasks is reported, scores are not reported to state but may be used by districts	**Component D: Curriculum Embedded Performance Tasks (CEPT)** • Longer • Three options • Task bank, state curated and quality controlled (eventually includes consortium/district developed tasks) • Teacher scored • Scores & Use of Tasks Reported?
3	Administered?	Administered?
4	Administered?	Administered?
5	Administered?	Administered?
6	Administered?	Administered?
7	Administered?	Administered?
8	Administered?	Administered?
9	Administered?	Administered?
10	Administered?	Administered?
11	Administered?	Administered?

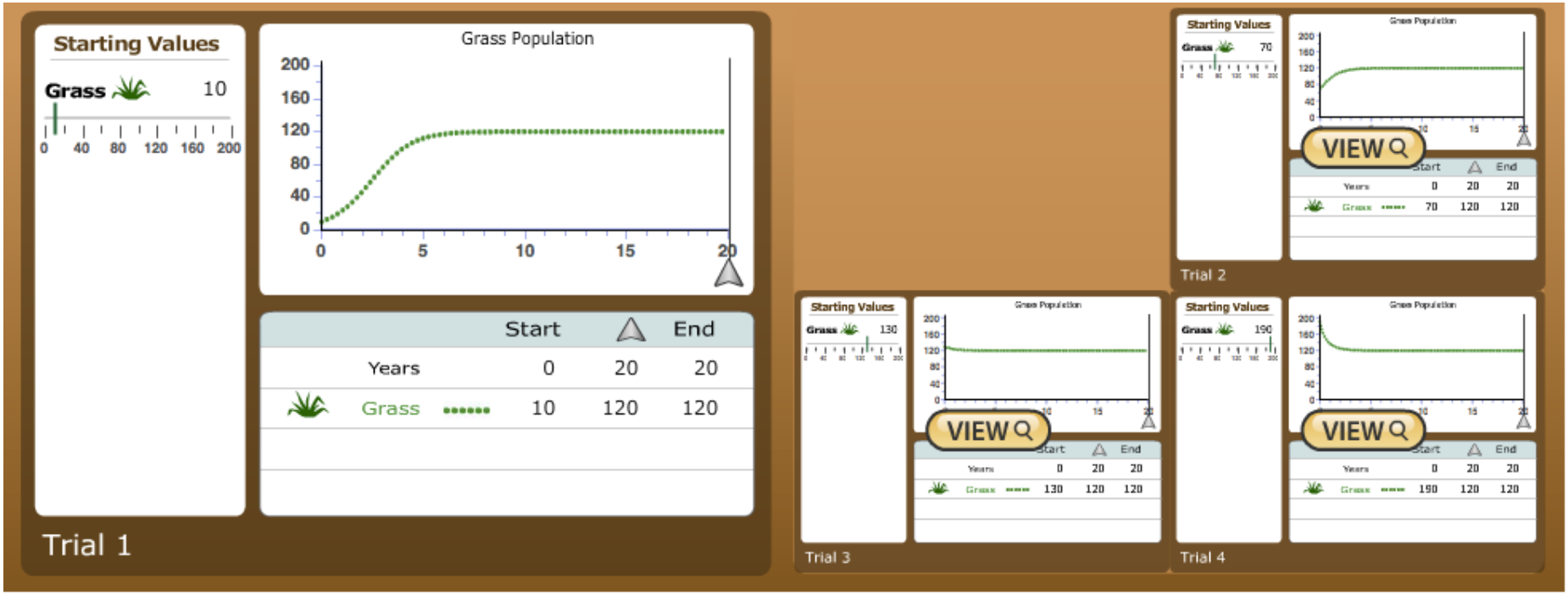
Classroom Based Extended Performance Task Options

Option 1: All tasks are voluntary

Option 2: Tasks only required for assessment in the federally mandated years

Option 3: tasks required in each year from grade 3-8

Short performance task (20 min)



Rosa is a tour guide at the visitor center. A visitor asked if the number of grass plants would ever decrease. Rosa used the model to test different starting numbers of grass plants. Carefully analyze her results above.

According to Rosa's results, does the number of grass plants ever decrease?

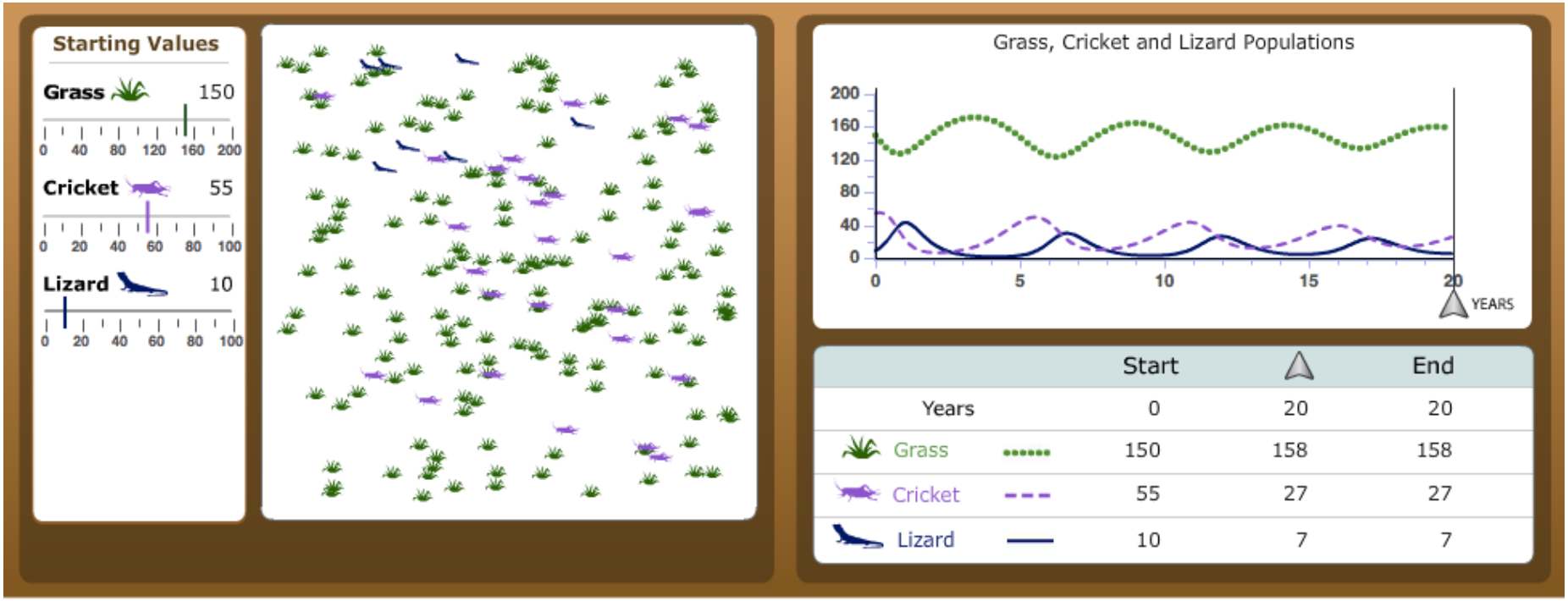
- Yes
- No
- Cannot tell from graphs

Which trial offers the strongest evidence for your answer?

- Trial 1
- Trial 2
- Trial 3
- Trial 4
- Cannot tell

From WestEd's simscientists.org

Component B



The graph shows changes in organism populations during a period of 20 years. Look carefully at the predator and prey populations between year 10 and year 11.

Which of these sentences correctly explains what is happening between year 10 and year 11?

- The prey population is low because there are so many predators eating them.
- The predator population is low because the prey population is increasing.
- The prey population is increasing because there are few predators eating them.
- The predator population is increasing because the prey population is low.

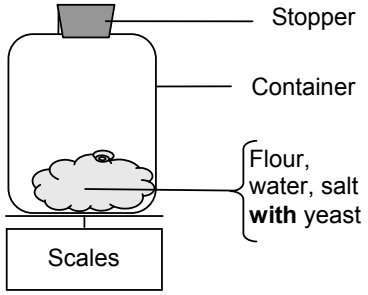
From WestEd's simscientists.org

Possible Questions

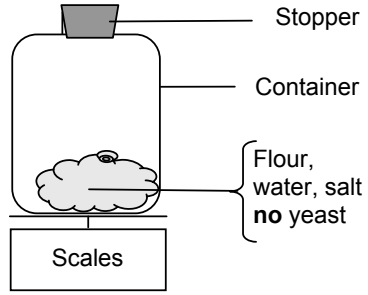
Question 2: BREAD DOUGH S505Q02

A few hours after mixing the dough, the cook weighs the dough and observes that its weight has decreased.

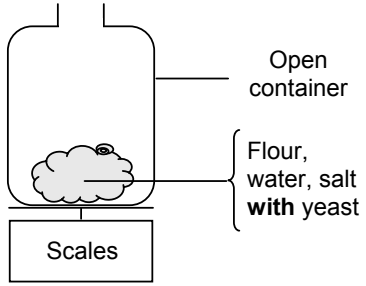
The weight of the dough is the same at the start of each of the four experiments shown below. Which **two** experiments should the cook compare to test if the **yeast** is the cause of the loss of weight?



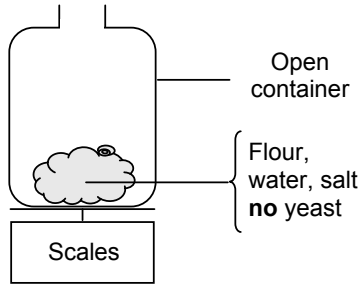
Experiment 1



Experiment 2



Experiment 3



Experiment 4

A The cook should compare experiments 1 and 2.
B The cook should compare experiments 1 and 3.
C The cook should compare experiments 2 and 4.
D The cook should compare experiments 3 and 4.

California Decisions (March 2016)

Grade five assessment, consisting of grade five performance expectations and matrix sampling of performance expectations from kindergarten through grade four;

Grade eight assessment, consisting of middle school (grades six through eight) performance expectations;

Grade **ten**, **eleven**, or **twelve** assessment, consisting of high school performance expectations.

California Decisions-Mandated Fed Tests

THREE COMPONENTS

SEGMENT A (FIXED/EQUIVALENT CONTENT, VARIABLE BY DIFFICULTY)

- Fixed Content – variable in difficulty
- Machine scorable
- Short Answer, selected response
- Score on this section will be used to determine what is tested in segment B

SEGMENT B

- Performance Assessments
- Variable Content

SEGMENT C

- Matrix Sampled
- Highly Variable Content

To Date

- Developed and finalized a paper presenting our thinking
- Held a meeting of advisors
- Collated a large bank of potential items
- Reviewed those items using a set of criteria we have developed
- Developed some initial templates and are trialing those in schools
- Signed an MOU with ETS
- Met with K-12 alliance, WestEd and CDE
- Held a workshop for developers

Future Work

- Building and developing more assessments
- Trialing those assessments with student
- Holding workshops to build expertise in the field

CONTACT INFO

- WEB SITE
  - http://SNAPGSE.STANFORD.EDU

- E-mail: osbornej@stanford.edu