

High School Math Pathways Symposium

Statistics and Probability Course



Nov. 9-10, 2021

4. Statistics and Probability

Facilitated by

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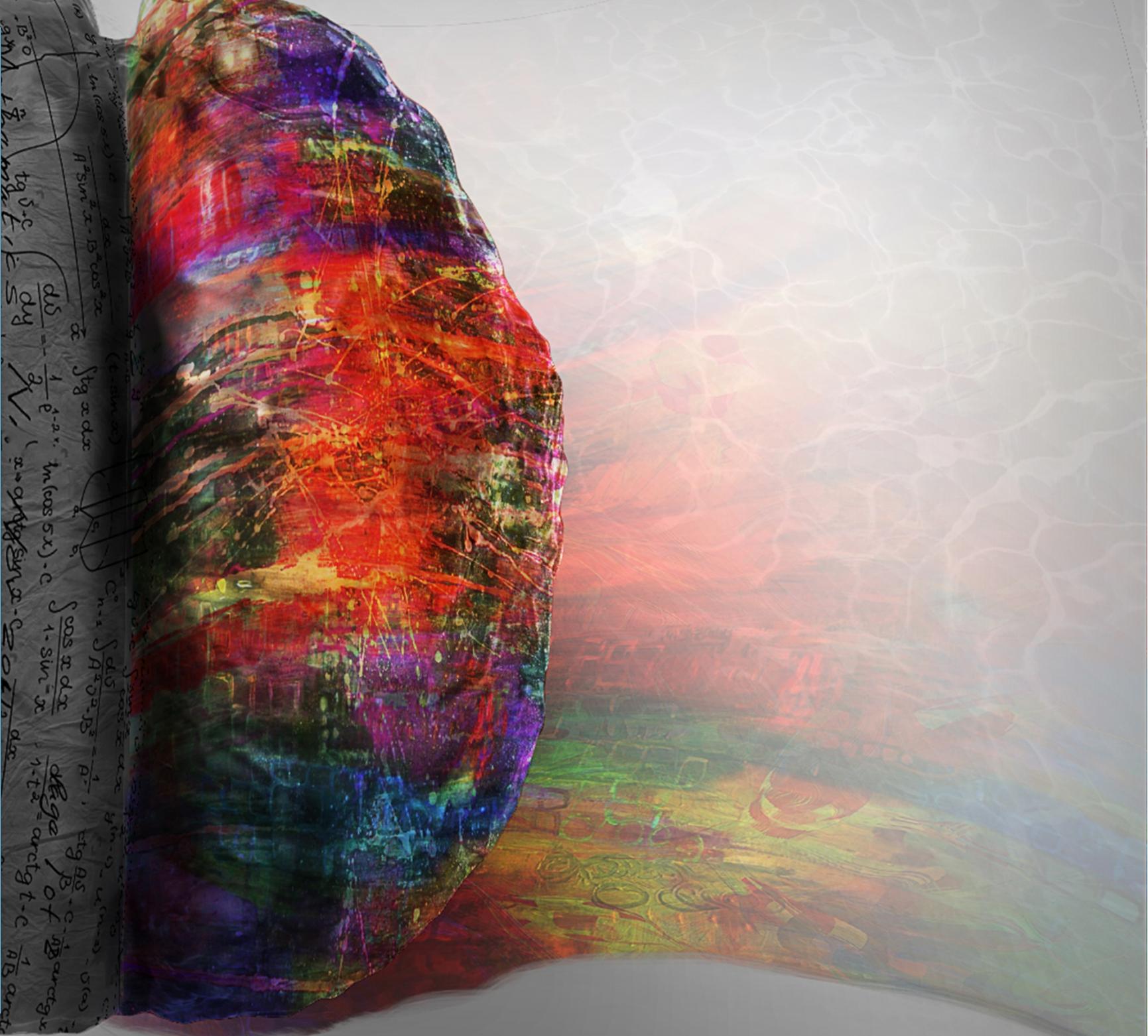
This session will be recorded, so it can be posted on the Department's website. The recording will begin at the end of this slide.

Give feedback on
our Padlet!



Rigor

“Students use mathematical language to communicate effectively and to describe their work with clarity and precision. Students demonstrate how, when, and why their procedure works and why it is appropriate. Students can answer the question, ‘How do we know?’”



Rigorous courses are...

Defined by complexity, which is a measure of the thinking, action or knowledge that is needed to complete the task

Measured in depth of understanding

Opportunities for precision in reasoning, language, definitions and notation that are sufficient to appropriate age/course

Determined by students' process

Opportunities for students to make decisions in problem solving

Rigorous courses are not...

Characterized by difficulty, which is a measure of effort required to complete a task

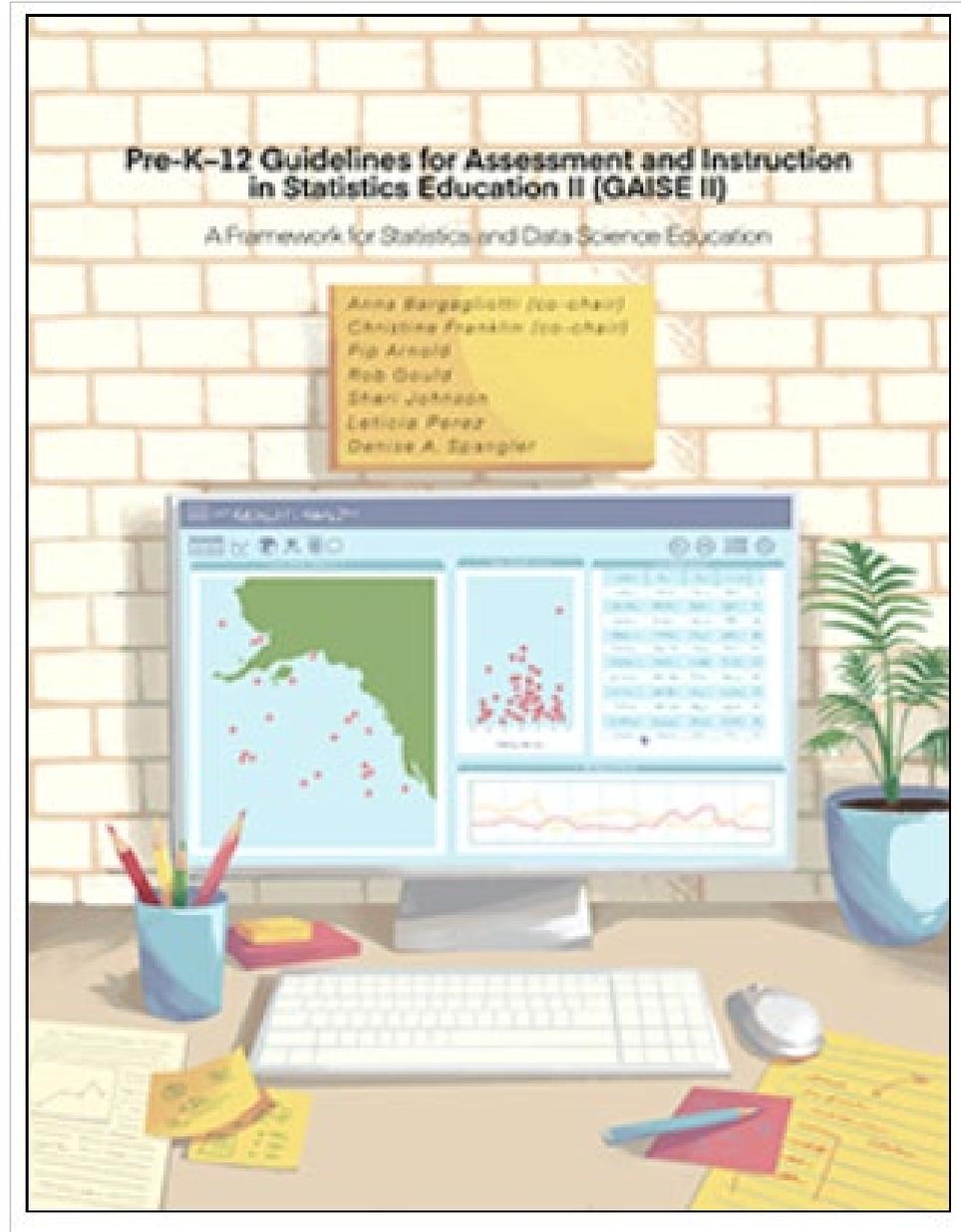
Measured by the amount of work

Based on procedure alone

Measured by assigning difficult problems

Defined only by the resources used

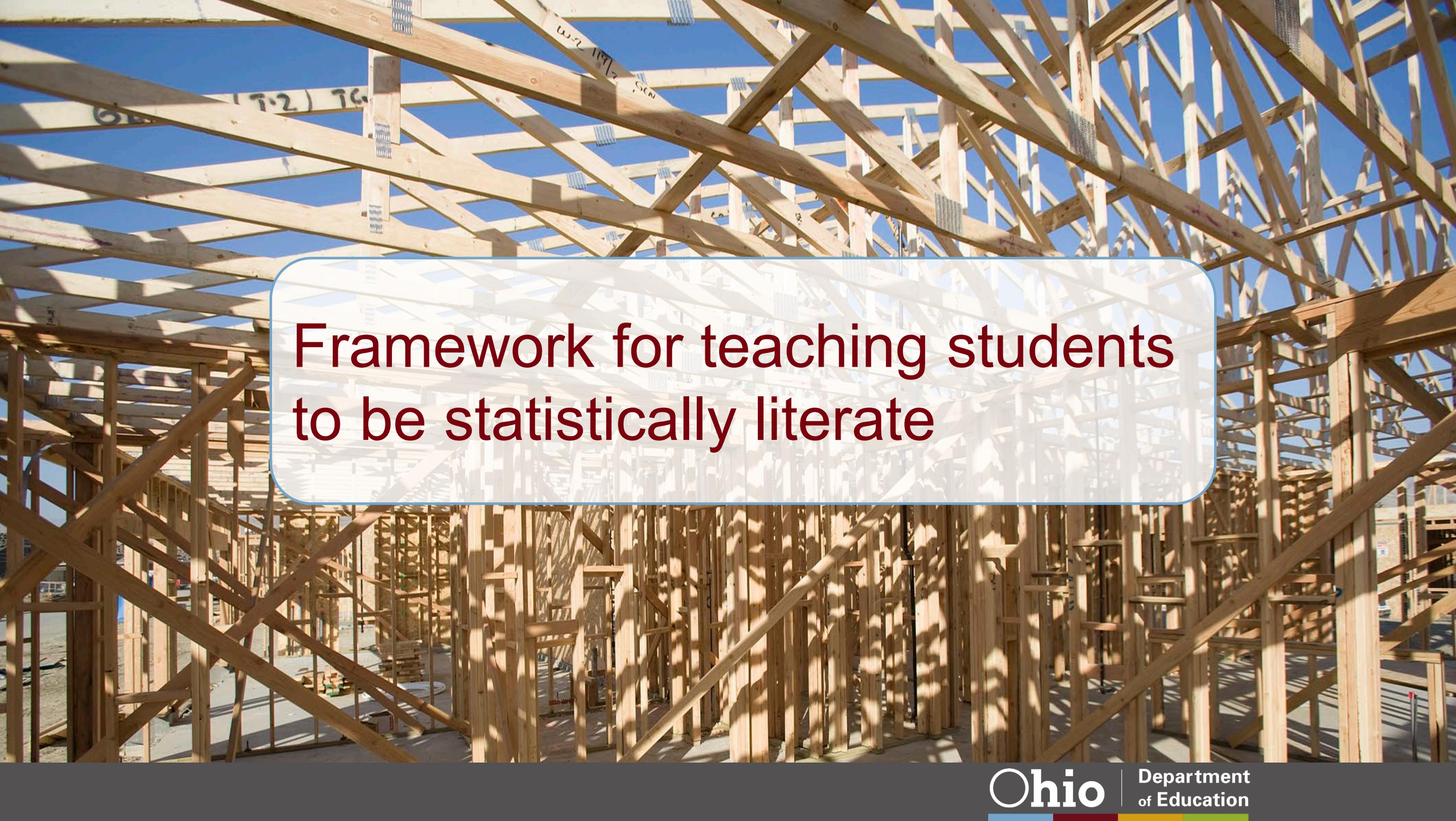
Rigorous courses are...	Rigorous courses are not...
Opportunities to make connections	Taught in isolation
Supportive of the transfer of knowledge to new situations	Repetitive
Driven by students developing efficient explanations of solutions and why they work, providing opportunities for thinking and reasoning about contextual problems and situations	Focused on getting an answer
Defined by what the student does with what you give them	Defined by what you give the student



GAISE II

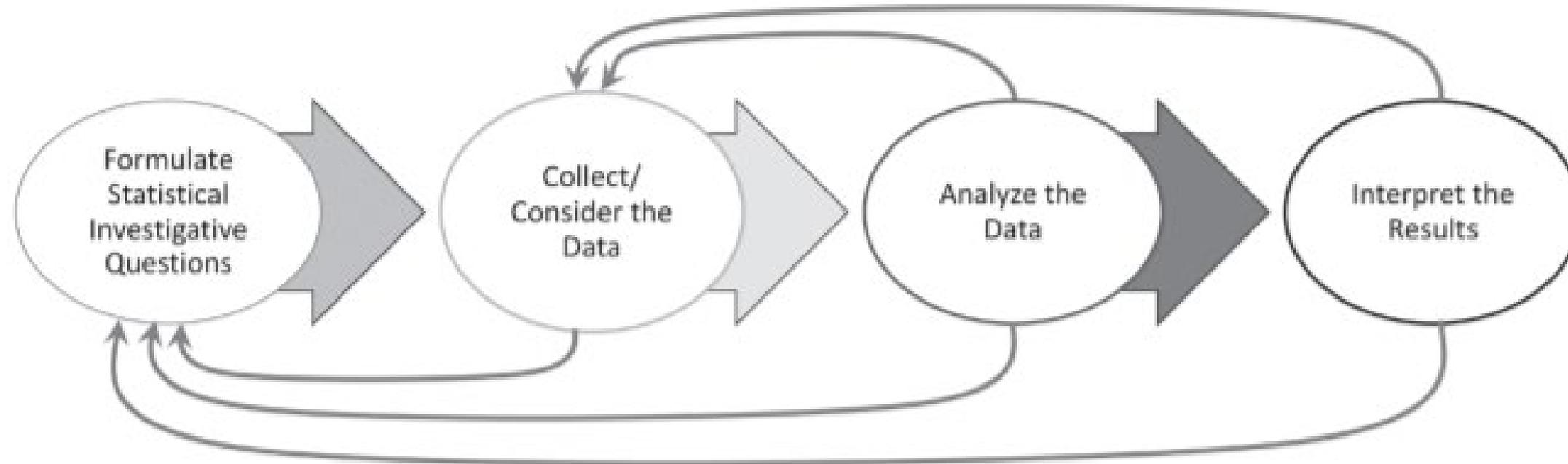
“It is critical that statisticians, or anyone who uses data, be more than just data crunchers. They should be data problem solvers who interrogate the data and utilize questioning throughout the statistical problem-solving process to make decisions with confidence, understanding that the art of communication with data is essential.” (GAISE II)

https://www.amstat.org/asa/files/pdfs/GAISE/GAISEIIPreK-12_Full.pdf



**Framework for teaching students
to be statistically literate**

GAISE Process



- I. Formulate Statistical Investigative Questions
- II. Collect/Consider the Data
- III. Analyze the Data
- IV. Interpret the Results

GAISE II Levels

LEVEL A

(Middle School
and Early High
School)

LEVEL B

(Middle School
and Early High
School)

LEVEL C

(Advanced High
School Courses)

Critical Areas of Focus

Communication and Analysis

Exploring One-Variable Data

Exploring Two-Variable Data

Collecting Data: Sampling Techniques and Experimental Design

Probability, Randomness, and Distributions

Inference for One-Sample Categorical and Quantitative Data

Follow-on Courses

- AP Statistics
- CCP TMM 010-Introductory Statistics
- CCP TMM Introduction to Data Science (Coming Soon)
- CCP TMM 011-Quantitative Reasoning
- CCP TMM 021-Mathematics in Elementary Education 1
- Algebra 2
- Other Math Pathways Course

Note: Students who want to pursue a Calculus-based STEM Pathway should take Algebra 2 as a follow-on course to this course or in tandem with this course.

How is this course different than AP Statistics?

Not Included in Course But Included in AP Statistics	Included in this Course But Covered in Greater Depth in AP Statistics
Inference for two proportions and two means	Formal inference for proportions and means
Inference for regression	Normal probability plots (the high school stats course would use them as a tool only if they can be easily generated with technology)
Inference for multiple categorical variables (Chi-square)	The Central Limit Theorem
Verifying conditions for inference	Residual plots
Type I, Type II errors and power	Linearizing data
Geometric distributions	
Combining random variables	
Confidence level interpretation (confidence interval interpretation is included)	
Z-scores with means	

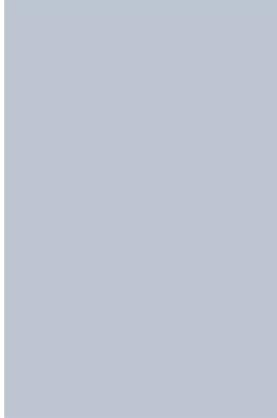
How is this course different than TMM 010-Introductory Statistics?

Not Included in Course But Included in TMM 010-Introductory Statistics	Included in this Course But Covered in Greater Depth in TMM 010-Introductory Statistics
Inference for two proportions and two means	Formal inference for proportions and means
Inference for regression	The Central Limit Theorem
Type I error	Residual plots
Confidence level interpretation (confidence interval interpretation is included)	Linearizing data
Z-scores with means	

What kind of support will teachers have to implement this course?



Standards Document



Instructional Supports for the Model Curriculum

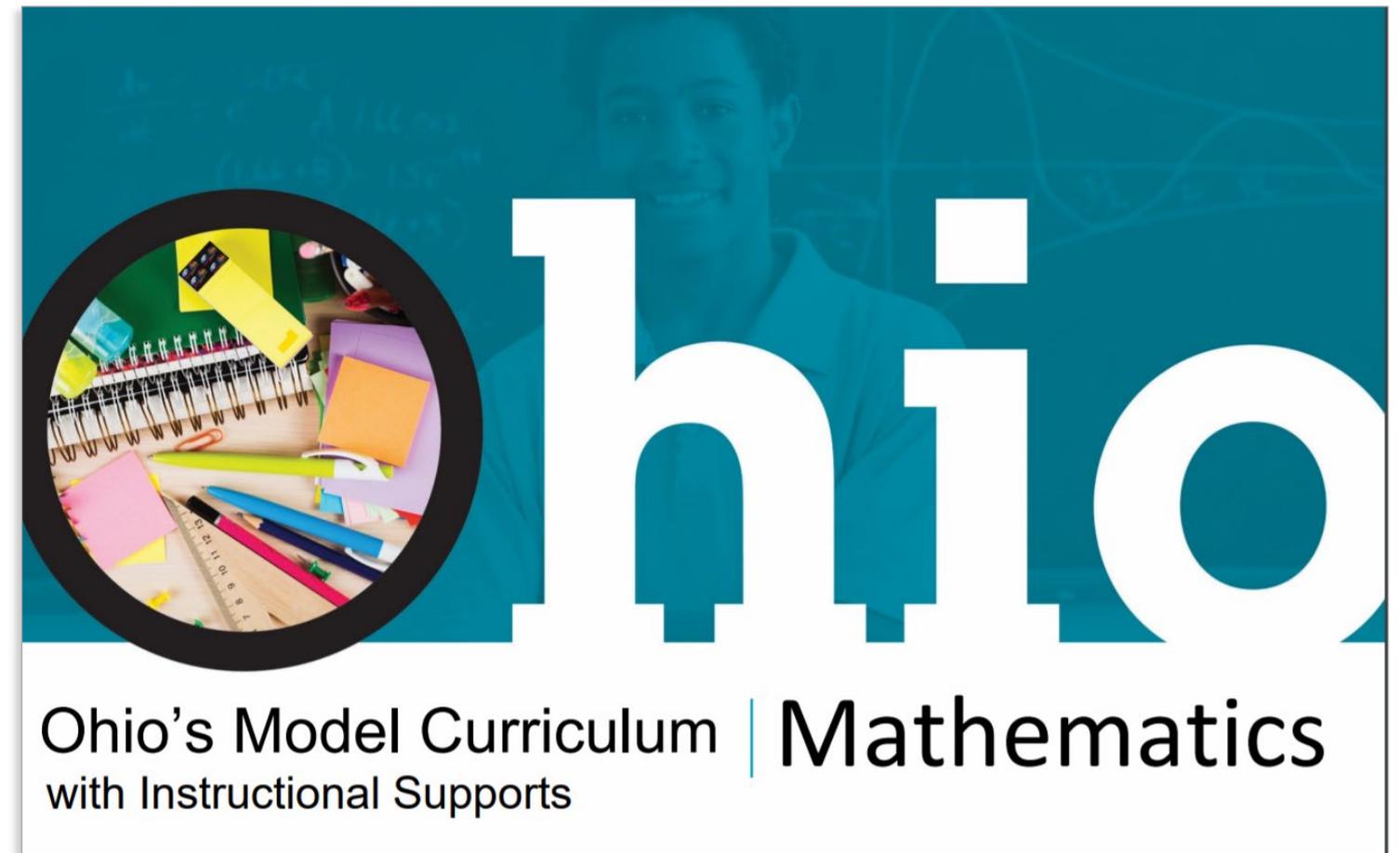


Align with Ohio Materials Matter Work
(See Nov. 10 High Quality Instructional Materials session from 6:30-7:15 p.m. for more information.)

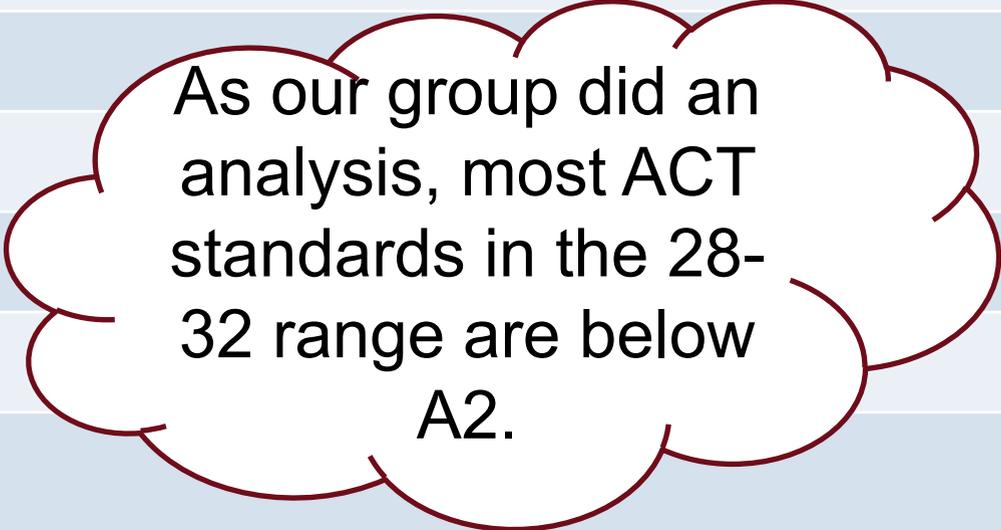
Instructional Supports for the Model Curriculum

Each cluster will include:

- How is this different from Algebra 1/ Geometry?
- Description of Cluster at A2E Level
- GAISE II Connection
- How is this different from TMM 010-Introductory Statistics?
- How is this different from AP Statistics?



ACT Math Blueprint

Reporting Category	Reporting Subcategory	# of Items	% of Test
Integrating Essential Skills (topics learned before 8 th grade using higher complexity)		24-26	40-43%
Preparing for Higher Mathematics		34-36	57-60%
 <p>As our group did an analysis, most ACT standards in the 28-32 range are below A2.</p>	Number & Quantity	4-6	7-10%
	Algebra	7-9	12-15%
	Functions	7-9	12-15%
	Geometry	7-9	12-15%
	Statistics and Probability	5-7	8-10%
Modeling		≥16	≥27%
Total		60	100%

SAT Math Blueprint

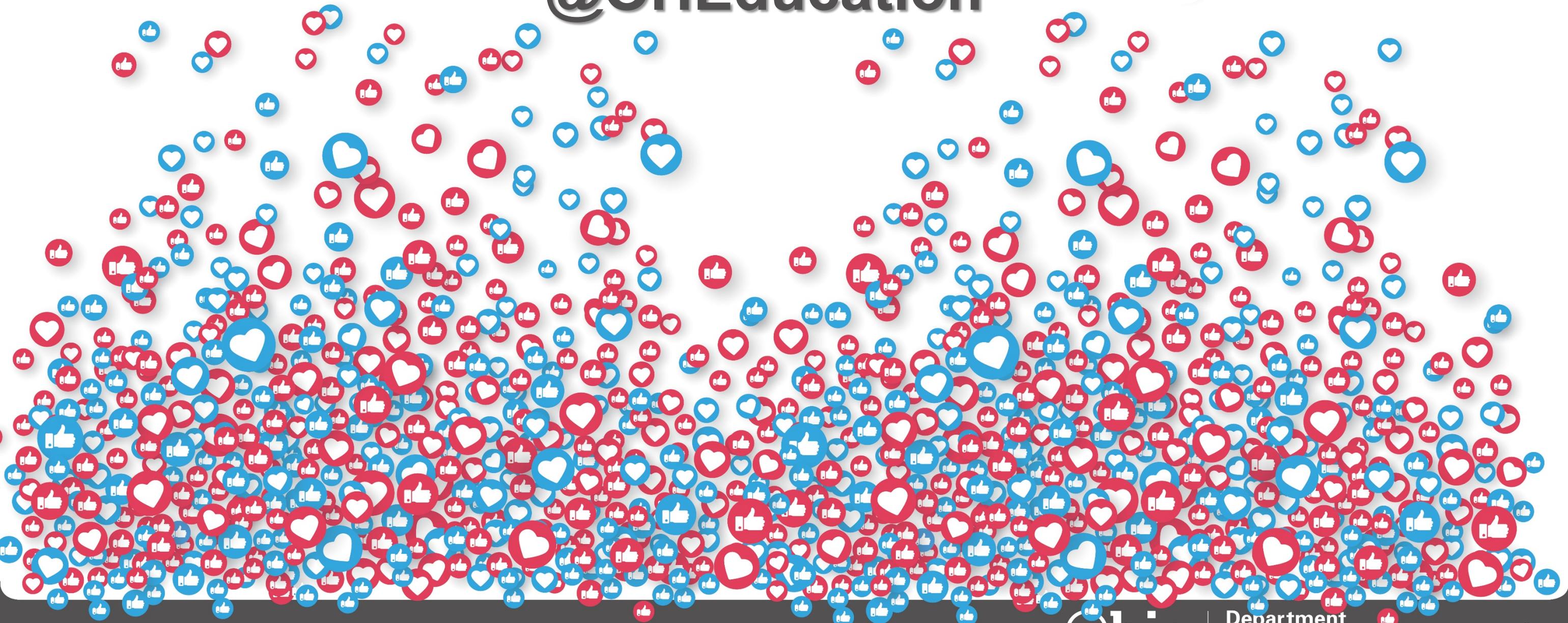
Reporting Category	Reporting Subcategory	# of Items	% of Test
Heart of Algebra <i>(Algebra 1 or Middle School)</i>	<ul style="list-style-type: none">Analyzing and fluently solving linear equations and systems of linear equationsCreating linear equations and inequalities to represent relationships between quantities and to solve problemsUnderstanding and using the relationship between linear equations and inequalities and their graphs to solve problems	19	33%
Problem Solving and Data Analysis <i>(Middle School and Statistics & Probability)</i>	<ul style="list-style-type: none">Creating and analyzing relationships using ratios, proportional relationships, percentages, and unitsRepresenting and analyzing quantitative dataFinding and applying probabilities in context	17	29%

SAT Math Blueprint

Reporting Category	Reporting Subcategory	# of Items	% of Test
Passport to Advanced Math <i>(Algebra 1 & Algebra 2)</i>	<ul style="list-style-type: none">Identifying and creating equivalent algebraic expressionCreating, analyzing, and fluently solving quadratic and other nonlinear equationsCreating, using, and graphing exponential, quadratic, and other nonlinear functions	16	28%
Additional Topics in Math <i>(Geometry and some Middle School & Algebra 2)</i>	<ul style="list-style-type: none">Solving problems related to area and volumeApplying definitions and theorems related to lines, angles, triangles, and circlesWorking with right triangles, the unit circle, and trigonometric functions	6	10%
Total		58	100%



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