NHMA New Haven MANUFACTURERS Association

Southern Connecticut State University
SCSU

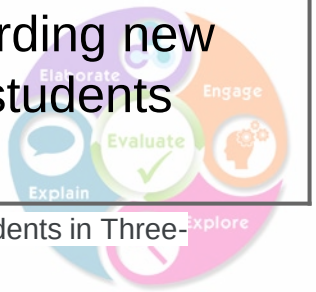
NHMA + NGSS:

public school implementation

Use the 5E model,
over next 3 days unpack what you see + learn, and consider/develop means of implementation for YOU

Materials & Manufacturing and NGSS: 5E Model

Engage	Capture (student) interest, provide STUDENTS opportunities to express prior knowledge and teacher helps students make connections
Explore	STUDENTS carry-out hands-on activities delve into the concept or skill, grapple with problem or phenomenon, afford common experiences so students can help each other
Explain	Teacher provides more information to help STUDENTS develop develop explanations based on their acquired knowledge and experiences
Elaborate	STUDENTS apply learning to new situations promoting development of deeper understanding or enhanced skill usage, and students discuss + compare their ideas with each other
Evaluate	STUDENTS review and reflect on their learning regarding new understandings and skills, teacher emphasizes that students gather evidence to support the aforementioned



1) Moulding, B.D. and R.W. Bybee. (2017). Teaching Science is Phenomenal: Using Phenomena to Engage Students in Three-Dimensional Science... (p14-15).
2) http://nextgenerationscience.weebly.com/5-es-of-science-instruction.html

ENGAGE in today's phenomenon:

Nipigon River Bridge (2016) Nipigon, Ont.

What	How	Timing
Think	Journal about or sketch likely CAUSE of the bridge's failure based on the video	5
Pair	Share with 3-4 partners your ideas, and use large post-it notes to sketch a model of what you believe happened	15-20
Share	Share with us all what you came up with, and place your post-its (e.g., comments, questions)	15-20
Refine	Revise your group's based on what you learned and think about (brainstorm) what would be the next step in terms of evaluating your model	10
Reflect	What did we do (as teachers/facilitators)? Is that consistent with your perceptions of NGSS- and the 5E model?	5

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Refine	Revise your group's based on what you learned and think about (brainstorm) what would be the next step in terms of evaluating your model	10
Reflect	What did we do (as teachers and facilitators)? Is that consistent with your perceptions of NGSS- and the 5E model?	5

End for Day 1

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Day 2 Reflection time

Time to think and discuss your new learning and experiences as well as the 5E model

Day 3: Elaboration in terms of the phenomenon!

See next slide for a breakdown

ELABORATION re: Nipigon River Bridge failure

What	How	Timing
Think	Journal about or sketch likely CAUSE of the bridge's failure based on first 34s of the video	5
Pair	Share with 3-4 partners your ideas, and use large post-it notes to revise/recreate a model of what you believe happened	15-20
Share	Share with us all what you came up with and how you changed your model from day 1.	15-20
Reflect	What did we do (as teachers/facilitators)? Is that consistent with your perceptions of NGSS- and the 5E model? How can we incorporate Evaluation?	10-15

ELABORATION in terms of the phenomenon:

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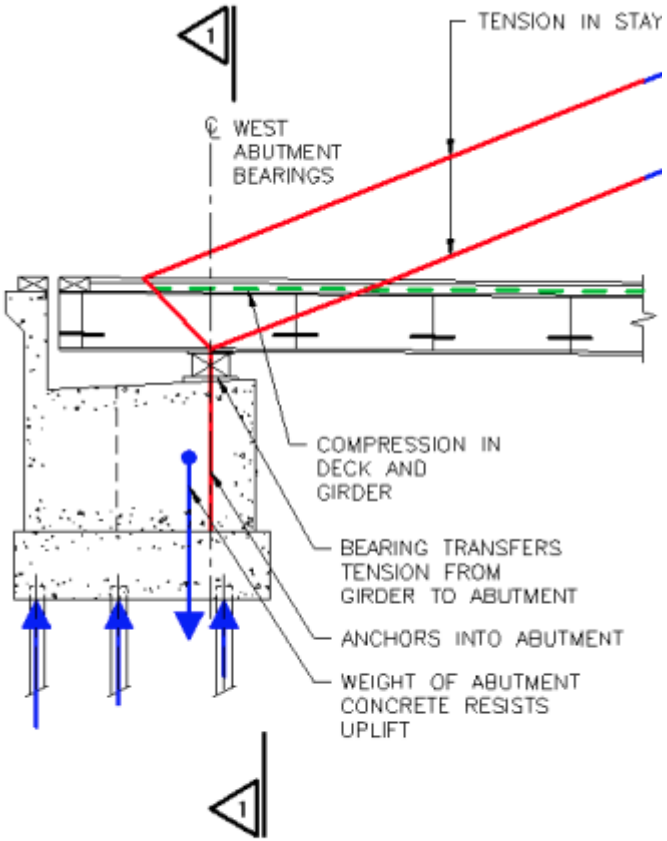
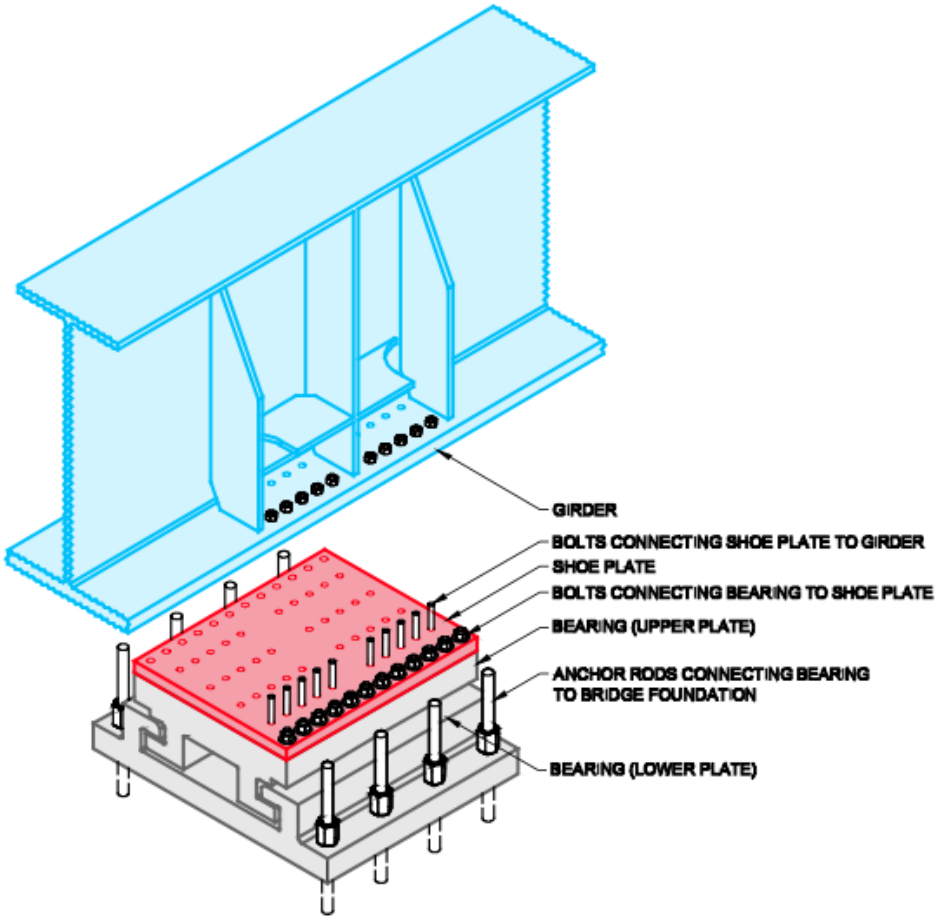
End for Day 3?

EXPLAIN what happened: Key takeaways from the technical report





Reference: http://www.mto.gov.on.ca/english/highway-bridges/nipigon-bridge/pdfs/mto-report.pdf

EXPLAIN what happened: Key takeaways from the technical report

Structural analysis of bearings + connections to adjacent components revealed failure caused by:

1) Prying effects due to the flexible shoe plate leading to higher forces in the exterior line of bolts
2) Bearing's inability to accommodate rotation leading to higher forces in the end rows of bolts
3) Lack of pretensioning of the bolts + lack of bevelled washers led to high fatigue stresses and high-stress, low-cycle fatigue failure.

Reference: http://www.mto.gov.on.ca/english/highway-bridges/nipigon-bridge/pdfs/mto-exec-summary.pdf