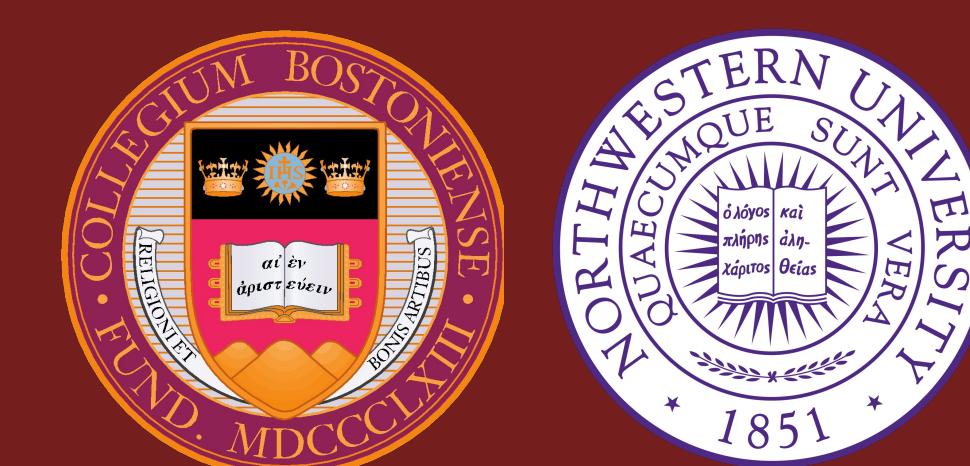




Supporting teacher customizations of curriculum materials for equitable student sensemaking in secondary science



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Research Questions:

1. What types of customizations do teachers make while enacting 3D science curriculum materials and what is their rationale for their customizations?
2. How can customization tools support teachers as they tailor curriculum materials to facilitate equitable sensemaking that is coherent from the students' perspective?
3. How do customization tools and cases embedded in curriculum-based professional learning influence teachers' beliefs and pedagogical content knowledge (PCK) for customizing curriculum materials?

Year 1 Results:

Teachers frequently customized curriculum to support students, but the customizations did not always align with OpenSciEd instructional goals

Code	Sub-code	"Successful"	"Unsuccessful"
Equity & participation	Engagement	22%	15%
	IEPs	4%	2%
	EMLs	2%	1%
Increase structure for students	More support	14%	12%
	Assessment	7%	2%
	Reinforce routines	6%	5%
Instructional context	Time	11%	21%
	Logistics	13%	9%
	Materials	2%	8%

Year 2: Professional Learning Co-Design Cycles



- Equity visions
- Initial strategies sheet
- Collect student data

Plan
Teachers & researchers identified and customized an upcoming lesson.

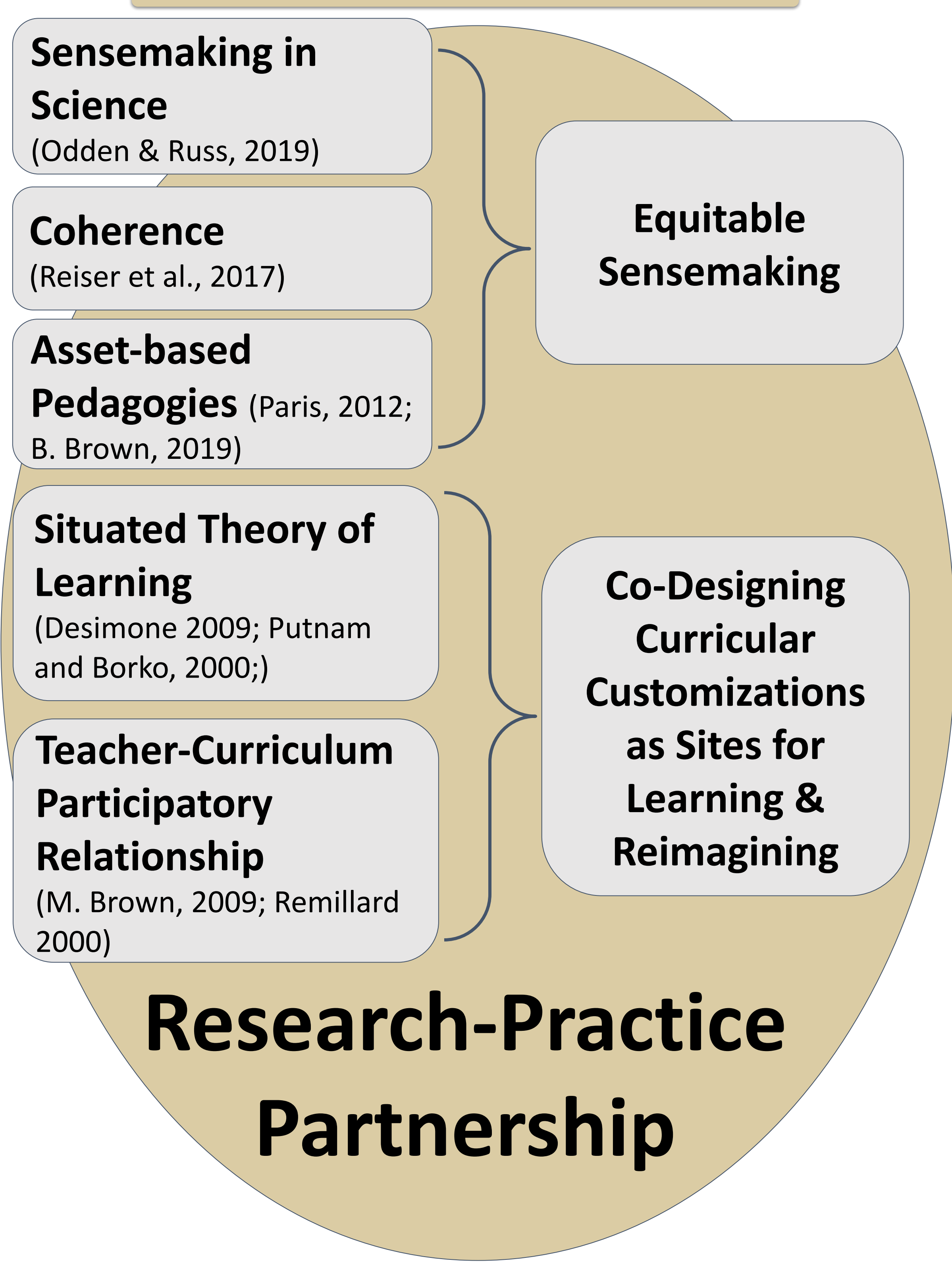
Reflect
Teachers and researchers examined student work and anecdotes to reflect on successes and new challenges.

Do
Teachers enacted their customized lesson & collected artifacts/ lessons. Select lessons were recorded.

- Revised and added to initial strategies sheet
- Create customization cover sheet
- Post-PLC interviews



Theoretical Framework:



Participants with more PL & experience were more likely to describe customizations aligned with OpenSciEd instructional model

Group	Customization Alignment					
	Not Aligned		Aligned		Unclear	
	N	%	N	%	N	%
No PL, some experience	17	37.8	19	42.2	9	20.0
Some PL, some experience	23	34.3	31	46.3	13	19.4
More PL, more experience	9	22.5	29	72.5	2	5.0

$\chi^2(4) = 10.190, p = .037$

Teachers were mostly not customizing for EML learners and were influenced by student factors rather than structural ones

Code	Sub-code	Transformation	Access	Assimilation
Student Rationale	Access	30%	8%	0%
	Ideas	15%	9%	11%
	Affect	15%	17%	0%
Structural Rationale	School Factors	15%	12.5%	0%
	Policy	0%	0%	0%
No EML-specific customization		46%	71%	89%

PLC 1: EML

1. How can we notice and leverage our own and our students' growing multilingual resources?
2. How can we support more ongoing student ownership of our classroom ideas?
3. How do we develop a supportive classroom community with a rolling admission of newcomer multilingual learners?

Strategies for Multiple Ways of Communication with EMLs

Strategy	Description	Example
Home Language Use	Teachers can explicitly encourage students to use their home languages as they are sensemaking. As multilingual students use their home languages, they are focused on understanding ideas instead of saying the "right" words.	<ul style="list-style-type: none"> Encourage Spanish-English bilingual students to read about decreasing populations of orangutans in English, take notes in Spanish, talk in their small groups about the ideas in the reading, using both Spanish and English, and write their ideas in multiple languages.
Strategic Grouping	Teachers can thoughtfully group students by language proficiency levels throughout the unit depending on the goals of each lesson. It is best to vary groups to open up opportunities for students to listen and produce varieties of language for authentic purposes.	<ul style="list-style-type: none"> Help students share ideas about the anchoring phenomena for the sound unit first in small groups with a language partner using their home language, and then with the whole class in English or through peer translation.
Revolve Ideas	Teachers can repeat student talk or gestures to highlight multilingual students' ideas as relevant and important. Revolving can help position students to further elaborate, build on, critique, translate, or clarify their ideas.	<ul style="list-style-type: none"> Listen for and use the words/phrases that students use to describe science phenomena and concepts (i.e. students might use "pegajoso" - "sticky" in Spanish - when they talk about friction). These words/phrases can be another language or dialect or might be invented or blended words or languages.
Re-Represent Ideas & Information	Teachers can connect students' ideas across different representations (e.g., models, drawings, gestures or movements). Often different representations have components that affirm, clarify, or provide nuance for a particular science	<ul style="list-style-type: none"> As the class describes different kinds of contact forces, connect one student's model idea with another student's analogy of rope burn to describe a rubbing-frictional contact force. Breakdown or highlight sections of a complex data table for students to focus on.

PLC 2: Voice & Perspective

How can we foster a classroom culture that respects and voices multiple perspectives while making sense of a phenomena?

Strategies for Curricular Customizations for Multiple Voices and Perspectives v4

Strategy	Description	Example
Provide multiple ways to respond	Create expansive prompts for activities or assignments that provide opportunities for students to respond in multiple ways such as drawing, writing, using manipulatives, or talking.	<ul style="list-style-type: none"> During discussions, allow students to speak or use post-its to share their ideas. (Slide)
Prompts and/or activities where the response includes multiple perspectives	Purposefully create prompts or activities where there is not one strongest response (or claim or model), but rather multiple different perspectives are not only possible, but help move the work forward for the whole class.	<ul style="list-style-type: none"> Share ideas/get ideas - present initial models in small groups, and gather ideas about how to improve your own model using others' perspectives. (Prep for consensus model discussion)
Structuring a lesson to position students as experts	Organizing a lesson so students have expertise in different areas so when they share out in a whole class discussion each group has different knowledge to share.	<ul style="list-style-type: none"> Matter Cycling, Lesson 12 - each group has a different sweetener and decides if it is "natural" or "synthetic". Earth & Space, Lesson 1 - listening to different podcasts and sharing key ideas across groups.
Encourage students to quote and cite each other	Set up systems where students share ideas and then quote or cite other students whose ideas they have heard during further discussions.	<ul style="list-style-type: none"> 8th grade pre-consensus model discussion organizer Sentence starters for shout-outs - make this common classroom language

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