

Dave’s & Megan’s philosophical stances:

- **Enactivism** (in brief!): construction of “knowing” is dynamic, influenced by context (time, place, society, etc.)
- **Heterogeneity as fundamental to learning**: youths’ diverse lived experiences and ways of talking, acting, thinking, feeling, knowing, and valuing are fundamental resources to learning.
- **Expansive pedagogy around sense-making**: Adopting an open or expansive approach to support youth in negotiating meaning-making about scientific phenomena. Underlying this approach is the assumption that youth are constantly making sense, regardless of whether the adult understands them.

Course Description

ED342 - Teaching Science Concepts: PK – 2 _ ED344 - Science Concepts & Curriculum: 1-6

This course engages students in integrating early childhood and/or elementary science content with state and national curriculum standards and resources, including instructional technology, to develop effective science lessons. The course includes practice in integrating science concepts with early childhood and/or elementary curriculum and requires a 25-hour pre-practicum in local classrooms.

Credit Hours	4; “generally means that students should devote about [8] hours of work to the class per week (in addition to in-class requirements)” --> assumed because 3 credits means 6 hours of preparation
Prerequisites	“Pass all required MTEL.”
Required Course Materials	<ul style="list-style-type: none"> • Geisen, M., & Pearce, C. (2016). <i>Everything you need to ace science in one big fat notebook: The complete middle school study guide</i>. New York, NY: Workman Publishing. • Additional course readings as posted on the course’s Canvas site.

ASSIGNMENTS

Below is a brief description of the assignments due for this class, at 12:30 PM unless otherwise noted. We will provide more detailed descriptions before the assignments are due. The due dates for the assignments are also listed on the schedule with the readings.

Class Participation

10%

We feel that the experiences during class are essential for your own personal growth and for creating a productive ED342_344 community. We expect that you will attend all classes, arrive on time, and actively participate in classroom activities and discussions. Email the instructors **before** an absence, except in medical emergencies. Every unexcused absence lowers your class participation grade by 10%, which translates into a one-percentage decrease in your total grade for the class. For example, if your grade would be a 93, but you have 2 unexcused absences it will lowered to a 91.

Science Autobiography**10%**

Reflecting on your past experiences with science teaching and learning can help you better understand their influence on your present and future work [purpose #1]. Also, this assignment will help the class (your "audience") get to know you as a science teacher and learner [purpose #2]. For this assignment, you will use your Empathy Map as a basis for developing a narrative ("genre") of your relationship with science, in all learning environments. Make sure to attend to affective/emotional elements, as well as the cognitive, behavioral, and social factors that have influenced your journey with science. Include your philosophy of what "counts" as science, in conversation with early course readings and activities (i.e. which ideas/beliefs do or do not resonate with you, and why). Your artifact may adopt any modality/ies (e.g., collage, video, slideshow, poem, essay, song, or something else), so long as it can be concisely presented (~3-4 minutes). This assignment is due **Friday, January 25**.

Interpretive Power Reflection**15%**

The purpose of this exercise is to cultivate your attention to the diverse ways in which young people make sense of the world by analyzing discourse (including aspects of language use, body, action, emotion, participation, co-narration, perspective-taking, etc.) as it unfolds in social interaction in specific activity settings (e.g., classroom discussion). Throughout this process, we ask you take an interpretive stance, as compared with an evaluative or diagnostic stance. This means that you will a) interpret the students' talk assuming they are making sense of the subject matter and task, and b) use your audio-recording and/or notes as a source of evidence for your interpretations (i.e., referring to specific moments in the interaction and what they are evidence for), and staying close to the participants' words, gestures, tone, and so on.

Keeping these guidelines above in mind, you will choose a 5-10 minute classroom episode to reflect on in 2-4 pages, double-spaced. Note where you are feeling uncertain or exploring something new or going out on a limb or contradicting an earlier point, etc. The interpretive power reflection is due **Wednesday, February 13**.

Curriculum Evaluation**10%**

Curriculum materials are also a critical resource. There are numerous curriculum materials, which represent a wide range of quality. It is important to critique those materials in order to help you choose and adapt curriculum materials for your classroom. You will select and critique materials from one curriculum project using a modified version of the American Association for the Advancement of Science (AAAS) evaluation criteria. You can choose to work with a partner to complete the curriculum evaluation, but you will need to each hand in a curriculum evaluation and complete the reflection independently. The curriculum evaluation is due **Wednesday, March 6**.

Teaching a Lesson and Reflection**15%**

An important aspect of the teacher cycle is using available resources to design instruction. You and a partner will develop a

thirty-minute lesson to teach a science topic of your choice by engaging students in science and/or engineering practices for a grade level of your choice. This lesson may become part of your final unit, or it may be on a separate topic. You can borrow materials from us, the Boston Museum of Science, or from Lasell's Brennan Library. You will then teach that lesson to ED342_344 and we will act as your students. A lesson plan is due at the beginning of your lesson. One week after you teach your lesson you will hand in a reflection on your teaching. You may hand in one lesson plan, but each student will write an independent reflection. The due date for this assignment will depend on when you teach the class. People will teach the class ranging from **March 8 – April 19** and will hand in their lesson plans and reflections ranging from March 15 – April 26.

Curriculum Unit Design

40%

As a teacher, you develop lessons and entire units to help support your students in learning science. The final project for this class will be to design a curricular unit that would last 6 class days. These could be consecutive class days or it could be a unit that you imagine spread out over a longer period of time (e.g. twice a week for 3 weeks). You can work with one partner to design the curriculum unit or you can create the unit independently. If you do choose to work with a partner, you need to do three aspects independently: (1) Design One Lesson; (2) Reflection for final curriculum unit; and (3) Three extensions for the unit (people working by themselves do not need to design the three extensions).

Unit Framework (5%)

- Before developing the entire curriculum unit, we would like you to develop an outline that provides that target learning goals and a description of the instructional sequence. This will allow us to provide you with feedback as you start to think through your complete curriculum unit. The outline is due **Wednesday, February 27**.

Design One Lesson (5%)

- Before designing the complete unit, I would first like you to hand in one individual lesson, different than your example lesson. This must be completed independently even if you are working on the unit with a partner. The one lesson is due **Friday, March 22**.

Design One Student Assessment (5%)

- You will develop one assessment including both the student version of the assessment as well as a rubric or key that you would use to evaluate students' understanding. The student assessment can take a variety of forms such as a quiz, presentation, lab report, performance assessment or other written assignment. The assessment is due **Friday, March 29**.

Final Curriculum Unit (25%)

- You will design a curricular unit that would last 6 class days (approximately ~45-55 minutes a day) that targets a specific science topic. You will develop detailed lesson plans for the 6 days including any handouts, slideshows, pictures, etc. that you would use with the students. Ideally, one of the six detailed lessons should already be developed from the lesson you taught in class. Your unit must include a hands-on science experiment or activity, as well as an introduction & purpose, science standards, science background, anticipated prior knowledge, strategies for leveraging cultural and linguistic diversity, relevance to students’ lived experiences, extra supports and enrichment, literacy connections, and one student assessment (the one you already developed). You will also hand in a reflection that discusses how you developed your unit and a rationale for your particular instructional sequence.
- **If you choose to design your curriculum unit with a partner**, you will need to independently write your reflection. You will also need to develop three extensions to the unit discussing possible next steps (each about ½ page long). The extensions could be descriptions of three additional lessons that you are summarizing instead of writing in depth. Or they could be a little less traditional, like a description of a field trip (e.g. visit to Darwin exhibit at Museum of Science, with related pre and post discussion, project, and/or activity) or a more long-term project (e.g. testing water quality in the Charles River) that you can imagine doing as next steps.
- Your final curriculum unit is due **Friday, May 3 at 5pm**.

Course Policies

<p>Communication Policies</p>	<p>We expect that you will check your email each weekday (Mon.-Fri.), and the Canvas site as needed per readings, assignments, and email notifications.</p> <ul style="list-style-type: none"> • We will provide feedback on assignments within a week of submission • Email both instructors, and at least one of us will answer your email within 24 hours on weekdays and within 48 hours on weekends. • For information on canvas notification recommendations, visit this site: https://community.canvaslms.com/docs/DOC-10624-4212710344
<p>Netiquette Expectations</p>	<p>When posting online, remember the following recommendations:</p> <ul style="list-style-type: none"> • Stay on topic and within the scope of the course material. Be as brief as possible while still making a substantive contribution. • Be attentive to existing arguments; in discussion forums, read all messages in a thread before replying. • Always give proper credit when referencing or quoting another source. • If you agree with someone else, make sure to build on their statement by adding something of your own. • Always be respectful of others’ opinions even when they differ from your own. When you disagree

	with someone, express your differing opinion respectfully and non-judgmentally. Be open-minded. (Derived from the University of Florida Netiquette Guide for Online Courses .)
Attendance	See "Class Participation", above, for attendance policy.
Late Work	Assignments lose 8% of the overall grade for every day or part thereof they are late.
Academic Integrity	Lasell College expects students to hold themselves to high ethical standards. You should be familiar with the College's policy for academic integrity as it appears in the catalog, including the examples of academic dishonesty listed. Consequences for violating this policy, including reporting and grade/course penalties, are outlined in the current college catalog. All work you submit toward your degree must be your own and must include proper credit for any resources you use. If you use copyrighted work, you must obtain proper permission. Lasell's Brennan Library has published these LibGuides on plagiarism and copyright ; for more information follow the link to "Defining and Avoiding Plagiarism" on the Purdue Online Writing Lab (OWL) web page on plagiarism.
Teaching through disruption	In the event of campus closing due to snow or other event, the class activity will be facilitated online via the Canvas conference tool. Students will receive an invitation to join the conference and should log in at beginning of the usual course time.
Grading Policy	Your grades are reflective of expectations that you have exceeded, met, or not met at a given time. Focus on your progress/growth toward and beyond these expectations , rather than the letter grade or percent. Your grade for each assignment as well as your final grade will be determined by the following scale (all numerals are percentages): A 93-100 A- 90-92 B+ 87-89 B 83-86 B- 80-82 C+ 77-79 C 73-76 C- 70-72 D+ 67-69 D 63-66 D- 60-62 F below 60

Academic Support

Educational Accommodations Statement	The Disability Services office supports Lasell students with special needs. If you require accommodations, please let us know as soon as possible and no later than the end of the first week of the course. To request academic accommodations at Lasell College contact Dolores Radlo, Director of the Academic Achievement Center & Learning Disabilities Services at dradlo@lasell.edu , (617) 243-2474.
Assistance in	The Academic Achievement Center (aac@lasell.edu , 617-243-2474) provides academic tutoring in

Writing and Academic Tutoring	specific subject areas, technology to assist you with reading and writing needs, and workshops on topics such as test taking and study skills. Online academic support service may also be available through Tutor.com through your Canvas course menus.
Research Assistance	Reference librarians at the Brennan Library (reference@lasell.edu , 617-243-2244) can help you find and evaluate resources for your research projects. Contact a librarian for help with exploring the library website in order to gain a better understanding of the many uses of our academic databases and Laser Search. <i>Note: Library services may not be available to non-matriculated students.</i>
Canvas Support	Canvas learning management support for students is available at (833) 846-2535 and at cases.canvaslms.com/liveagentchat . You can also find this information under Resources in your Canvas global navigation menu or visit our Student Canvas FAQ.
Technical Support	The IT Department Help Desk provides support for technology-related issues. Should you ever have problems accessing your Lasell account or using other course resources, submit your request to the Help Desk at helpdesk@lasell.edu . If you need immediate assistance, they are available 24/7 by phone at 617-243-2200.
Title IX and Sexual Respect	Lasell College is committed to maintaining a conducive learning environment for all students and a professional workplace for its employees. Lasell College prohibits all forms of discriminatory and harassing behaviors including sexual harassment, sexual violence, and any type of sexual misconduct. Incidents of other forms of harassment and/or discrimination should be brought to the attention of the Title IX Coordinator or a Title IX Deputy Coordinator. More information is available at https://www.lasell.edu/discover-lasell/title-ix-and-sexual-respect.html .
Diversity and Inclusion	The Lasell community appreciates diverse, global perspectives and recognizes that students, faculty, and staff from a range of backgrounds make our campus greater. We are committed to providing our community with the academic resources and professional development needed to foster an inclusive environment. More information is available at https://www.lasell.edu/campus-life/diversity-and-inclusion.html .
Counseling Center	The college years are often a time of change and growth, challenge and achievement. When challenges present themselves it is often helpful to talk to a caring, professional counselor. The Counseling Center offers a free, confidential place to discuss personal concerns, problems, or feelings as students grow towards greater independence and satisfaction with life. For those students needing care beyond the scope of our services (e.g., weekly psychotherapy, psychiatric evaluation, or specialized substance abuse or intensive mental health treatment), we can assist with referrals to services in the local community. Appointments can be made by calling the main line at 617-243-2181 or the Director at 617-243-2145. The Counseling Center is located at 18 Maple Terrace and is open during the academic year Monday through Friday 8:30 a.m. to 4:30 p.m.
Self-care during class time	Some students may need or wish to leave the class to gather themselves, take a breather, or get water or food. This is acceptable in our class – an instructor will check in with you to ensure that you are safe and to lend support.

Course Outline (subject to change)

Class # and Date	Topic(s) & Activity/ies	Readings (Due)	Assignments (Due)
<p><i>Class 1</i> <i>Wed 1/16</i></p>	<p>Introduction to the course ☺ ? ? ? ? ?</p> <ul style="list-style-type: none"> • Personal introductions • Empathy map • What is science?: 6 Ws of science • Goals & expectations • Brief intro to the NGSS (Next Generation Science Standards) 	<p>{ }</p>	<p>{ }</p>
<p><i>Class 2</i> <i>Fri 1/18</i></p>	<p>Science as Cultural Practice: Investigating relationships between the Sun, Earth, and Moon ☺ ☰ ☽</p> <ul style="list-style-type: none"> • Launch Investigation #1: Sundials • Reflect on reading • Address questions from syllabus • D & M share their empathy maps • Watch music videos and listen to audio: Sun, earth, moon • Discuss "learning styles" (myth) → encourage multimodality 	<p>Practice Brief (PB) 55 (Rodriguez & Bell) "...make cultural diversity visible..." "Point of View..." (Medin et al., 2014) "What We Call Misconceptions May Be Necessary Stepping-Stones..." (Campbell et al., 2016)</p>	<p>Complete reading syllabus</p>
<p><i>Class 3</i> <i>Wed 1/23</i></p>	<p>Science as Cultural Practice: Modeling with Luna ☺ ☾ ☽</p> <ul style="list-style-type: none"> • Reflect on reading • Generate DQB (Driving Questions Board) • Investigation #1 - Modeling the phases of the moon <ul style="list-style-type: none"> • Student-driven modeling: miscellaneous materials • Teacher-driven modeling • Discuss pros and cons of starting with teacher-driven vs. student-driven investigations 	<p><i>SSLS (Seeing Students Learn Science)</i> p. 1-18 <i>Ready Set Science</i>, Chapter 1 subsection: "Rethinking Children's Capacity for Scientific Understanding" (p. 6-8 only)</p>	<p>Watch lunar eclipse, live or recorded Bring in a 40+ sheet notebook</p>
<p><i>Class 4</i> <i>Fri 1/25</i></p>	<p>Science as Cultural Practice: Unpacking the NGSS</p> <ul style="list-style-type: none"> • Reflect on science autobiography in small groups • NGSS: <ul style="list-style-type: none"> • Practices, DCIs and cross-cutting concepts • How to read a standard • Unpacking a standard • Briefly reflect on investigations using NGSS practices as a lens 	<p>Rodriguez (2015) - Engagement, equity, and diversity practices (table on p. 1043 = required; article = optional)</p>	<p>Science Autobiography (based on empathy map)</p>

	<ul style="list-style-type: none"> Sundial measurement 		
Class 5 Wed 1/30	<p>Science as Cultural Practice: Diversity of "life"</p> <ul style="list-style-type: none"> Watch video(s) of Ss engaging in science practices and reflect (use Kate's continuum as a reflection tool) Start investigation #2 (life science) <ul style="list-style-type: none"> Phase A: Set up - seed germination Generate DQB - life science Reflect on investigations from class 3 and 4 using Kate's science practices continuum 	<p>"Toward More Equitable Learning in Science" (Bang et al., 2017) All read p. 33-39 & 55-56</p>	{ }
Class 6 Fri 2/1	<p>Expanding possibilities (NGSS+): Meaningful opportunities to learn</p> <ul style="list-style-type: none"> Jigsaw share-out on vignettes from reading (Bang et al 2017) Briefly review 3 principles - expanding meaningful opp's to learn - from Bang et al 2017 (another lens to use - Rodriguez 2015) Seed germination investigation <ul style="list-style-type: none"> Generate and share-out data Add to DQB Sundial measurement 	<p>"Toward More Equitable Learning in Science" (Bang et al., 2017) Jigsaw 3 vignettes: p. 40-46, 46-51, 51-55</p>	Brief (1-page) summary of vignette & how it connects with each of the 3 principles
Class 7 Wed 2/6	<p>Expanding possibilities (NGSS+): Cultivating interpretive power</p> <ul style="list-style-type: none"> Wrap-up: Seed germination investigation <ul style="list-style-type: none"> Generate and share-out data Analyze data Start investigation: Plant growth Reflect on reading Video/transcript analysis - "Do plants grow every day?" Q&A about the Interpretive Power exercise 	<p>Chapter 4 from <i>Teaching Science to ELLs</i> (Rosebery & Warren, 2008) SSLS p. 18-26</p>	Sign up for teaching lessons.
Class 8 Fri 2/8	<p>3D Assessment in Science: Evaluation</p> <ul style="list-style-type: none"> Reflect on reading Evaluate 1-2 assessment/s in Mass. MCUs (Model Curric. Units) Plant growth investigation Sundial measurement 	<p>SSLS p. 26-32 <i>Linking Science & Literacy</i>, Ch. 11: "Using Diversity as a Strength in the Science Classroom" p. 312 (bottom) - 317</p>	Decision about audio recording (or not)
Class 9 Wed 2/13	<p>3D Assessment in Science: Adaptation</p> <ul style="list-style-type: none"> Reflect on reading Adapt assessment from last class Practice using rubrics Plant investigation 	<p>SSLS (Chapter 2) <ul style="list-style-type: none"> p. 33 (all), then bottom 38 through 50 <p><u>Further reading</u>: PB 29: "Steps to Designing a</p> </p>	{ }

		Three Dimensional Assessment"	
Class 10 Fri 2/15* *Museum of Science option 1/2	Approaches to Science Curricula <ul style="list-style-type: none"> Evaluate MCU, "Investigating Material Properties" Rubrics: Modified version of AAAS Project 2061 Curriculum/Textbook Eval or NGSS screening tool Sundial measurement 	"Curriculum Integration..." (Venville et al., 2010)	Bring curriculum to class (for curric. eval.)
Class 11 Wed 2/20	Curriculum Evaluation <ul style="list-style-type: none"> Reflect on reading Intro: curriculum evaluation (pairs) Work-time for curriculum evaluations Plant growth investigation... 	PB 53 (Bell et al.): "How to avoid known pitfalls associated with culturally responsive instruction" Rodriguez Talk (10 min): Avoiding 7 common STEM curriculum pitfalls	Interpretive Power Reflection Write-up
Class 12 Fri 2/22	Designing Science Lessons: Unit structure <ul style="list-style-type: none"> Presentation: Creating a storyline/instructional sequence Work time: <ul style="list-style-type: none"> Pick an instructional model and start creating a unit structure for your final unit project (6 lessons); start by reviewing grade-level standards for your unit Up next: (1) get feedback on your unit framework and (2) design one lesson to teach (within your future unit) Sundial measurement 	PB 4 (Bell & Shouse) " ...instructional models that fit...NGSS... " + addendum	Bring an empty two-liter plastic bottle
Class 13 Wed 2/27	Designing Science Lessons: Lesson structure <ul style="list-style-type: none"> Approaches to structuring lessons Example Lesson from Dave & Megan, then class feedback Work time: Provide feedback on 1-2 classmates' unit framework Mid-semester feedback 	{ }	Finish unit framework draft 1 for final unit project
Class 14 Fri 3/1	Designing Science Lessons: Start designing a lesson <ul style="list-style-type: none"> Presentation: Lesson structure Work time & questions: Start designing one lesson in that unit Set up bottle ecosystem investigation If time: Sundial measurement 	{ }	{ }
Class 15 Wed 3/6	Designing Science Lessons: Continue designing a lesson <ul style="list-style-type: none"> Bottle ecosystem investigation 	{ }	Curric. eval.

	<ul style="list-style-type: none"> Continue working on your lesson 		
<p>Class 16 Fri 3/8</p>	<p>Science & Literacy: Synergies</p> <ul style="list-style-type: none"> Lesson 1 + feedback Bottle ecosystem investigation Why science & literacy? Writing opportunities and strategies 	<p><i>Linking Science & Literacy</i>, Chapter 6: "Writing to Learn"</p>	<p>First lesson taught</p>
<p>Spring Break 3/11-3/15</p>	{ }	{ }	{ }
<p>Class 17 Wed 3/20</p>	<p>Science & Literacy: Sociohistorical approaches to measuring time</p> <ul style="list-style-type: none"> Lesson 2 + feedback Wrap-up Sundial measurement 	<p>exactlywhatistime.com - Read home page; also read "Calendars" OR "Time in Different Cultures"</p>	{ }
<p>Class 18 Fri 3/22</p>	<p>Science & Literacy: Sense-making via "science talk(s)"</p> <ul style="list-style-type: none"> Lesson 3 + feedback Bottle ecosystem investigation 	<p><i>Linking Science & Literacy</i>, Chapter 11: "Using Diversity as a Strength in the Science Classroom" (p. 305-312)</p>	<p>Final unit lesson plan due</p>
<p>Class 19 Wed 3/27</p>	<p>Science & Literacy: Sense-making via argumentation & explanation</p> <ul style="list-style-type: none"> Lesson 4 + feedback Bottle ecosystem investigation 	<p>"Engaging Students in the Scientific Practices of Explanation and Argumentation" (Reiser et al., 2012)</p>	{ }
<p>Class 20 Fri 3/29</p>	<p>Computational Thinking Practices: What are they?</p> <ul style="list-style-type: none"> Lesson 5 + feedback What are computational thinking practices and how are they connected to the NGSS? Practice with computational thinking 	<p>"Computational Thinking: A Competency Whose Time Has Come" (Grover & Pea, 2017)</p>	<p>Final unit assessment due</p>
<p>Class 21 Wed 4/3</p>	<p>Computational Thinking Practices: Ways to embed</p> <ul style="list-style-type: none"> Lesson 6 + feedback Practice with computational thinking 	<p>"Remaining Trouble Spots with Computational Thinking" (Denning, 2017)</p>	{ }
<p>Class 22 Fri 4/5</p>	<p>Engineering Connections</p> <ul style="list-style-type: none"> What are engineering practices? Why is engineering emphasized in the NGSS? Engineering connections Analyze <i>Engineering is Elementary</i> example videos Wrap-up bottle ecosystem investigation 	<p><i>A Gift From Fadil</i> (launcher book for unit, "Thinking Inside the Box: Designing Plant Packages") PB 7: "Learning STEM Through Design" (Escudé</p>	<p>No lessons due</p>

		et al.)	
Class 23 Wed 4/10	Engineering Design <ul style="list-style-type: none"> Lesson 7 + feedback "...Designing Plant Packages", iteration 1 	"Scientific and Engineering Practices in K-12 Classrooms" (Bybee, 2011)	{ }
Class 24 Fri 4/12* *Museum of Science option 2/2	Engineering Redesign <ul style="list-style-type: none"> Lesson 8 + feedback "...Designing Plant Packages", iteration 2 	PB 53 (Shouse & Lakhani): "Failing Forward" PB 40 (Bevan & Ryoo): "How can Making promote equity and excitement in STEM?"	Driving Questions due for Unit and Lessons
Class 25 Wed 4/17	Expanding Possibilities: Equity case studies <ul style="list-style-type: none"> Lesson 9 + feedback Diversity and equity case studies 	"Creating a 'We' Culture: Strategies to ensure all students connect with science" (Carlone et al., 2014) Video: Who gets to be a "smart science student"?	{ }
Class 26 Fri 4/19	Expanding Possibilities: Revisiting our 6Ws <ul style="list-style-type: none"> Lesson 10 + feedback Reflecting on our 6Ws for science Work time - final assignments Video transcript analysis 	The Power of Being Seen (article & 3min video)	Last lesson taught
Class 27 Wed 4/24	No class (make-up from Museum of Science visit) <ul style="list-style-type: none"> Work on final assignment 	{ }	{ }
Class 28 Fri 4/26	Course "outro" <ul style="list-style-type: none"> Work time: final assignments Revisit Empathy Maps 	{ }	{ }

Final assignment due: Friday 5/3 at 5:00 pm

...and as always,

