LDOE Believe and Prepare Math Collaborative

Model Methods Course Outline:

Secondary Mathematics

2020 Fall

LDOE Believe and Prepare Math Collaborative, led by
The Charles A. Dana Center at The University of Texas at Austin

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The LDOE Believe and Prepare Math Collaborative is a project of LDOE: the Louisiana Department of Education, in collaboration with K–12 teachers and university faculty across the state of Louisiana and led by experts from the Charles A. Dana Center at The University of Texas at Austin.

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Introduction and Purpose

This Model Methods Course Outline, the product of a collaboration among Louisiana higher education and K–12 mathematics faculty, led by experts at the Charles A. Dana Center at The University of Texas at Austin, outlines student learning outcomes, course design principles, and suggested activities and assessments for a course or sequence of courses that address instructional methods for prospective secondary mathematics teachers.

The document is intended to provide teacher preparation programs with appropriate guidance to ensure that teacher candidates completing their programs are well prepared to effectively engage secondary students in standards-aligned mathematics learning using high-quality curriculum materials.

Overview

The course or course sequence outlined in this document will prepare prospective secondary teachers to teach mathematics to students in Grade 6 through Grade 12. Teacher candidates will develop the knowledge, skills, and dispositions necessary to help students develop mathematical understandings, reasoning processes, and problem-solving skills. The **Student Learning Outcomes** described in this document focus on these areas:

- knowing and understanding mathematics,
- knowing and using mathematical processes,
- recognizing students' individual differences for mathematical learning,
- planning and implementing meaningful mathematical experiences for students,
- assessing impact on student learning, and
- knowing and understanding social and professional contexts of mathematics teaching and learning.

Also included in this document are **Course Design Principles** that describe how methods or similar secondary teacher preparation courses should be designed to support a coherent and engaging experience for teacher candidates.

Whenever possible, instruction should be grounded in critical secondary mathematics content, and assessment should provide opportunities for candidates to authentically demonstrate their proficiency. For this reason, the learning outcomes are aligned to appropriate assessments and activities from the **Sample Assessments** and **Sample Activities** sections found later in this document.

Course Design Principles

These principles describe how methods or similar courses intended to prepare secondary mathematics teachers should be designed to support meaningful learning experiences for teacher candidates.

These principles should inform faculty teaching these courses as they design instruction, and they should support curriculum developers building materials that are true to the vision of the course.

Faculty should employ a broad repertoire of pedagogical strategies in teaching these courses, not only to help candidates develop critical professional knowledge and skills, but also to model effective, high-yield instructional practices that the candidates should implement in their own future classrooms.

Design Principle	Teacher Candidates will . . .	Instructors will . . .
Active Learning. The course provides regular opportunities for teacher candidates to actively engage in discussions and tasks through a variety of different instructional strategies (e.g., hands-on and technology-based activities, small-group collaborative work, facilitated student discourse, interactive lectures).	• Be active and engaged participants in discussion, in working on tasks with classmates, and in making decisions about the direction of instruction based on their work. • Actively support one another's learning. • Discuss course assignments and concepts with the instructor and/or classmates outside of class.	• Provide activities and tasks with accessible entry points that present meaningful opportunities for teacher candidates to explore and co-create mathematical and pedagogical understanding. • Create a safe, candidate-driven classroom environment in which teacher candidates are encouraged to take risks or make mistakes, and in which they are able to make decisions about the direction for instruction through the results of their exploration of content and strategies. • Facilitate teacher candidates' active learning through a variety of instructional strategies, including inquiry, problem solving, critical thinking, and reflection, with limited time spent in "direct teach" activities.

Design Principle	Teacher Candidates will . . .	Instructors will . . .
Constructive Perseverance. The course engages teacher candidates in productive struggle to grow their capacity to develop their future students' tenacity, persistence, and perseverance for learning mathematics; for using mathematics to tackle authentic problems; and for being successful in the mathematics classroom.	• Understand the importance of a growth mindset for tenacity and persistence, and develop a growth mindset in themselves. • Persevere in problem solving. • Receive critical feedback and persevere to improve mathematical competency and teaching practices.	• Have a growth mindset in mathematics. • Teach candidates what constructive perseverance means and its importance in K–12 learners' progress. • Choose authentic tasks or activities that develop perseverance, a trait that is valuable in and out of the classroom. • Allow appropriate time and encouragement for teacher candidates to persevere.
Problem Solving. The course provides opportunities for candidates to make sense of problems, apply problem-solving strategies, and persist in solving them.	• Make sense of problems and explore and use a variety of solution methods. • Share, discuss, and analyze different solution methods. • Be willing to learn from mistakes in the problem- solving process	• Present complex or non-routine problems that require problem-solving strategies such as multiple representations, diagrams or constructions, consideration of related problem types, etc. • Model the thinking that goes into the problem-solving process, as well as effective strategies for problem-solving. • Provide scaffolding for teacher candidates to reach mathematical competency using prior knowledge. • Refrain from giving teacher candidates solutions. • Give timely, critical feedback.

Design Principle	Teacher Candidates will . . .	Instructors will . . .
Authenticity. The course presents mathematics as a necessary tool to model and solve problems that arise in the real world, and it connects mathematics to various disciplines and everyday experiences.	• Solve problems/problem-solving situations/tasks that reflect real-world applications that are relevant to students, and connect mathematics to various disciplines (e.g., such as STEAM—science, technology, engineering, arts, and mathematics). • Discuss real-world contexts not explicitly provided in a problem. • Select tasks or activities that have authentic real-world applications and/or connections to other disciplines and everyday experiences.	• Present problems/problem-solving situations/tasks that reflect real-world applications that are relevant to teacher candidates (or to their future students) and/or that connect mathematics to various disciplines (e.g., such as STEAM—science, technology, engineering, arts, and mathematics). • Provide opportunities to connect problems to real-world contexts. • Facilitate teacher candidates' creation of and/or selection of appropriate and authentic problems/tasks. • Give constructive feedback about the creation/selection of problems.
Communication. The course develops teacher candidates' capacity to communicate about and with mathematics in contextual situations and to use communication to critique mathematical reasoning, to assess student misconceptions, and to give timely, meaningful, strength-based feedback.	• Communicate with growth mindset language. • Use precise mathematical language when communicating with other teacher candidates and students. • Plan for giving strength-based meaningful feedback to students. • Plan for facilitating productive mathematical discourse with students.	• Respond to teacher candidates' misconceptions with strength-based, meaningful feedback. • Use precise mathematical language. • Use collaborative groups and pairs and model productive discussion strategies, including selecting and sequencing teacher candidates' approaches and solution strategies for whole-class analysis. • Facilitate productive mathematical discourse regularly.

Design Principle	Teacher Candidates will . . .	Instructors will . . .
Technology. The course leverages technology to develop conceptual understanding and to facilitate active learning by enabling teacher candidates to directly engage with and use mathematical concepts—for example, through virtual manipulatives and digital math curricula.	• Use a variety of technology applications to enhance instruction and assessment. • Reflect on the use of different technology applications to solve problems. • Plan for integration of appropriate technology. • Implement technology with students. • Evaluate the effectiveness of technology use, and plan for necessary adjustments.	• Facilitate opportunities to use technology to enhance instruction (e.g., virtual manipulatives, formative assessments, digital math curricula). • Model effective use of digital instruction platforms. • Provide opportunities for teacher candidates to select technological tools that would be most efficient and effective for achieving learning goals.
Experiential Learning. The course provides teacher candidates the opportunity to unpack and debrief teaching and learning experiences to reflect on math as a recipient of learning while also considering how they would implement the structures and activities as teachers.	• Practice empathy by role-playing the student in productive struggle for problem solving. • Practice role-playing the teacher guiding productive struggle. • Unpack and debrief teaching and learning experiences regularly to reflect on research and applications for teaching students. • Model lesson debrief with students. • Engage in role-playing collaborative planning and student work analysis activities.	• Facilitate role-playing scenarios for developing empathy for productive struggle. • Provide regular opportunities for meaningful debriefing and reflection connected to practice and research. • Facilitate role-playing of collaborative planning and student work analysis activities.

Design Principle	Teacher Candidates will . . .	Instructors will . . .
Reflective Practice. The course requires that teacher candidates develop the ability to set student learning goals and professional learning goals—and to reflect on those goals frequently.	• Develop professional learning goals and reflect on those goals frequently. • Consider constructive feedback from other teacher candidates and peers in the field, such as a faculty member or a mentor teacher, and refine professional learning goals as needed. • Learn about national and state professional organizations and conferences for mathematics teachers (i.e., NCTM: National Council of Teachers of Mathematics, LATM: Louisiana Association of Teachers of Mathematics, etc.). • Develop learning outcomes for students and assess student progress against outcomes regularly. • Analyze and reflect on assessment data. • Consider reasons for equity gaps in student progress—including possible biases or mindsets about particular students or groups of students—and reflect on strategies to address those gaps. • Learn about the local community and its cultures, and reflect on how that should inform your instruction. • Develop next steps for instruction based on student data.	• Provide opportunities for teacher candidates to develop their own professional learning goals. • Expose teacher candidates to national and state professional organizations and conferences for mathematics teachers (i.e., NCTM: National Council of Teachers of Mathematics, LATM: Louisiana Association of Teachers of Mathematics, etc.). • Provide frequent, timely feedback to teacher candidates. • Model lessons and reflect with teacher candidates using their constructive feedback to demonstrate how learning goals can be refined. • Model assessment data collection and analysis. • Guide candidates to consider reasons for equity gaps that may exist across groups of students, including possible bias in curriculum or in teacher mindsets, and reflect on strategies to address those gaps. • Provide opportunities for teacher candidates to learn about the local community and its cultures.

Secondary Student Learning Outcomes With Aligned Assessments and Activities

These learning outcomes are intended to guide instruction and assessment within a single course or across multiple courses, depending on the design of an institution's teacher preparation program.

The outcomes reflect the expectations outlined in a number of professional frameworks, including the Council for the Accreditation of Educator Preparation (CAEP) *K–6 Elementary Teacher Preparation Standards*,[1] the Council of Chief State School Officers (CCSSO) Interstate Teacher Assessment and Support Consortium (InTASC) *Model Core Teaching Standards*,[2] the *Louisiana Teacher Preparation Competencies* (LTPC),[3] and the National Council of Teachers of Mathematics (NCTM) *Standards for Mathematics Teacher Preparation*.[4] Connections to appropriate standards from the various frameworks are indicated as part of the description of each outcome.

Whenever possible, instruction should be grounded in critical secondary mathematics content, and assessment should provide opportunities for candidates to authentically demonstrate their proficiency. For this reason, the learning outcomes are aligned to appropriate assessments and activities from the **Sample Assessments** and **Sample Activities** sections found later in this document.

[1] http://www.caepnet.org/accreditation/caep-accreditation/caep-k-6-elementary-teacher-standards

[2] https://ccsso.org/sites/default/files/2017-11/InTASC_Model_Core_Teaching_Standards_2011.pdf

[3] https://www.louisianabelieves.com/docs/default-source/teaching/teacher-preparation-competencies.pdf

[4] https://www.nctm.org/Standards-and-Positions/CAEP-Standards

Student Learning Outcomes	Assessments	Activities
1. *Know and understand mathematics, including*		
a. engaging in various mathematical tasks that address the components of rigor (building conceptual understanding, procedural fluency, and application skills in mathematics) [CAEP 2b; InTASC 4j; NCTM 2a]	1, 2	1
b. developing and applying deep mathematical content knowledge of grades 6–12 (secondary) mathematics, focusing on essential concepts of the major math domains as described by curriculum frameworks such as the Louisiana Student Standards for Mathematics (LSSM) [CAEP 2b; InTASC 4n; NCTM 3a]	1, 2	1, 2, 3
c. understanding how the major math domains in grades 6–12 (secondary) can be vertically aligned to create coherence across and within grade levels [LTPC CP A1; CAEP 2b; InTASC 7g; NCTM 2e, 3a)]	1	2, 3
2. *Know and use mathematical processes, including*		
a. demonstrating the use of mathematical problem solving strategies and mathematical models to make sense of and solve contextual and non-contextual problems within and across grades 6–12 (secondary) domains [CAEP 2b; NCTM 2a]	2	4
b. organizing their own mathematical reasoning and using the language of mathematics to express their mathematical reasoning precisely, both orally and in writing, to professors, to other teacher candidates, and to students [CAEP 2b; InTASC 4l; NCTM 2b]	2, 3	
c. modeling the mathematical dispositions and habits of mind described in the Standards for Mathematical Practice, including precision of language, logical thought, reflection, explanation, and justification [LTPC CK A5; CAEP 2b; InTASC 5m; NCTM 2a-f]	1, 2, 3	4
3. *Recognize students' individual differences to plan for mathematical learning, including*		
a. leveraging student diversity by acknowledging, surfacing, and valuing the background knowledge and experiences that students bring to the classroom, as well as students' mathematical strengths and individual needs, in planning rigorous and engaging mathematics instruction that supports meaningful participation and learning by each and every student [LTPC CP A5; CAEP 1b, 3d, 4a, 4g; InTASC 2a; NCTM 3a, 3b]	1, 2, 3	5, 6

Student Learning Outcomes	Assessments	Activities
b. understanding that teachers' interactions can influence and reinforce students' mathematical identities, positive or negative [CAEP 1a; NCTM 3c]	1	
c. planning experiences and instruction to develop and foster positive mathematical identities for each and every student [CAEP 3f; LTPC CP A5; InTASC 1b; NCTM 3c]	1, 2, 3	
d. planning or annotating lessons using research-based planning materials, such as LDOE K–12 Math Planning Resources, to promote NCTM Effective Mathematics Teaching Practices and Standards for Mathematical Practice [LTPC CP A1, A2, A3, A4; InTASC 4f; NCTM 3b]	1, 2, 3	6
4. *Plan and implement meaningful mathematical experiences for students, by*		
a. identifying and establishing rigorous mathematics goals (daily, unit, or course) that consider students' prior mathematics experiences, learning progressions, mathematics standards and practices, and the purposes of mathematics [LTPC CP A1; CAEP 2b, 3c; InTASC 7a; NCTM 4a]	1, 2	
b. selecting and adapting both formative assessments and summative assessments to elicit progress toward rigorous mathematics learning goals for students' individual learning needs [CAEP 3a, 3b, 3c; InTASC 1a; NCTM 5a]	2	
c. designing learning experiences that allow for students' use of varied strategies by selecting or refining standard-aligned tasks from high-quality instructional materials, including curricula identified by the LDOE as Tier I [LTPC CP A3; CAEP 2b, 3c, 4a, 4c; InTASC 3b, 6e, 7c, 8e-f; NCTM 4b]	2, 3	5, 6
d. analyzing, modifying, sequencing, and implementing tasks to engage each and every student in high-cognitive-demand learning experiences that promote reasoning, sense-making, and productive struggle [CAEP 2b, 3b, 4b; InTASC 3i, 3j, 6f, 7c; NCTM 4b]	2, 3	
e. evaluating, selecting, and integrating mathematical tools/devices and technology to support each and every student in learning, understanding, and applying mathematics [CAEP 2b; InTASC 3g; NCTM 4c]	1, 2, 3	
f. selecting and connecting a variety of mathematical representations, including manipulatives, models, and diagrams/pictures, to support students' understanding of mathematics concepts and procedures and students' ability to apply representations to solve real-world problems [LTPC CP B1; CAEP 2b, 4a; InTASC 3e, 8e; NCTM 4d]	2, 3	5

Student Learning Outcomes	Assessments	Activities
g. facilitating discussions with and among students to build shared understanding, make connections between representations, develop conceptual understandings, and engage in mathematical practices [LTPC CP B1; CAEP 2b, 3f, 4e; InTASC 3h, 8h-i; NCTM 4d]	3	5
h. planning for, eliciting, noticing, and tracking multiple student responses as part of monitoring students' thinking, including identifying the understandings and alternate conceptions used when solving problems [LTPC CP A2; CAEP 2b, 4e; InTASC 4k, 6l; NCTM 4e]	2, 3	5
i. engaging each and every student in extending their mathematical thinking by using students' different solution pathways and alternate conceptions [LTPC CP A5; CAEP 2b, 3f; InTASC 6e; NCTM 4e]	2, 3	5
j. designing and implementing instruction to facilitate students' connecting their conceptual understanding and procedural fluency [LTPC CP A5; CAEP 2b; NCTM 4f]	3	5
k. posing purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships [CAEP 2b; InTASC 5d; NCTM 4g]	2, 3	5, 6
l. providing students with precise, accurate, useful explanations of algorithms and procedures, including descriptions of the accuracy of alternative procedures or algorithms, and executing procedures flexibly, accurately, efficiently, and appropriately as defined by curriculum frameworks, such as the Louisiana Student Standards for Mathematics (LSSM) [LTPC CK A2; CAEP 2b, 4a]	3	5
m. providing exact, explicit definitions of mathematical ideas and concepts using appropriate mathematical language [LTPC CK A1; CAEP 2b]	2	
n. connecting problems arising in real-world applications to topics in the relevant standards [LTPC CK A6; CAEP 2b; InTASC 5j; NCTM 2b]	2, 3	
5. *Assess impact on student learning, including:*		
a. using data from formative and summative assessments to analyze progress toward rigorous mathematics learning goals for each individual student, the class as a whole, and subgroups of students disaggregated by demographic and other categories [CAEP 3a; InTASC 1b, 6a; NCTM 5b]	1, 3	

Student Learning Outcomes	Assessments	Activities
b. using evidence/data related to student learning to analyze the effectiveness of instruction (including reflecting on possible biases/mindsets towards specific students or groups of students) in order to make adjustments that address the learning needs of each individual student, the class as a whole, and subgroups of students disaggregated by demographic and other categories [CAEP 3b; InTASC 6g; NCTM 5c]	1, 2, 3	5
6. *Know and understand social and professional contexts of mathematics teaching and learning, including:*		
a. identifying personal beliefs, classroom practices, and systemic structures that produce equitable and inequitable mathematical learning experiences and outcomes for students [CAEP 1a; InTASC 1e, 9e; NCTM 6a]	1, 2, 3	
b. seeking out information to increase equitable practices and/or eliminate inequitable practices to further mathematical learning for individual students [NCTM 6a]		
c. demonstrating ways to ensure that traditionally marginalized students experience success [InTASC 7j; NCTM 6a]	1, 2, 3	
d. reflecting on teacher impact on individual student's mathematical identities and developing professional learning goals that promote students' positive mathematical identities, including specific strategies and professional resources for meeting these goals [CAEP 3f; NCTM 6b]	1, 2, 3	
e. learning about opportunities in the community to understand and interact with families [InTASC 1c; NCTM 6c]		
f. recognizing the importance of involving families in the students' mathematics education, including communicating with families about the mathematical ideas and processes that students are exploring, suggesting good mathematics resources, and discussing strategies for ensuring the mathematical success of the families' children [InTASC 7m; NCTM 6c]		
g. collaborating with colleagues to support student learning of mathematics [CAEP 5a; InTASC 7e; NCTM 6d]		
h. participating in professional development and/or learning communities that focus on learning and teaching in mathematics education, and in professional development opportunities based on targeted professional learning needs [CAEP 5c; InTASC 9a-d; NCTM 6d]		

Sample Assessments

These performance-based assessments are intended to be authentic summative measures of candidates' understanding of the knowledge and skills described in the Student Learning Outcomes, using field experience, when possible, as an opportunity for candidates to demonstrate their learning while applying their skills in the classroom.

Each assessment addresses multiple Student Learning Outcomes and has four interconnected parts—**Analyze, Develop, Implement, and Evaluate**—that are intended to be implemented together rather than over an extended period of time.

These tasks and rubrics are adapted from assessments that are part of the Louisiana Content Leader Assessment Series. The assessments were originally developed for the credentialing program completed by Louisiana Content Leaders as part of the Louisiana Department of Education Content Leader initiative to develop talented teachers' abilities to coach and support other teachers and, by doing so, to grow local leadership pipelines for schools and school districts. The assessments were developed by BloomBoard (https://bloomboard.com) and are hosted on their platform.

TASKS FOR ASSESSMENT 1: COHERENCE AND ALIGNMENT OF MATHEMATICS STANDARDS

Mathematics is not a list of disconnected topics, tricks, or mnemonics; it is a coherent body of knowledge made up of interconnected concepts. The candidate must be able to connect deep mathematical content knowledge and understanding of mathematics standards (e.g., the Louisiana Student Standards for Mathematics (LSSM)) to the planning and implementation of a high-quality math curriculum.[1]

When educators understand the coherence of the standards, they are able to make connections explicit in their lesson design and delivery, and they are able to scaffold knowledge for students within and across lessons and grade levels, resulting in increased student achievement in math.

This performance-based assessment is separated into four parts: Analyze, Develop, Implement, and Evaluate.

PART 1: ANALYZE

- Analyze a sequence of connected lessons (minimum of 3 lessons) from a high-quality math curriculum that is focused on the major work of the grade to demonstrate your knowledge of Coherence and Alignment of the mathematics standards. Refer to the LDOE Teacher Companion Documents, Grade-Level Focus Documents, and Remediation Guide from https://www.louisianabelieves.com/resources/library/k-12-math-year-long-planning, as well as the Coherence Map from https://achievethecore.org/coherence-map as necessary throughout your work.
- Submit the lessons accompanied by a 500-word narrative in which you discuss how these lessons reinforce a larger mathematical concept. Address the following:
  - Which standard(s) does this sequence of lessons focus on?
  - Where along the path to mastery do each of these lessons fall?
  - How do the lessons create a path toward mastery of a larger mathematical concept?
  - How is each lesson leveraging coherence to build student knowledge?

PART 2: DEVELOP

- Develop an intervention plan for the 3 connected lessons identified in ANALYZE to support student mastery of the larger mathematical concept.
- Submit the sequence of connected lessons with annotations to reflect the intervention plan. Include the following in your annotations:
  - Predict where students will struggle with each lesson, and explain why.
  - Considering equitable practices and promotion of positive mathematical identities in students, determine which interventions (including technology-based interventions, if appropriate) will be necessary, including addressing previous standards (from the same year or previous years) and resources.

[1] See https://www.louisianabelieves.com/academics/ONLINE-INSTRUCTIONAL-MATERIALS-REVIEWS/curricular-resources-annotated-reviews for a list of resources the LDOE has identified as high-quality/Tier I.

PART 3: IMPLEMENT

- Implement the series of lessons you identified in ANALYZE.
- Collect a set of student work from one struggling student that represents a traditionally marginalized group. Make sure that the sample set includes artifacts from all the lessons in the series.
- Annotate the artifacts, capturing both positive and constructive feedback given to the targeted student during or between each lesson with respect to the learning goals. Identify the types of interventions that occurred and a justification for each intervention. Highlight any interventions that specifically leveraged coherence.
- Submit the lessons and annotated artifacts.

PART 4: EVALUATE

- Evaluate the implementation of your lessons and submit a 500-word narrative answering the following questions:
    - Did the areas of struggle identified in DEVELOP match the actual areas where your targeted student struggled in IMPLEMENT?
    - How effective were the interventions that you used with your targeted student across the series of lessons you implemented?
    - If the targeted student did not reach mastery at the end of the series of lessons, what interventions could you have used to more effectively support the student? What steps will you take to remediate the learning gaps moving forward?
    - Reflect on your interactions in influencing or reinforcing the student's mathematical identity. How did your personal beliefs, classroom practices, and systemic structures produce an equitable or inequitable learning experience? What could you have done differently to have more equitable instruction?

RUBRIC FOR ASSESSMENT 1: COHERENCE AND ALIGNMENT OF MATHEMATICS STANDARDS

Assessment 1	DEMONSTRATED	PROGRESSING	NOT MET
PART 1: ANALYZE Path to Mastery	Identifies how each lesson builds a path toward mastery of a larger mathematical concept, explaining the connections between lessons and justifying the sequence. Articulates clear standards-based starting and stopping points for the path and explains the concept knowledge built by the path.	Identifies a path of lessons toward mastery of a larger mathematical concept, but does not clearly explain the connections between lessons or justify the sequence. Identifies a progression, but does not connect all of the following to standards: clear starting and stopping points for the path and the concept knowledge built by the path.	Analyzes a sequence of lessons, but does not connect or justify this grouping as a path toward mastery of a larger mathematical concept.
PART 1: ANALYZE Analysis of Coherence	Narrative articulates how the path of lessons is coherent within the larger mathematical concept being targeted, with logical prerequisites for that larger mathematical concept, and within/across grade level or course scope.	Narrative justifies the coherence of the path of lessons in some but not all of the following categories: within the larger mathematical concept being targeted, with logical prerequisites for that larger mathematical concept, and within/across grade level or course scope.	Narrative does not articulate how the path of lessons is coherent.

Assessment 1	DEMONSTRATED	PROGRESSING	NOT MET
PART 2: DEVELOP Annotated Lesson Plans	Annotations articulate a clear intervention plan. Interventions are appropriately placed in the sequence of lessons. Interventions refer back to previous standards when necessary, effectively build toward the larger mathematical concept, and consider equitable practices and the promotion of positive mathematical identities in students. Specific and appropriate resources, including technology-based resources where appropriate, have been identified for the intervention.	Annotations articulate a clear intervention plan. The planned interventions demonstrate some, but not all of the following characteristics: interventions are appropriately placed in the sequence of lessons, coherently refer back to previous standards when necessary, effectively build toward the larger mathematical concept, and consider equitable practices and the promotion of positive mathematical identities in students. Resources, including technology-based resources, have been identified for the intervention, but they are not specific or appropriate.	Intervention plan is incomplete and too general. Resources for the intervention have not been identified.
PART 3: IMPLEMENT Appropriate Feedback	Feedback to student identifies strengths and areas for improvement in clear, student-friendly terms and reflects an understanding of coherence.	Feedback to student identifies strengths and areas for improvement, but this feedback is unclear or not in student-friendly language.	Feedback fails to identify strengths and areas for improvement.
PART 3: IMPLEMENT Addressing Misconceptions	Feedback includes interventions to address misconceptions. These interventions identify the root cause of the misconception and demonstrate a way to move forward that capitalizes on the coherence of the standards.	Feedback includes interventions to address misconceptions. These interventions do not consistently identify the root cause of the misconception or demonstrate a way to move forward.	Feedback does not include interventions to address misconceptions.

Assessment 1	DEMONSTRATED	PROGRESSING	NOT MET
PART 4: EVALUATE Strength and Refinement of Interventions	Evaluation reflects meaningfully on effectiveness of interventions, identifying successes and areas for improvement. This includes how personal beliefs, classroom practices, and systemic structures influenced the student's mathematical identity and promoted an equitable learning experience.	Evaluation reflects on effectiveness of interventions, and includes some but not all of the following: successes, areas for improvement, or how personal beliefs, classroom practices, and systemic structures influenced the student's mathematical identity and promoted an equitable learning experience.	Evaluation does not reflect on the strength of interventions.
PART 4: EVALUATE Impact on Future Instruction	Evaluation demonstrates awareness of lessons the candidate will take from this process and identifies adjustments that will be made to the intervention plan (including the promotion of more equitable instruction) using specific examples to explain how they will apply those lessons for future students.	Evaluation demonstrates awareness of lessons the candidate will take from this process and identifies adjustments that will be made to the intervention plan, but the candidate does not use specific examples to explain how those lessons will be applied for future students or does not address the promotion of more equitable instruction.	Evaluation does not demonstrate awareness of lessons the candidate took from this process and does not identify adjustments they will make to the intervention plan.

TASKS FOR ASSESSMENT 2: DEMONSTRATING CONTENT KNOWLEDGE

Effective candidates are able to connect deep mathematical content knowledge and understanding of mathematics standards (e.g., the Louisiana Student Standards for Mathematics (LSSM)) to the planning and implementation of a high-quality[2] math curriculum. When successful, candidates apply their knowledge of the Key Shifts in the mathematics standards (focus, coherence, and rigor) in order to engage in purposeful, collaborative planning and they implement the curriculum with fidelity in the classroom.

This performance-based assessment is separated into four parts: Analyze, Develop, Implement, and Evaluate.

PART 1: ANALYZE

- Select a lesson from a high-quality curriculum that incorporates problems arising in the real world.
- Through the lens of the key shifts of focus, coherence, and rigor, analyze the lesson's content, delivery of instruction, and the activities the students are asked to complete. Use a colored pen to annotate the selected lesson to describe how the key shifts are illustrated.
- Submit the selected lesson plan to which you have added your annotations.

PART 2: DEVELOP

- Develop a set of instructional decisions to ensure focus coherence and rigor. Using a different colored pen from your annotations in ANALYZE, annotate the same lesson to communicate the following:
  - The plan for making adjustments to the lesson, based on the specific needs of your students
  - The plans for implementation that specifically address areas where students are likely to struggle, need additional support, or have misconceptions.
  - What mastery should sound like, including specific student oral responses (considering multiple methods students might use)
  - Prepared specific probing questions to advance student learning in the context of the specific curriculum and scope of learning.

PART 3: IMPLEMENT

- Implement the lesson that was planned in ANALYZE and DEVELOP.
- Submit at least 3 work samples from students who are at different levels of mastery.
- Annotate the student work to identify where understanding of the concept is illustrated or where unfinished learning is evident.

[2] See https://www.louisianabelieves.com/academics/ONLINE-INSTRUCTIONAL-MATERIALS-REVIEWS/curricular-resources-annotated-reviews for a list of resources the LDOE has identified as high-quality/Tier I.

PART 4: EVALUATE

- In a written response (approximately 300-500 words), evaluate your lesson implementation by answering the following questions:
  - How can you leverage the Key Shifts, specifically coherence, to adjust for the students that struggled with mastery? Directly reference the student work collected in IMPLEMENT.
  - As you were going through this process, did you notice any change in your approach to the content of the lesson? If not, how did the process reinforce what you have already been doing?
  - Reflecting on your interactions in influencing or reinforcing the students' mathematical identities, how did your personal beliefs, classroom practices, and systemic structures produce an equitable or inequitable learning experience? What could you have done differently to have more equitable instruction?

RUBRIC FOR ASSESSMENT 2: DEMONSTRATING CONTENT KNOWLEDGE

Assessment 2	DEMONSTRATED	PROGRESSING	NOT MET
PART 1: ANALYZE Identifying Focus	Analysis identifies the specific part of the standard that the lesson targets, clearly articulating how the lesson targets that part of the standard and fits into the larger standard. Analysis identifies the 1-2 key takeaways from the lesson. It is clear that the candidate understands why this lesson is valuable relative to the Key Shifts and the curriculum.	Analysis identifies the standard that the lesson targets but does not identify how a specific part of that standard is targeted. Analysis identifies a key takeaway of this lesson but does not clearly show why the lesson is valuable.	Analysis does not connect the lesson to standards. Analysis does not show why the lesson is valuable.
PART 1: ANALYZE Identifying Coherence	Annotations highlight coherence: within the unit that the lesson is contained, within the grade level or course scope, and across grades and courses.	Annotations highlight coherence in some but not all of the following categories: within the standard that the lesson is targeting, within the grade level or course score, and across grades and courses.	Annotations do not highlight coherence.
PART 1: ANALYZE Identifying Rigor	Analysis identifies the component of rigor applicable to the lesson, as well as specific instructional strategies appropriate to teaching the content. Analysis acknowledges a range of student outcomes.	Analysis identifies the component of rigor applicable to the lesson, as well as specific instructional strategies appropriate to teaching the content. While the candidate identifies the explicit expectations of the identified standard, they do not acknowledge a range of student outcomes.	Analysis does not identify specific instructional strategies appropriate to teaching the content.

Assessment 2	DEMONSTRATED	PROGRESSING	NOT MET
PART 2: DEVELOP Aligning Content	Plan effectively evaluates the content and instruction to determine potential success toward the desired target, identifying any adjustments that need to be made to the analyzed lesson plan. Annotations demonstrate a clear lesson facilitation plan.	Plan includes reflection on the analyzed lesson plan but does not identify any adjustments that need to be made to the lesson plan. Facilitation plan in annotations is vague or general.	Plan does not provide a reflection on the analyzed lesson plan. Facilitation plan and annotations are absent.
PART 2: DEVELOP Planning for Addressing Hot Spots	Plan identifies areas where instruction may need to be adjusted, articulates a plan for addressing those hot spots (i.e., places where students are likely to struggle and need additional support), and justifies the reasoning for those adjustments.	Plan identifies areas where instruction may need to be adjusted and articulates a plan for addressing those hot spots, (i.e., places where students are likely to struggle and need additional support), but does not justify the reasoning for those adjustments.	Plan does not identify areas where instruction may need to be adjusted or articulate a plan for addressing those hot spots (i.e., places where students are likely to struggle and need additional support).
PART 2: DEVELOP Identifying Student Mastery	Plan articulates specific student oral responses that will suggest mastery of the content.	Plan articulates student responses that will suggest mastery of the content, but the anticipated student responses are either inappropriate for demonstrating mastery of the content or are too general.	Plan does not articulate student responses that will suggest mastery of the content.

Assessment 2	DEMONSTRATED	PROGRESSING	NOT MET
PART 2: DEVELOP Preparing Responses	Plan articulates the candidate's prepared response to student misunderstandings in the context of the specific curriculum and scope of learning (e.g., a response to a missed exit ticket in a lesson introducing new material should look different to a response further along the path to mastery).	Plan articulates the candidate's prepared response to student misunderstandings, but these planned responses are not connected to the specific curriculum or scope of learning.	Plan articulates the candidate's prepared response to student misunderstandings.
PART 3: IMPLEMENT Identifying Levels of Mastery	Annotations appropriately identify the level of mastery for each student with regard to the outcome of the lesson and according to the standard.	Annotations appropriately identify the level of mastery for some but not all students	Annotations do not appropriately identify the level of mastery for the students.
PART 3: IMPLEMENT Explaining Levels of Mastery	Annotations justify the selections, explaining where students indicate understanding of the concept and where student work demonstrates unfinished learning.	Annotations explain the selections but fail to identify where students indicate understanding of the concept or where student work demonstrates unfinished learning.	Annotations do not explain the selections.

Assessment 2	DEMONSTRATED	PROGRESSING	NOT MET
PART 4: EVALUATE Evaluating Lessons Implementation	Evaluation articulates planned adjustments to help students achieve mastery. Evaluation articulates multiple, specific changes in practice that the candidate plans to implement in future lessons to target the students who have not yet achieved mastery. Evaluation articulates how the adjustments are connected to the curriculum to ensure coherence.	Evaluation explains adjustments that are needed to help students achieve mastery but does not list multiple, specific changes in practice that they plan to implement in future lessons that target the students who have not yet achieved mastery. Evaluation does not connect future adjustments to the larger curriculum in a coherent manner. The planned adjustments are stopgap solutions, rather than coherent, integrated plans.	Evaluation does not explain adjustments that are needed to help students achieve mastery.
PART 4: EVALUATE Evaluating Impact on Personal Practice	Evaluation includes a statement of impact detailing how the process will change the current approach to the content and topics in a lesson, or how the process has reinforced or enhanced current practices.	Evaluation includes a statement of impact, but it does not detail how the process will change the current approach to the content and topics in a lesson, or how the process has reinforced or enhanced current practices.	Evaluation does not include a reflection on the process and its impact on practice.

TASKS FOR ASSESSMENT 3: FACILITATING MATHEMATICALLY PRODUCTIVE DISCUSSIONS

As the standards for mathematics have shifted from primarily routine procedures and algorithms to also include building conceptual understanding, students must be able to reason, justify and model their thinking in mathematics.

Achieving this requires that educators also shift their instruction, so that students are doing more of the cognitive lift. Productive discourse is an instructional tool that facilitates this by allowing educators to use students' developing thinking to help others master the content. Productive discourse also helps educators collect important information about what students are thinking and learning that can be used to adjust instruction.

This performance-based assessment is separated into four parts: Analyze, Develop, Implement, and Evaluate.

PART 1: ANALYZE

- Analyze a selected lesson from a high-quality3 curricular resource to prepare to lead a mathematically productive discussion with a class. Select a pivotal point in the lesson where discourse would help students achieve your identified learning goal.
- Submit a narrative or a discourse planning template/monitoring sheet in which you have addressed the following:
  - Identify the learning goal and the specific task students will complete.
  - List all of the ways in which you anticipate students are likely to solve the task and the errors that they might make.
  - Considering equitable practices and promotion of positive mathematical identities in students, write a set of questions that you could ask about these approaches to help students in making progress on the task.

PART 2: DEVELOP

- Develop a plan for your discussion by identifying:
  - The specific solution pathways you will monitor for during the lesson,
  - The strategies you anticipate you will select to highlight and why
  - How you will sequence those strategies and why
  - The connections you will hope to make in order to lead a productive discussion that will result in students reaching the learning goal.
- Submit either a discourse planning template/monitoring sheet, annotated lesson or written narrative (about 300 words) that reflects your plan for facilitating the discussion.

[3] See https://www.louisianabelieves.com/academics/ONLINE-INSTRUCTIONAL-MATERIALS-REVIEWS/curricular-resources-annotated-reviews for a list of resources the LDOE has identified as high-quality/Tier I.

PART 3: IMPLEMENT

- Implement the discussion using the anticipated strategies and questions from ANALYZE and the plan from DEVELOP, making adjustments as appropriate. Facilitate the class discussion connecting students' ideas and deepening their mathematical understanding.
- Submit a 5-10 minute video (or two to three 2-5 minute videos) demonstrating how you facilitated the mathematical discussion and connected students' ideas and mathematical concepts.

PART 4: EVALUATE

- Evaluate your facilitation of the mathematical discussion in IMPLEMENT. Submit a 500- to 600-word narrative addressing the following questions:
  - How effectively did you facilitate the mathematical discussion? How did you influence or reinforce students' mathematical identities? Directly reference the video(s) submitted in IMPLEMENT, including specific questions you or the students asked and specific responses from students.
  - What adjustments, if any, did you need to make to your plan for facilitating the discussion in order to support students in reaching the learning goal? Why?
  - Which parts of facilitating mathematically productive discussions did you find most challenging? How will you continue to improve in this area?

RUBRIC FOR ASSESSMENT 3: FACILITATING MATHEMATICALLY PRODUCTIVE DISCUSSIONS

Assessment 3	DEMONSTRATED	PROGRESSING	NOT MET
PART 1: ANALYZE Anticipating Student Responses	Analysis lists multiple ways in which students are likely to solve the task and articulates why errors might occur for each anticipated type of response.	Analysis lists ways in which students may solve the task but struggles to articulate where or why errors may occur.	Analysis does not list multiple ways that students are likely to solve the task.
PART 1: ANALYZE Using Questions to Guide Discussion	Analysis includes questions that show a broad understanding of potential errors that recognizes the coherence throughout the curriculum.	Analysis includes questions that are centered on a single problem and do not show an understanding of the coherence throughout the curriculum.	Questions in the analysis are missing or lack relevance to the anticipated student responses.
PART 2: DEVELOP Monitoring	The submitted plan is well organized and clearly shows the multiple solution pathways you looked for during the lesson.	It is difficult to see how the plan allows for multiple solution pathways.	The submitted plan is incomplete.
PART 2: DEVELOP Selecting	There is a clear explanation of why the specific solution pathways were selected as the focal points for the discussion.	It is unclear why specific solution pathways were selected.	There is no explanation of why specific solution pathways were selected.
PART 2: DEVELOP Sequencing	The proposed sequence orders the work in such a way as to make the mathematics accessible to all students and to build a mathematically coherent storyline.	Submitted plan does not include justification for why the solutions are sequenced the way they are OR the sequence would not make mathematics accessible to all students by building a mathematically coherent storyline.	No justification for the sequencing is given AND the sequence would not make mathematics accessible to all students building a mathematically coherent storyline.

Assessment 3	DEMONSTRATED	PROGRESSING	NOT MET
PART 2: DEVELOP Connecting Student Work	There is a clear explanation for how the sequence of solutions connects to each other and is aligned to the learning outcome.	It is unclear how the sequence of solutions connects to each other.	There is no explanation of how the sequence of solutions connects to each other.
PART 3: IMPLEMENT Facilitating Discussion	The candidate uses probing questions to advance student learning and connects student responses to key mathematical ideas. Students are doing the majority of the thinking and talking about the mathematical content. They are engaging with the teacher and each other in discussion about the mathematical content.	The candidate either uses probing questions to advance student learning OR the candidate connects student responses to key mathematical ideas. Some students are engaging with the teacher and each other in discussion about the mathematical content.	Candidate does not use probing questions to advance student learning or connect student responses to key mathematical ideas. Students are not doing the majority of the thinking or talking about the mathematical content.
PART 4: EVALUATE Evaluating Lesson Implementation	Narrative makes direct references to the videos from IMPLEMENT. Narrative includes acknowledgement of the successes from the discussion, what improvements could be made in the future, and how it influenced or reinforced students' mathematical identities.	Narrative makes direct references to the videos from IMPLEMENT; however, it does not clearly identify successes and areas for improvement.	Narrative does not make direct references to the videos from IMPLEMENT.

Assessment 3	DEMONSTRATED	PROGRESSING	NOT MET
PART 4: EVALUATE Evaluating Impact on Personal Practice	Evaluation includes a statement of impact detailing how the process will change the current approach to facilitating mathematically productive discussions, or how the process has reinforced or enhanced current practices. Evaluation lists multiple, specific changes in practice that can be implemented in future lessons.	Evaluation includes a statement of impact detailing how the process will change the current approach to the content and topics in a lesson, or how the process has reinforced or enhanced current practices. Evaluation lists a single change in practice that can be implemented in future lessons.	Evaluation does not include a statement of impact detailing how the process will change the current approach to the content and topics in a lesson. Evaluation does not list changes in practice that can be implemented in future lessons.

Sample Activities

These activities are drawn from the Louisiana Secondary Mathematics Content Modules, which were developed and delivered as part of a Louisiana Department of Education initiative to ensure that Louisiana educators for grades 6–9 are well-equipped to engage students in mastering the content described in the Louisiana Student Standards for Mathematics (LSSM).

Because the assessments and activities in these content modules exemplify the state's expectations for Louisiana mathematics teachers, they are provided as suggestions for use in secondary teacher preparation courses.

While the activities currently refer to Louisiana-specific standards, resources, and Tier I curricula for grades 6–9, they can be easily adapted to engage candidates in work to support grades 10–12, as well as with other standards sets, resources, and high-quality curricula such as those reviewed by EdReports (https://www.edreports.org).

The complete set of Mathematics Content Modules can be found at https://www.louisianabelieves.com/resources/library/louisiana-content-leaders.

The list of Louisiana Tier I curricula can be found at https://www.louisianabelieves.com/academics/ONLINE-INSTRUCTIONAL-MATERIALS-REVIEWS/curricular-resources-annotated-reviews.

Secondary Learning Activity 1: Defining the Key Shifts

This learning activity is selected from *LDOE Secondary Math Content Module 1, Session 1: Rigor of the Louisiana Student Standards for Mathematics*.

Activity Objectives

Through this activity, teacher candidates will know:

- The key shifts of focus, coherence, and rigor play a critical role in the implementation of the Louisiana Student Standards for Mathematics (LSSM):
  - *Focus*—narrowing in on fewer topics in a lesson or unit to ensure teachers have adequate time to push students toward mastery of key mathematical concepts;
  - *Coherence*—viewing the standards as interconnected across grade levels, and across domains within a grade level, rather than as isolated events; and
  - *Rigor*—ensuring that **conceptual understanding**, **procedural skills**, and **fluency** drive the exploration of mathematical content at greater depth, culminating with the ability to apply mathematics to solve real-world problems. Rigor is about giving equal intensity to conceptual understanding, procedural skills and fluency, and applications to real-life situations. It is not about giving students more or harder problems.
- The components of rigor should be evident in any high-quality curriculum.
- The key shifts for teaching and learning have important implications.

Activity at a Glance

Participants will…

- Read about the key shifts and use a discussion protocol to develop a common, foundational understanding of focus, coherence, and rigor in the standards.
- Engage in a small group card sort to produce a poster that aligns tasks from different grade levels to the LSSM for grades 6–9.
- Identify the component of rigor addressed in each of the standards from the poster activity.

Louisiana Believes Math Content Module Resources

To facilitate this activity, access the folder located at https://tinyurl.com/LDOE-Sec-KeyShifts for the following Louisiana Believes Math Content Module resources:

- Detailed description of activity: LDOE_SecY3_CM1_CL-00 Module 1 Overview.pdf (pages 6–11)
- Activity slides: LDOE_SecY3_CM1_P-00 Module 1 Slides (slides 6–12)

Ancillary resources referenced in detailed description:

- LDOE_SecY3_CM1_CL-03 Save the Last Word for ME (discussion protocol)
- LDOE_SecY3_CM1_P-01 Key Shifts in Mathematics (key shifts passage)
- LDOE_SecY3_CM1_CL-02 ENY Tasks Standards Card Sort (tasks to be sorted for poster)

Secondary Learning Activity 2: Focus and Coherence

This learning activity is selected from *LDOE Secondary Math Content Module 1, Session 2: Focus and Coherence of the LSSM.*

Activity Objectives

Through this activity, teacher candidates will know:

- The key shifts of focus and coherence play a critical role in the implementation of the Louisiana Student Standards for Mathematics (LSSM), and they guide decisions about teaching and learning.
- Mathematics standards are not isolated concepts.
- The major work at each grade level 6–9 builds student understanding by connecting concepts within and across grades.

Activity at a Glance

Participants will…

- Revisit the definitions of focus and coherence in the LSSM.
- Use the Louisiana Focus Documents to summarize the major and supporting work of grades 6–9.
- Watch Achieve the Core video (William McCallum) that explains the importance of connections within mathematics.
- Explore the Student Achievement Partners Coherence Maps to identify connections between related standards.
- Use chart paper to create a description of coherence between three related standards across grade levels.

Louisiana Believes Math Content Module Resources

To facilitate this activity, access the folder located at https://tinyurl.com/LDOE-Sec-Focus for the following Louisiana Believes Math Content Module resources:

- Detailed description of activity: LDOE_SecY3_CM1_CL-00_Module Plan.pdf (pages 14–20)
- Activity slides: LDOE_SecY3_CM1_P-00 Module 1 Presentation Slides (slides 14–25)

Additionally, the following ancillary resources are referenced in detailed description of the activity:

- Louisiana Believes Math Focus Documents and Remediation Guides https://www.louisianabelieves.com/resources/library/k-12-math-year-long-planning
- Video: William McCallum, The Importance of Coherence in Mathematics: https://vimeo.com/81639437
- Achieve the Core Interactive Coherence Map: https://achievethecore.org/coherence-map

Additional Notes

After engaging in the above described activity, teacher candidates could create a portion of a coherence map that outlines the standards that are connected to the focus standards of a lesson from a high-quality curriculum and then use the coherence map, as well as additional curricular resources, to annotate the selected lesson, using the following guiding questions:

- How does the lesson fit into the learning progression for students?
- Which of the math practices support or enhance the learning goals of this lesson, and how?
- Identify multiple entry/access points for students based on the coherence/progression of the standard.
- What learning supports will be necessary for students who might struggle?
- What learning enhancements will be provided for students with a strong command of the subject matter already?

Secondary Learning Activity 3:
Engaging in Perseverance and Exploring Coherence in the Standards

This learning activity is selected from *LDOE Secondary Math Content Module 4, Session 1: Deepening Mathematical Content Knowledge and Exploring Coherence in the LSSM*.

In this activity, teacher candidates engage in a problem-solving task from a high-quality curriculum that will prompt them to persevere and justify their reasoning while also building their content knowledge of the big idea "Extending and applying operations with rational numbers."

In the second part of the activity, they will explore the vertical progression of operations with rational numbers from 4th to 11th grade.

The structure of this activity can be applied to develop candidates' understanding of other big ideas by replacing the task and the standards as appropriate.

Activity Objectives

Through this activity, teacher candidates will know:

- What it feels like to engage in productive struggle as they persevere through a mathematics task that requires them to justify their reasoning just as their students will do in the classroom.
- How to describe the vertical progression of operations with rational numbers across grades 4–11.
  - Students' work with operations with rational numbers begins in 4th grade, and all operations with rational numbers are complete by 7th grade.
  - In 8th grade and Algebra I, the focus is on applying operations with rational numbers to solve equations.
  - In high school, students extend their knowledge of operations with rational numbers to operations with rational expressions.
- How their new understanding of the standards impacts instruction in secondary mathematics classrooms.

Activity at a Glance

Participants will…

- Engage in a math task aligned to grade-level standards related to the big idea of extending operations with rational numbers.
- Explore how the standards prescribe what students should know and be able to do when operating with rational numbers and expressions across grade levels, and document their (the teacher candidates') findings on chart paper.
- Summarize the vertical progression of operations with rational numbers from grade 4 to grade 11.

Louisiana Believes Math Content Module Resources

To facilitate this activity, access the folder located at https://tinyurl.com/LDOE-Sec-Perserverence for the following Louisiana Believes Math Content Module resources:

- Detailed description of activity: LDOE_SecY3_CM4_CL-00_Module Plan.pdf (pages 5–11)
- Activity slides: LDOE_SecY3_CM4_P-00_ Module 4 Presentation Slides (slides 6–10)

Ancillary resources referenced in detailed description:

- LDOE_SecY3_CM4_P-01_Egyptian Fractions II.pdf (problems referenced from Module 4: Session 1)
- LDOE_SecY3_CM4_CL-02_Egyptian Fractions II Commentary.pdf (commentary on solutions)
- LDOE_SecY3_CM4_CL-01_Module 4 Posters and Handouts Guide.pdf (page 1)
- LDOE_SecY3_CM4_P-02_Operations with Rational Numbers Across the Grades Levels.pdf (full resource)

Additional Notes

To increase the cognitive complexity when facilitating the "Egyptian Fractions" task, the given algebraic identify in Part B can be withheld, providing candidates the opportunity to develop a solution strategy and attempt to generalize the method prior to formalizing the algebraic method.

Such fully open-ended implementation of this task will engage candidates in many of the Standards for Mathematical Practice, thus requiring significantly more time than is suggested in the detailed description above. See pages 2–4 of the LDOE_SecY3_CM4_CL-02_Egyptian Fractions II Commentary.pdf for insight on variations in implementation.

Secondary Learning Activity 4: Standards for Mathematical Practice (SMPs)

This learning activity is selected from *LDOE Elementary Math Content Module 6, Session 4: Instructional Strategies to Improve Curriculum Implementation* and from *LDOE Secondary Math Content Module 2, Session 4: Instructional Strategies to Improve Curriculum Implementation*.

This activity is composed of two sessions which introduce participants to the Standards for Mathematical Practice.

The first portion is from an elementary session, but the elementary documents referenced in the detailed description can easily be replaced with the secondary documents found in the resources section below.

The second portion is an excerpt from a secondary session that digs deeper into the mathematical practice of Modeling, specifically as a conceptual category in high school mathematics.

Activity Objectives

Through this activity, teacher candidates will know:

- The Standards for Mathematical Practice (SMPs) describe varieties of ways in which students should engage with math content as mathematicians.
- Educators should attend to the need to connect the Standards for Mathematical Practice to mathematical content in mathematics instruction in order to engage students in deep mathematical thinking.
- Making mathematical models is best interpreted in relationship to other standards, as it is not only a Standard for Mathematical Practice (SMP 4), but it is also one of the six conceptual categories described in high school mathematics, and specific modeling standards appear throughout the five other conceptual categories.

Activity at a Glance

In Elementary Module 6: Session 4, participants will…

- Record their initial thoughts on the meaning of the Standards for Mathematical Practice and will add notes as they deepen their understanding of the standards.
- Generate a series of posters for each of the practice standards that show how students and teachers implement them in the math classroom.

In Secondary Module 2: Session 4, participants will…

- Develop an understanding of the six actions students take over the course of completing a modeling task from the standards.
- Make connections between modeling in middle school and high school.
- Identify the educator's role in each stage of the modeling cycle.

Louisiana Believes Math Content Module Resources

To facilitate this activity, access the folder located at https://tinyurl.com/LDOE-Sec-SMPs for the following Louisiana Believes Math Content Module resources:

Elementary Module 6: Session 4

- Detailed description of activity: LDOE_ElemY3_CM6_CL-00a_MODULE_PLAN.pdf
- Activity slides: LDOE_ElemY3_CM6_CL-00b-00_SLIDES (slides 30–34)

Ancillary resources referenced in detailed description:

- LDOE_ElemY3_CM6_P-04_FirstImpressions.pdf (recording document)

Additional secondary resources to use in place of the that are referenced in the detailed description:

- http://commoncoretools.me/wp-content/uploads/2014/05/2014-05-06-Elaborations-6-8.pdf (SMP Commentary and elaborations for grades 6–8)
- LDOE_SecY3_CM2_P-10_HS Modeling Conceptual Category.pdf (LSSM Companion Document for Algebra 1: Modeling Standards)

Secondary Module 2: Session 4

- Detailed description of activity: LDOE_SecY3_CM2_CL-00_Module 2 Plan.pdf (pages 32–33, descriptions of facilitation of slides 32 and 33)
- Activity slides: LDOE_SecY3_CM2_P-00_Module 2 Presentation Slides (slides 32–33)

Ancillary resources referenced in detailed description:

- LDOE_SecY3_CM2_P-10_HS Modeling Conceptual Category.pdf (LSSM Companion Document for Algebra 1: Modeling Standards)

Secondary Learning Activity 5: Discourse

This learning activity is selected from *LDOE Secondary Math Content Modules 3–6, Session 2: Instructional Strategies to Improve Curriculum Implementation.*

This activity is composed of 4 sessions that introduce participants to research for facilitating productive mathematical discourse, specifically based on the NCTM publication *5 Practices for Orchestrating Productive Mathematics Discussions*.

Each of the sessions focuses on a different practice or set of practices. These sessions can be spaced out, merged, or modified to best meet the needs of the teacher candidates.

Activity Objectives

Through this activity, teacher candidates will know:

- How to establish a specific learning goal for a lesson.
- How to identify opportunities for discourse within high-quality curriculum and the importance of cultivating a classroom culture with explicit supports for student discourse.
- How to anticipate student strategies and misconceptions and plan probing questions in response to these anticipated responses.
- How to monitor student responses so teachers can be prepared to connect student strategies to intended learning—and to address misconceptions.
- How to intentionally select and purposefully sequence student presentations of their responses to build a mathematically coherent storyline from prior knowledge to current grade-level standards.
- The importance of encouraging students to make mathematical connections between different responses from their classmates.

Activity at a Glance

In Module 3: Session 2, participants will…

- Be introduced to the National Council of Teachers of Mathematics book *5 Practices for Orchestrating Productive Mathematics Discussions*.
- Establish a specific learning goal for a lesson.
- Anticipate student responses to mathematical problems selected from a lesson which is part of a high-quality curriculum.

In Module 4: Session 2, participants will…

- Learn what it means to monitor student responses as part of orchestrating productive discourse.
- Engage in a question type card sort to define the 4 types of questions: gathering information, probing thinking, making mathematics visible, and encouraging reflection and justification.
- Practice anticipating student responses and plan probing questions to ask students while monitoring in response to those anticipated student responses, and create a chart to communicate thinking to peers.

In Module 5: Session 2, participants will…

- Learn what it means to select and sequence student responses as part of orchestrating productive discourse.
- Practice *anticipating* student responses and planning probing questions to ask while monitoring.
- Practice *selecting* and *sequencing* by analyzing student responses to a task and charting a proposed sequence of selected student responses to a lesson.

In Module 6: Session 2, participants will…

- Learn what it means to *connect* student responses as part of orchestrating productive discourse.
- Practice *anticipating* student responses, planning probing questions to ask students while monitoring, and selecting and sequencing student responses.
- Discuss ways to make connections among the various strategies and to the intended learning in order to deepen students' mathematical understanding.
- Chart a proposed sequence of selected student responses to a lesson and highlight connections that will help students achieve the learning goal.

Louisiana Believes Math Content Module Resources

To facilitate this activity, access the folder located at https://tinyurl.com/LDOE-Sec-Discourse for the following Louisiana Believes Math Content Module resources:

Module 3: Session 2

- Detailed description of activity: LDOE_SecY3_CM3_CL-00_Module Plan.pdf (pages 18–27)
- Activity slides: LDOE_SecY3_CM3_P-00_Module 3 Presentation_Slides (slides 20–29)

Ancillary resources referenced in detailed description:

- LDOE_SecY3_CM3_P-03_aENY Lesson_6.EE.C.9-Teacher.pdf (grade 6 lesson)
- LDOE_SecY3_CM3_P-03_bPartB_Gr 6_Stu Exercises 1-3.pdf (grade 6 lesson)
- LDOE_SecY3_CM3_P-04_aENY Lesson_7.RP.2c-Teacher.pdf (grade 7 lesson)
- LDOE_SecY3_CM3_P-04_bPartB_Gr7_Stu Exercises 1-3.pdf (grade 7 lesson)
- LDOE_SecY3_CM3_P-05_aENY Lesson_8.F.A.3-Teacher.pdf (grade 8 lesson)
- LDOE_SecY3_CM3_P-05_bPartB_Gr8_Stu Exercises 4-10.pdf (grade 8 lesson)
- LDOE_SecY3_CM3_P-06_aENY Lesson A1 F-LE.A.2-Teacher.pdf (Alg lesson)
- LDOE_SecY3_CM3_P-06_bPartB_Alg_Stu MathModelingExercise 1.pdf (Alg lesson)

Module 4: Session 2

- Detailed description of activity: LDOE_SecY3_CM4_CL-00_Module Plan.pdf (pages 12–19)
- Activity slides: LDOE_SecY3_CM4_P-00_ Module 4 Presentation Slides (slides 12–19)

Ancillary resources referenced in detailed description:

- LDOE_SecY3_CM4_CL-03_Sample Questions Card Set.pdf (questions to sort)
- LDOE_SecY3_CM4_P-03_Posing Purposeful Questions_QuesTypes_QuesPatterns.pdf
- LDOE_SecY3_CM4_P-04_Anticipating and Monitoring Discourse.pdf (tool for planning)
- LDOE_SecY3_CM4_P-01_Egyptian Fractions II.pdf (problems referenced from Module 4: Session 1)
- LDOE_SecY3_CM4_CL-02_Egyptian Fractions II Commentary.pdf (commentary on solutions)

Module 5: Session 2

- Detailed description of activity: LDOE_SecY3_CM5_CL-00_Module Plan.pdf (pages 13–21)
- Activity slides: LDOE_SecY3_CM5_P-00_Module 5 Presentation Slides (slides 12–22)

Ancillary resources referenced in detailed description:

- LDOE_SecY3_CM5_P-03_Practices for Orchestrating…pdf (summary of 5 practices)
- LDOE_SecY3_CM5_P-01_Ultimate Invaders.pdf (problems referenced from Module 5: Session 1)
- LDOE_SecY3_CM5_CL-02_Ultimate Invaders Answers.pdf
- LDOE_SecY3_CM5_CL-03 Sample Student Work.pdf (to select and sequence)
- LDOE_SecY3_CM5_P-04_PlanningforMathematicalDiscourse.pdf (tool for planning)

Module 6: Session 2

- Detailed description of activity: LDOE_SecY3_CM6_CL-00_Module Plan.pdf (pages 14–20)
- Activity slides: LDOE_SecY3_CM6_P-00_Module 6 Presentation Slides (slides 13–19)

Ancillary resources referenced in detailed description:

- LDOE_SecY3_CM6_P-04_Practices for Orchestrating…pdf (summary of 5 practices)
- LDOE_SecY3_CM6_P-01_Smoothie.pdf (problems referenced from Module 6: Session 1)
- LDOE_SecY3_CM6_CL-02_SmoothieAnswers.pdf
- LDOE_SecY3_CM6_CL-03_Student Work Samples.pdf (to select, sequence, and connect)

Secondary Learning Activity 6: Purposeful Planning

This learning activity is selected from *LDOE Secondary Math Content Module 3, Session 1: Deepening Mathematical Content Knowledge, Exploring Coherence in the LSSM, and Purposeful Planning* and from *Session 3: The Purposeful Planning of the EngageNY Curriculum*.

This activity is composed of two sessions which introduce participants to a two-part planning guide that can be used to facilitate collaborative planning sessions during which teacher candidates can focus on studying standards (part 1) and annotating lessons and resources from a high-quality curriculum (part 2) to ensure all students receive rigorous math instruction.

These sessions can be merged or modified, and any lessons, tasks or standards that are referred to can be replaced to best meet the content needs of the teacher candidates.

Activity Objectives

Through this activity, teacher candidates will know:

- Collaborative planning is:
  - Working and learning together to plan instruction (including lessons, units, assessments, and activities) focused on building the intended learning described by the standards.
  - Discussing, interpreting, and refining high-quality curriculum resource materials together in order to use them to best meet our students' learning needs.
- Focusing planning conversations around the standards in order to make informed instructional decisions will:
  - Build a shared understanding of the math content described in the standards and what that content looks like in teaching and learning.
  - Promote consideration and use of instructional strategies and resources that will best build on students' current understanding and connect to the intended learning.

Activity at a Glance

In Module 3, Session 1, participants will…

- Define collaborative planning.
- Explore the parts of a Planning Guide tool that can help teams focus on standards and planning standards aligned instruction together.
- Watch a video of a team of teachers who are using the first portion of the planning guide to engage in a foundational study of the standards.
- Practice collaborating in a foundational study of the standards.

In Module 3: Session 3, participants will…

- Review the process of engaging in a foundational study of the standards.

- Analyze an annotated lesson from a high-quality curriculum for connections to the "Bridge to Lesson Planning" portion of the planning guide.
- Use the second portion of the planning guide to connect the understanding of the standards with a lesson from a high-quality curriculum by annotating the lesson so they can make instructional decisions that best meet the intent of the standards and the needs of all students.

Louisiana Believes Math Content Module Resources

To facilitate this activity, access the folder located at https://tinyurl.com/LDOE-Sec-PurposefulPlanning for the following Louisiana Believes Math Content Module resources:

Module 3: Session 1

- Detailed description of activity: LDOE_SecY3_CM3_CL-00_Module 3 Overview.pdf (pages 9–17)
- Activity slides: LDOE_SecY3_CM3_P-00_Module 3 Presentation_Slides (slides 8–18)

Ancillary resources referenced in detailed description:

- LDOE_SecY3_CM3_P-02_LDOE_SecMath_PlanningGuide.pdf (planning guide)
- LDOE_SecY3_CM3_video_Purposeful Planning Part One.mp4 (part 1 of sample video of teachers engaged in a foundational study of the standards)
- LDOE_SecY3_CM3_video_Purposeful Planning Part Two.mp4 (part 2 of sample video of teachers engaged in a foundational study of the standards)

Module 3: Session 3

- Detailed description of activity: LDOE_SecY3_CM3_CL-00_Module 3 Overview.pdf (pages 28–39)
- Activity slides: LDOE_SecY3_CM3_P-00_Module 3 Presentation_Slides (slides 31–45)

Ancillary resources referenced in detailed description:

- LDOE_SecY3_CM3_P-02_LDOE_SecMath_PlanningGuide.pdf (planning guide)
- LDOE_SecY3_CM3_P-07_Sample ENY annotated lesson.pdf (sample annotated lesson)
- LDOE_SecY3_CM3_P-06_aENY Lesson A1 F-LE.A.2-Teacher.pdf (lesson referenced from Module 3: Session 1)
- LDOE_SecY3_CM3_P-06_bPartB_Alg_Stu MathModelingExercise 1.pdf (lesson referenced from Module 3: Session 1)
- LDOE_SecY3_CM3_P-03_aENY Lesson_6.EE.C.9-Teacher.pdf (grade 6 lesson)
- LDOE_SecY3_CM3_P-03_bPartB_Gr 6_Stu Exercises 1-3.pdf (grade 6 lesson)
- LDOE_SecY3_CM3_P-04_aENY Lesson_7.RP.2c-Teacher.pdf (grade 7 lesson)
- LDOE_SecY3_CM3_P-04_bPartB_Gr7_Stu Exercises 1-3.pdf (grade 7 lesson)
- LDOE_SecY3_CM3_P-05_aENY Lesson_8.F.A.3-Teacher.pdf (grade 8 lesson)
- LDOE_SecY3_CM3_P-05_bPartB_Gr8_Stu Exercises 4-10.pdf (grade 8 lesson)
- LDOE_SecY3_CM3_P-06_aENY Lesson A1 F-LE.A.2-Teacher.pdf (algebra lesson)
- LDOE_SecY3_CM3_P-06_bPartB_Alg_Stu MathModelingExercise 1.pdf (algebra lesson)

Additionally, the following ancillary resources are referenced in both detailed descriptions:

- Louisiana Believes Teacher Companion Documents, Guide to Implementing Eureka, Remediation Guides and the LSSM: https://www.louisianabelieves.com/resources/library/k-12-math-year-long-planning
- Achieve the Core Interactive Coherence Map: https://achievethecore.org/coherence-map

Additional Notes

As an alternate to using the Louisiana Planning Guide, teacher candidates could use the guiding questions from a Math 5E Inquiry Lesson Plan Template to help facilitate their collaborative standards focused planning conversations as they annotate a lesson from high-quality curriculum.

Instructors can choose which component of the planning template to focus on based on course readings, time, and candidate needs.

The resource was inspired by a template originally developed by the Department of Teaching and Learning at Southeastern Louisiana University (http://www.southeastern.edu/acad_research/depts/teach_lrn/index.html). Janelle Lorenzen, Ph.D., of Southeastern Louisiana University, Department of Mathematics then augmented it with a rubric from the National Institute for Excellence in Teaching (NIET) (https://www.niet.org), and the National Council of Teachers of Mathematics (NCTM)'s 8 effective teaching practices (available at https://www.nctm.org/uploadedFiles/Standards_and_Positions/PtAExecutiveSummary.pdf) and M. S. Smith & M. K. Stein's 2018 book *5 Practices for Orchestrating Productive Mathematics Discussions* (available at https://www.nctm.org/Store/Products/5-Practices-for-Orchestrating-Productive-Mathematics-Discussions,-2nd-Edition/). The developers of this model methods course outline consider this hybrid tool a fair use for education purposes.