Introduction to Standards for the Preparation of Teachers of Upper Elementary (3-6) Education

Purpose

The purpose of the Standards for the Preparation of Teachers of Upper Elementary (3-6) Education is to establish a shared vision for the content and skills that entry-level teachers of upper elementary (3-6) education in Michigan should possess and be able to demonstrate in their teaching, regardless of whether they follow a traditional or alternative route into the profession. The standards reflect a vision of a well-prepared beginning teacher whose primary role is to deliver high-quality, Tier 1 instruction in grades 3-6 Literacy, Mathematics, Science, and Social Studies to all Michigan children within a Multi-Tiered System of Supports.

These standards are organized into five sections of professional preparation to teach elementary education and define acceptable levels of performance at teachers' point of entry into the field. These standards establish outcomes for graduates of teacher preparation programs in upper elementary (3-6) education and are to be used to inform program development and continuous improvement efforts at Michigan's institutions of higher education. Each section is written differently, as the stakeholder teams who drafted these standards developed a structure that they believed best represented the essential disciplinary knowledge and pedagogical skills of the respective section. For example, the Literacy section details understandings and practices related to literacy development, assessment, and instruction that are key to effective implementation of the Essential Instructional Practices in Literacy for the appropriate grade band. This contrasts with the Mathematics section, which focuses on mathematical competencies and pedagogical concerns for a core set of high-leverage mathematical topics in mathematics that are foundational to later mathematics instruction and provide necessary skills for engaging with other areas of mathematics.

Despite this variation in structure, an overarching goal of all the areas in these standards is to ensure preparation programs are conscientious in preparing new teachers to deliver instruction aligned to Michigan's State Board of Education-approved K-12 academic standards. Whereas previous sets of teacher preparation standards for elementary education focused strongly on defining teacher candidates' knowledge base in topics appropriate for elementary instruction, these standards shift to focus on demonstration of instructional practices, deferring elementary-level content knowledge and definition of student outcomes to the respective K-12 standards. Should the State Board of Education adopt new PK-12 standards in any area covered by these grades 3-6 preparation standards, preparation programs will be expected to ensure teacher candidates are equipped to deliver instruction aligned to those new PK-12 standards.

Not only does this shift support Michigan's Top 10 in 10 Years strategic goal to "provide every child access to an aligned, high-quality P-12 system from early childhood to post-secondary attainment," it is also part of a broader effort to shift educator preparation in Michigan to a practice-based system. These standards are to be implemented alongside Michigan's Clinical Experience Requirements and Core Practices to ensure teacher candidates have sufficient opportunity to demonstrate proficiency in these standards and Core Practices in authentic PK-12 classroom settings.

Development of the Proposal

For over three years, the Michigan Department of Education (MDE), in collaboration with Michigan's stakeholders, have been working to revise Michigan's teacher certification structure and improve the preparation of the educator workforce in Michigan. This is in direct alignment with the MDE's Strategic Plan for becoming a Top Ten Education State within Ten Years.

This collaboration has led to the design of a structure that places students at the heart of the system. A key goal of this structure is deeper preparation of teachers to meet the unique learning needs of children at each grade level, particularly in early literacy. The structure includes: focused grade bands to provide new teachers with specialized knowledge about the students and content they will teach, defined clinical experiences and foundational coursework for each grade band, unique preparation for instructing middle level learners, and enhanced content knowledge preparation for middle school teachers to award high school credit.

Concurrently with the collaboration to design a new certification structure, stakeholder committees representing PK-12 educators and administrators, college and university teacher educators, and education researchers began meeting in October 2016 to revise elementary education teacher preparation standards to support the new grade bands. The elementary teacher preparation standards were the first set of standards selected for review and revision due to an expressed need to enhance the preparation of early literacy and mathematics instruction for beginning teachers. In concert with the MDE's Early Literacy Initiative, stakeholders with expertise in early literacy instruction were the first to meet.

Michigan's Certification Standards for the Preparation of All Elementary Teachers – Reading Instruction were adopted by the State Board of Education (SBE) in 2002, and are based on International Reading Association (now, International Literacy Association, or ILA) standards from the late 1990s. These standards were separate from the reading and language arts related standards within Michigan's Certification Standards for Elementary Teachers, adopted by the SBE in 2008. Since adoption of these Michigan standards, the ILA has updated its teacher preparation standards multiple times, while the SBE adopted more rigorous K-12 standards for English Language Arts (ELA) and Mathematics. The stakeholder committee began its work by reviewing the 2002 Michigan teacher preparation standards, the ELA portion of the 2008 Michigan elementary teacher preparation standards, the Michigan K-12 ELA standards, and the Michigan Early Childhood Standards of Quality for Prekindergarten. The committee considered the question of whether to reaffirm existing Michigan teacher preparation standards, compose new standards, or adopt the new ILA standards as Michigan's standards. The stakeholder committee was unanimous in recommending that new standards be composed for Michigan teacher preparation in literacy, and utilized the following documents as source material for composing these standards:

- Michigan Association of Intermediate School Administrators' (MAISA) General Education Leadership Network Early Literacy Task Force (GELN-ELTF) Essential Instructional Practices in Early Literacy, Grades K to 3 (2016)
- MAISA GELN-ELTF Essential Instructional Practices in Early Literacy, Prekindergarten (2016)

- ILA Standards for the Preparation of Literacy Professionals (2017, draft versions)
- International Dyslexia Association Knowledge and Practice Standards for Teachers of Reading (2010)
- Michigan Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects K-12 (2010)
- Michigan Early Childhood Standards of Quality for Prekindergarten (2013)

The stakeholder committee completed a first draft of teacher preparation standards for grades PK-3 in March 2017. The committee met approximately monthly throughout 2017 to refine the draft standards in response to feedback solicited from additional stakeholders (including members of Governor Snyder's PreK-12 Literacy Commission and attendees at the Michigan Reading Association's Annual and Summer Literature Conferences) and to ensure alignment between the standards and research into effective literacy instruction. Stakeholders with expertise in upper elementary literacy instruction were recruited and began meeting in late 2017 to develop comparable 3-6 teacher preparation standards in literacy, building upon the work of the PK-3 standards development stakeholder committee. In addition to the above source documents, the 3-6 team also utilized MAISA GELN-ELTF's Essential Instructional Practices in Literacy, Grades 4 to 5 (2017). The resulting standards will allow for greater continuity in literacy education for Michigan's children from pre-kindergarten through grade six and help to highlight the developmental nature of literacy learning.

Stakeholder committees to review and revise the mathematics standards for grades PK-3 and 3-6 began meeting in November 2016, and they followed a similar process as the literacy stakeholder teams. Source materials utilized for composing new standards in mathematics teacher preparation for these grade bands are the following:

- Michigan Early Childhood Standards of Quality for Prekindergarten (2013)
- Michigan K-12 Standards, Mathematics
- Association for Mathematics Teacher Educators (AMTE) Standards for Mathematics Teacher Preparation
- Teaching for Robust Understanding (TRU) Framework
- The Mathematical Education of Teachers II

As with the literacy standards, drafts of the mathematics standards were shared with selected stakeholders representing PK-12 schools and districts, intermediate school districts, college and university teacher education programs, and the education research community, and were shared by members of the stakeholder committee for feedback at annual conferences of the Michigan Association of Mathematics Teacher Educators.

Stakeholder committees with expertise in science and social studies teacher preparation, research, and instructional practices were recruited and began work on revising the respective components of the 2008 Michigan elementary teacher preparation standards. These standards were updated to ensure appropriateness for PK-3 and 3-6 grade bands and alignment with Michigan PK-12 standards in these content areas.

These standards were presented to the Michigan State Board of Education at its regular meeting on August 14, 2018. Following this presentation, the Office of

Educator Excellence solicited public comment on the proposed standards through September 26, 2018. A total of 433 individuals (PK-12 teachers, teacher candidates, teacher educators, education organization representatives, parents, and interested citizens) selected a level of support and submitted comments by the close of the public comment period. Several commenters stated the standards needed greater emphasis on knowledge and skills related to early childhood development and learning. Commenters recommended the addition of selected standards from the current Early Childhood – General and Special Education (ZS) endorsement standards to the Professional section of these standards to provide more detailed information about the whole child and the social emotional needs of children. Although the draft standards referenced and provided links to the MDE's whole child definition and Social and Emotional Learning Competencies and Indicators, the MDE incorporated the recommended additions and received approval of the revisions from key stakeholders representing early childhood education. Additional references to Michigan's Early Childhood Standards of Quality for Prekindergarten were added to each section of the standards to ensure teacher candidates in the PK-3 grade band are adequately prepared to support children's development and learning in prekindergarten settings.

Program Considerations

In alignment with the certification structure, programs are expected to address discipline area standards, Core Teaching Practices, and Clinical Experiences Requirements. This set of board-approved discipline area standards is the only set of standards for Upper Elementary programs, and subsumes all other previous standards documents, including the Standards in Reading for all Elementary Programs.

In addition to requirements in the Administrative Rules for Teacher Certification, in order to adequately address the standards, the stakeholder committee recommends the following credit structure:

- 9 credits of Literacy coursework (including the 6 credits required by R390.1123)
- 9 credits of Mathematics coursework
- 9 credits of Science coursework
- 9 credits of Social Studies coursework

Programs have flexibility to be innovative in structuring coursework for integration of content and to adequately address the standards.

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Standards for the Preparation of Teachers of Upper Elementary (3-6) Education

Professional Standards

Michigan aspires to become a state in which all graduates are prepared to be competent global citizens successful in the workforce and society. In order to accomplish this goal, beginning teachers must be prepared to address the needs of the whole child; use relevant, research-based criteria to establish a supportive, engaging environment that fosters learning; and use practices that meet individual children's needs. To support this vision, standards related to professional knowledge and skills in the areas of Learner-Centered Supports, Ethics and Professional Growth, and Strategic Partnerships are presented first, as these standards describe what beginning teachers should know and be able to do regardless of the specific discipline area of specialization or instruction.

P.1. Learner-Centered Supports

Well-prepared beginning teachers will be able to:

a. Support the whole child through knowledge and understanding of young children's characteristics and needs, including multiple interrelated areas of child development and learning, learning processes, and motivation to learn.
b. Demonstrate knowledge and understanding of the multiple influences on development and learning of the whole child, including but not limited to: cultural and linguistic context, economic conditions of families, social emotional needs, trauma, health status and disabilities, peer and adult relationships, children's individual and developmental variations, opportunities to play and learn, family and community characteristics, and the influence and impact of technology and the media.
c. Support children by using practices that engage and empower learners.
d. Demonstrate the ability to build meaningful learning environments and curriculum by focusing on children's characteristics, needs and interests; linking children's language, culture, and community to learning; using social interactions during routines and play-based experiences; incorporating technology and integrative approaches to content knowledge; and utilizing incidental teaching opportunities and informal experiences to build children's development in all areas.
e. Implement norms and routines and use classroom management strategies that support individual and group motivation and behavior among learners to generate active engagement in play and learning, self-motivation, and positive social interaction, and to create supportive and dynamic indoor and outdoor learning environments.
f. Utilize individual and group guidance and problem-solving techniques to develop positive and supportive relationships with children, encourage and teach positive social skills and interaction among children, promote positive strategies of conflict resolution, and develop personal self-regulation, motivation, and esteem.
g. Demonstrate understanding of the implications for development in learning of common disabilities in children, including etiology, characteristics and classification.
h. Demonstrate knowledge and use of a variety of strategies, instructional accommodations, and adaptations of the learning environment including

accommodation of instructional and assessment materials as appropriate to meet children's abilities or disabilities, home language, and culture to promote the full participation of all children, including those with special needs, in general education classrooms.

i. Demonstrate understanding of the teacher's role as a participant in the development, enactment, and assessment of an Individualized Education Program (IEP) and 504 plan including the identification and evaluation process.
j. Demonstrate knowledge and use of a variety of strategies to promote full participation of English learners in classrooms (including literacy strategies).
k. Demonstrate an ability to manage and implement standards-based content instruction to support English learners in accessing the core curriculum as they learn language and academic content.
l. Demonstrate knowledge of and maintain currency in public policy issues and processes and the impact on the education of all children, including English learners and children with special needs.
m. Identify signs of emotional distress, toxic stress, child abuse and/or neglect in children and follow appropriate procedures for mandated reporting and utilize skills and strategies for clarifying and communicating sensitive issues with appropriate parties (including but not limited to child abuse, neglect, hygiene, and nutrition) to promote children's physical and psychological health, safety, and sense of security.
n. Demonstrate understanding of and ability to use ongoing systematic observation, documentation, and screening tools, and other appropriate forms of formative and summative assessment tools, and approaches embedded in assessment related activities in curriculum and daily routines.
o. Demonstrate knowledge and application of research-based instructional strategies to support the whole child's learning and development through the visual and performing arts.
p. Demonstrate knowledge and application of research-based instructional strategies to support the whole child's development through movement and physical activity.
q. Demonstrate knowledge and application of research-based instructional strategies to create opportunities to develop critical knowledge, skills, and behaviors that contribute to life-long health.

P.2. Ethics and Professional Growth

Well-prepared beginning teachers will be able to:

a. Demonstrate knowledge of and critically analyze the ethical/professional codes of conduct in education including the Michigan State Board of Education Code of Ethics.
b. Demonstrate knowledge and application of legal and ethical guidelines and professional standards related to children and families.
c. Evaluate continually the effects of their professional and personal decisions and actions on learners, parents, and other professionals in the learning community.
d. Identify, analyze, and engage in ongoing professional learning opportunities that strengthen their instructional practice and use reflective practices to design, monitor, and adapt their instruction as a means for gauging their own professional growth.

P.3. Strategic Partnerships

Well-prepared beginning teachers will be able to:

a. Promote and provide opportunities to engage parents, families, and communities.
b. Identify appropriate agencies and other resources in the larger community to support learners' learning and well-being.
c. Use variety of communication strategies that support and empower families and communities through respectful, reciprocal relationships.
d. Engage in positive partnerships with families and other professionals and articulate the value, appropriate use (and potential misuse) of assessment, including screening and referral practices.
e. Describe the roles and responsibilities of other building and district professionals in the PK-12 school system, including, but not limited to: early childhood specialist, school psychologist, social workers, occupational therapists, speech and language pathologists, physical therapists, school counselors, reading specialists, and bilingual or English as a second language educators.
f. Identify specialized personnel in the PK-12 school system and collaborate with them in a system of supports to advance children's learning.

Literacy

Literacy knowledge and skills are central to success in schooling, career, and citizenship. Evidence is clear that the grades 3-6 are pivotal in developing literacy. For these reasons, it is essential that beginning teachers are well prepared to develop learners' literacy knowledge and skills.

The standards in this document set an unprecedented bar for what beginning teachers should know and be able to do related to literacy education. Importantly, the standards are based tightly on research in literacy. For example, specific literacy instructional practices identified in the standards are practices that have robust support in research—using these practices will foster learners' in grades 3-6 literacy development.

The standards were carefully designed to align well between PK-3 and grades 3-6 and to align well with the key knowledge and skills detailed in the Michigan K-12 Standards for English Language Arts for this grade band. Those using the standards are encouraged to read both sets of preparation standards, as well as the K-12 academic standards, even if their preparation program or teaching assignment focuses on only one of these grade bands.

In order to achieve a high degree of specificity in the standards, they are organized into many relatively narrow constructs. However, it should be understood that these constructs are highly interrelated in development and education. In reality, for example, vocabulary development affects word reading development and vice versa, and a given instructional practice may affect many aspects of literacy development.

L.1. Literacy learning environments

Well-prepared beginning teachers of literacy will be able to:

a. Facilitate learners' access to a range of age appropriate contemporary and classical digital and print materials of a variety of genres (e.g., informative/explanatory texts, narrative texts, signage including environmental print, poetry) and media (e.g., books, magazines, digital texts, audio text, speech-to-text technologies) for both in and out of school literacy.
b. Create a variety of organized, safe and respectful learning spaces and opportunities for learning that foster collaborative and meaningful literacy experiences (e.g., class meeting space, small group area, furniture arrangement, writing center, reading areas, safe/appropriate use of digital technologies).
c. Make accessible and actively use word-learning artifacts (e.g., interactive word walls across disciplines, themes, general academic and discipline-specific vocabulary; online dictionaries and thesauruses).
d. Use materials and space to foster literacy and disciplinary inquiry (e.g., class question wall, classroom library, flexible seating, mapping graphic representations against explanations in text, inquiry notebooks, online resources).
e. Provide access to and intentional interactions with socially, culturally and linguistically diverse texts and to high-interest, self-selected reading and writing materials with a variety of text complexity.
f. Support and guide integration of digital technologies to aid learners' literacy and learning across disciplines (e.g., opportunities to create digital artifacts of

learning, interactive simulations, digital narrative and informational texts, digital presentations).

g. Use a variety of flexible grouping strategies that are based on the literacy task and learners' specific literacy strengths, needs, prior knowledge, interests, and other factors.
h. Teach, model, facilitate, and provide independent practice with opportunities to use literacy for positive social interactions (e.g., solving conflicts; negotiating in collaborative projects).
i. Use a range of digital and non-digital tools to support socialization, oral language, writing development, word study, vocabulary, fluency, and comprehension.

L.2. Culturally responsive practices in literacy

Well-prepared beginning teachers of literacy will be able to:

a. Understand the importance of the learners' use of their first or home language(s) and dialect(s) and development of additional languages and literacies, and design instruction that builds upon learners' use of their first or home language(s).
b. Select instructional materials that value and reflect the multidimensionality of diversity represented in society and learners.
c. Critically analyze texts with learners for social and cultural biases by analyzing language and visual representations in print and digital texts and media to identify themes and patterns that perpetuate gender, social class, and racial/ethnic stereotypes.
d. Engage learners in the creation and use of visual representations of thinking and learning (e.g., anchor charts; graphic organizers; personal artifacts, such as learning/response journals; visible thinking routines).

L.3. Literacy Curriculum Design and Assessment

Well-prepared beginning teachers of literacy will be able to:

a. Design or adapt and implement literacy curricula that support literacy learning for whole class, small groups, and individual learners in reading, writing, and other forms of communication, including all constructs of literacy.
b. Observe and describe the impact of language on learners' social and academic development and developing identities as readers and writers, and plan and implement instruction accordingly.
c. Identify and value learners' multiple ways of communicating, in- and out-of-school discourses, and variations in language expression, and leveraging these to provide appropriate literacy instructional practices and social development of individual learners.
d. Demonstrate knowledge and understanding of state standards and competencies applicable to literacy learning in grades 3-6.
e. Provide specific, constructive feedback targeting learners' most critical needs during the process of reading, writing, speaking, listening, viewing, and visually representing.
f. Identify reasonable goals and expectations for learners that align with their literacy and academic development.
g. Select texts that provide useful material, especially to back up an argument, for rich instruction and discussion, and analyze texts to identify specific learning goals, challenges (e.g., the complexity of the ideas in the text, insufficient information) and affordances.

h. Select texts of varying complexity that align with instructional purposes (e.g., independent practice, study of author's craft and structure, integration of knowledge and ideas).

L.4. Overall Literacy

a. **What it is:** Teacher candidates will learn that literacy processes—reading, writing, speaking, listening, viewing, and visually representing—are inherently connected, and the constructs of literacy identified in this strand of the standards, as well as other constructs of literacy, are related in complex ways. The ultimate goal of literacy is communication.
b. **How it develops:** Teacher candidates will learn that all of the constructs of literacy identified in this strand of standards are integrated in the service of meaningful communication (e.g., to entertain, to persuade, to inform/explain, to argue); all constructs can and should be developed throughout elementary education; put another way, we do not, for example, first address fluency and then later address comprehension, but rather address each of these areas, building on their reciprocity.
c. **How to assess it:** Teacher candidates will learn that assessment of individual components of literacy is valuable as well as the understanding and ability to administer and interpret the results of multiple formative and summative assessments that examine the processes of reading and writing in their entirety; it is important to understand that a learner's assessed literacy proficiency will vary depending upon a number of factors, including background knowledge related to the topic of a particular text, motivation and engagement at that point in time, and features of the literacy task, and thus should be seen as an approximation to inform instructional decision-making, not a definitive judgment or a label; that learners may exhibit difficulties within and/or across the many components of literacy, and, if warranted, the teacher should seek assessment and/or instructional support from a specialist, which will vary depending on the type of difficulty.
d. **How to teach it:** Cognizant of each child's experiences, strengths, needs, and interests, well-prepared beginning teachers of literacy will learn and be able to select and use research-supported instructional techniques that address multiple constructs of literacy development simultaneously (e.g., a single practice could address fluency, comprehension, vocabulary and writing), such as, but not limited to, literacy-enriched storytelling, role play, interactive read aloud, shared reading, guided oral reading, writing, and discussions of ideas with print and digital texts across disciplines.

L.5. Motivation and Engagement

a. What it is: Teacher candidates will learn that literacy motivation refers to the beliefs, values, goals, and dispositions that provide energy and direction for behaviors and thoughts of the individual related to literacy and is often conceptualized as intrinsic and extrinsic; that literacy engagement refers to the cognitive, emotional, and social behaviors in academic or out-of-school settings that enable the individual to participate in literacy and disciplinary learning and gain expertise.
b. How it develops: Teacher candidates will learn that literacy motivation develops through meaningful interactions with individuals and information, combined with experiences, including various inquiry activities in which the learner asks and seeks answers to their own and academic questions across

disciplines; academic and recreational engagement is energized, directed and sustained by learners' motivations and interests.

c. **How to assess it:** Well-prepared beginning teachers of literacy will learn and be able to assess literacy motivation and engagement through interviews or questionnaires with the learner, which may be supplemented by teacher observation of learner affect and actions, writing, logs, or academic work that reveals effort, persistence, care, commitment, and accomplishment.
d. **How to teach it:** Cognizant of each child's experiences, strengths, needs, and interests, well-prepared beginning teachers of literacy will learn and be able to select and use research-supported instructional practices to foster intrinsic literacy motivation, including: setting expectations for classroom participation; assuring opportunities for developing self-efficacy through scaffolding, text and task selection, differentiation, goal-setting and self-monitoring; offering learners substantive options, choices and input into learning activities; arranging collaborative activities that foster literacy learning through social interactions; providing a variety of meaningful purposes for curricular units and tasks; providing continual encouragement for academic and personal attainment and interests; emphasizing the utility, value, and enjoyment of literacy and literacy tasks (e.g., reading of high-interest texts, critical disciplinary inquiry); building interpersonal relationships with learners that encourage mutual trust and commitment.

L.6-8. Foundational Skills of Print Concepts and Decoding: Phonological Awareness, Phonics

* These are foundational skills described in more detail in the PK-3 Standards

a. **What it is:** Teacher candidates will learn that print concepts are foundational knowledge about how print, in general, and books in particular, "work," including, but not limited to, knowledge of parts of texts; that phonological awareness is a set of foundational oral language skills that involve conscious awareness of sounds within the speech stream, and the segmentation and blending of sounds; and has reciprocal relationships with word reading, spelling, and vocabulary; and that phonics is a connection between individual and groups of graphemes (letter symbols) and phonemes (letter sounds) that, among other things, allows readers to translate written symbols into meaningful words (decoding).
b. **How it develops:** Teacher candidates will learn that some of these skills are language-specific, not universal (e.g., English and Arabic have different directionality); the common and fluid developmental progression of phonological awareness skills, including multiple levels of sounds within words, expectations by grade level, and the differences among various phonological manipulations; and that phonics relies in part on a base of phonological awareness skills and developing reciprocally with those skills (see Michigan K-2 standards for expectations by grade level).
c. **How to assess it:** Well-prepared beginning teachers of literacy will learn and be able to measure these skills using observation and/or assessment tools that engage learners in demonstrating these skills in acts of reading and writing, being cognizant of the language(s) and dialect(s) spoken, and if warranted by difficulties, to seek assessment and/or instructional support from a specialist whose knowledge base includes, but is not limited to, knowledge of core phonological processing difficulties (dyslexia).

d. **How to teach it:** Cognizant of each child's experiences, strengths, needs, and interests, well-prepared beginning teachers of literacy will learn and be able to select and use research-supported instructional techniques and targeted interventions to develop these skills.

L.9-11. Spelling

a. **What it is:** Teacher candidates will learn that spelling is a connection between individual and groups of phonemes (letters sounds) and graphemes (letter symbols) and morphemes (meaning units) that, among other things, allows readers to translate thoughts into written words (encoding); that spelling instruction enables writing and also improves the specific reading skills of decoding and word reading and whose influences include phonological, orthographic, and morphological knowledge.
b. **How it develops:** Teacher candidates will learn that spelling develops through a series of common and fluid, stages, with phases within each stage and through explicit instruction in reading and writing across disciplines; that spelling development relies particularly on developing phonological, advanced phonics, morphological, orthographic, and vocabulary knowledge.
c. **How to assess it:** Well-prepared beginning teachers of literacy will learn and be able to use diagnostic and formative assessments to inform instruction, cognizant of the language(s) and dialect(s) spoken by the learner, including assessments of knowledge of more complex sound-letter relationships; stage of spelling development; and spelling performance within meaningful writing, recognizing that spelling performance may reveal information about learners' phonemic, phonics, morphological, orthographic, and vocabulary knowledge, and, if warranted by difficulties, to seek assessment and/or instructional support from a specialist, whose knowledge base includes, but is not limited to, knowledge of dyslexia.
d. **How to teach it:** Cognizant of each child's experiences, strengths, needs, and interests, well-prepared beginning teachers of literacy will learn and be able to select and use engaging and multimodal research-supported instructional techniques including practices that simultaneously address morphology and spelling, explicitly teaching, modeling, providing guided and independent practice with, and providing feedback regarding spelling strategies (e.g., mental graphemic representations, word ladders, word maps, word sorting); involving learners in synthesis, analysis, and manipulations of graphemes, morphemes, and syntax within and across words; and providing multiple and varied opportunities for fluent application in meaningful reading and writing across disciplines.

L.12. Syntax

a. **What it is:** Teacher candidates will learn that syntax is an oral and written language concept comprised of a set of principles that govern phrase and sentence structure, which varies across languages and dialects; in formal English syntax, these principles specify the relation of word order and meaning; the grammar of the language indicates how words are combined to convey meanings; understanding syntax involves knowledge of parts of speech (e.g., verb, noun, adverb) and word order (which may vary from learners' home language); phrases and sentences vary in complexity (simple, compound, complex, compound/complex); analysis of syntax helps to link structure and meaning.

b. **How it develops:** Teacher candidates will learn that syntactic knowledge develops through social interactions in home languages and dialects that may or may not parallel formal English syntax, and thus may develop differently in a school setting when formal academic language expectations are different from home and community languages; that in oral and written academic language, learners' attention is directed to the relation of word order and sentence structure and meaning; that learners acquire facility in manipulating words, phrases, and clauses within sentences to place emphasis on particular words and ideas and to communicate increasingly complex ideas across disciplines.
c. **How to assess it:** Well-prepared beginning teachers of literacy will learn and be able to use checklists and rubrics for written language samples, and, when necessary, listen for difficulties in oral language samples, and if warranted, seek assessment and/or instructional support from a specialist (e.g., speech and language therapist and/or ESL/ELL/EL/DLL/ENL specialist).
d. **How to teach it:** Cognizant of each child's experiences, strengths, needs, and interests, well-prepared beginning teachers of literacy will learn and be able to select and use research-supported instructional techniques such as modeling, sentence framing, sentence expanding, and sentence combining; to provide authentic opportunities during reading and writing to examine how specific syntactic constructions function in texts and their own writing across disciplines.

L.13. Reading Fluency

a. **What it is:** Teacher candidates will learn that fluency entails accuracy, automaticity, and prosody; its role in reading development; and reciprocal relationships with, among other constructs, background knowledge, motivation, orthographic knowledge, morphological awareness, word recognition, syntax and reading comprehension (although strong fluency does not guarantee reading comprehension).
b. **How it develops:** Teacher candidates will learn that fluency development entails progression in phonological and orthographic awareness, rapid processing and aspects of expression including volume, phrasing, smoothness, and appropriate pace (which, for good readers, will vary based on what is being read, the purpose for reading, and other factors) within and across texts.
c. **How to assess it:** Well-prepared beginning teachers of literacy will learn and be able to assess each dimension of reading fluency (accuracy, automaticity, and prosody), orally and silently (for automaticity); this can best be accomplished by using tasks that also incorporate an evaluation of reading comprehension (for example, through comprehension questions and dialogic conversations about the reading).
d. **How to teach it:** Cognizant of each child's experiences, strengths, needs, and interests, well-prepared beginning teachers of literacy will learn and be able to select and use multimodal, research-supported instructional techniques to build reading fluency, such as repeated reading, partner reading, listening to models of fluent reading, reading texts of increasing difficulty, reading while listening to recorded books and a large volume of silent and/or oral reading, in coordination with techniques that build word knowledge and skills foundational to fluency (e.g., see the Foundational Skills for Decoding and Vocabulary sections).

L.14. Vocabulary

a. **What it is:** Teacher candidates will learn that vocabulary is an oral and written language construct that is central to everyday and academic language, which includes general and discipline-specific vocabulary and involves knowledge of word meanings and the conceptual knowledge across disciplines that underlies them; it includes understanding multiple meanings across contexts, figurative language, and morphological structure of words; it is central to oral language, academic language, reading comprehension, and written composition.
b. **How it develops:** Teacher candidates will learn that vocabulary develops through oral language, wide reading, inquiry, experiences, explicit and implicit instruction (including explicit instruction in word meanings, vocabulary strategies [e.g., looking for a possible synonym in the sentence], and deliberate analysis of the morphemic composition of words), and deliberate analysis of the morphemic composition of words, with particular complexity for learners whose home language is not the language of instruction.
c. **How to assess it:** Well-prepared beginning teachers of literacy will learn and be able to examine learners' breadth and depth of academic language, including how morphology relates to academic vocabulary knowledge, recognizing that learners may have knowledge of vocabulary not in the language of instruction, and to assess vocabulary through engagement in purposeful reading, writing, and oral language tasks, and, if warranted by difficulties, to seek assessment and/or instructional support from a specialist.
d. **How to teach it:** Cognizant of each child's experiences, strengths, needs, and interests, well-prepared beginning teachers of literacy will learn and be able to select and use multimodal, research-supported instructional techniques to develop vocabulary, including for learners whose home language is not the language of instruction, through a large volume of oral and written language exposure (e.g., through conversation, read aloud, audio books, silent reading, wide reading and inquiry); selecting appropriate words for instruction; providing accessible, explicit explanation of the meaning of words; providing multiple exposures to new words through text and oral language; explicitly teaching morphology (e.g., root words, prefixes, affixes, inflections) and etymology (i.e., word origins); and other techniques.

L.15. Handwriting*

* These are foundational skills described in detail in the PK-3 Standards, and most appropriately addressed in instruction within the PK-3 grade band.

L.16. Comprehension

a. **What it is:** Teacher candidates will learn that comprehension is the ability to extract and construct meaning through interaction and involvement with oral, written, and visual language separately or in combination and the ultimate purpose of reading instruction.
b. **How it develops:** Teacher candidates will learn that comprehension of oral, print, visual, and digital texts develops through the integration of many areas including language development (e.g., morphological knowledge and awareness, vocabulary depth and breadth), world knowledge development, and, in the case of written language, development in fluency, written textual knowledge, comprehension strategies, metacognition, and attitudes specific to written and visual language (e.g., a disposition to read actively to construct meaning through interaction with text), and working memory and executive functioning skills, such as attention and processing speed; not all reading

comprehension difficulties have the same cause nor require the same instructional responses.

c. **How to assess it:** Well-prepared beginning teachers of literacy will learn and be able to assess reading comprehension through tasks including questioning, retelling, dialogic conversations, summarizing, and application tasks (e.g., carrying out a procedure while reading a procedural text) that, collectively, involve the three categories of comprehension in the National Assessment of Educational Progress: locate and recall, integrate and interpret, and critique and evaluate; if warranted by difficulties, to seek assessment and/or instructional support from an appropriate specialist.
d. **How to teach it:** Cognizant of each child's experiences, strengths, needs, and interests, well-prepared beginning teachers of literacy will learn and be able to select and use research-supported instructional techniques to develop comprehension, including instruction in many of the other areas in this strand of the standards (e.g., vocabulary, fluency) and daily time for learners to read in motivating and engaging contexts for the purposes of building disciplinary knowledge and/or advancing personal interests; comprehension strategy instruction; modeling and guiding learners to be metacognitive while reading; instruction in text search, navigation, and evaluation; focused, high-quality discussion of the meanings of text; text structure and feature instruction; and application tasks (e.g., building an argument from textual evidence) that, collectively, involve the three categories of comprehension in the National Assessment of Educational Progress: locate and recall, integrate and interpret, and critique and evaluate; to select and analyze texts for their affordances and challenges, including for specific disciplinary contexts.

L.17. Composition

a. **What it is:** Teacher candidates will learn that composition is the process of conveying meaning and communicating information across disciplines and for discipline-specific purposes (e.g., opinion, informative/ explanatory, narrative, argument) through oral, written (print or digital), visual language separately or in combination, is important to active citizenship, many professions, and daily life; and requires applications of writing conventions to construct clear and coherent writing in which the development, organization, and style are appropriate for specific tasks, purposes, and audiences across disciplines.
b. **How it develops:** Teacher candidates will learn that written composition develops in a manner that varies across disciplines, genres, and modes of communication, and may be influenced by a learner's home language(s) or dialect(s), and integrates many areas of language (e.g., morphological, vocabulary, and syntax knowledge), world knowledge, textual knowledge, and knowledge of composition strategies; not all composition difficulties have the same cause nor require the same instructional responses.
c. **How to assess it:** Well-prepared beginning teachers of literacy will learn and be able to assess overall quality of a composition (the effectiveness of a specific piece of writing for a specific purpose and audience), print or digital, through observation, checklists, rubrics, and other tools and to use intermediary outcomes toward overall quality of a composition, including writing output, mechanics, spelling, vocabulary, sentence and paragraph structure, syntax, organization, ideation, voice, and genre (or text) elements and, if warranted by oral and/or written language difficulties, to seek assessment and/or instructional support from an appropriate specialist.

d. **How to teach it:** Cognizant of each child's experiences, strengths, needs, and interests, well-prepared beginning teachers of literacy will learn and be able to select and use research-supported instructional techniques to develop written composition abilities including daily time for learners to write across disciplines in motivating and engaging contexts with multiple and varied opportunities to set writing goals and increase stamina; to provide opportunities to offer, receive, and incorporate feedback from multiple sources including adults and peers; instruction in writing processes and strategies, particularly those involving researching, planning, drafting, revising, and editing writing in print and digital contexts; opportunities to study text models and non-models and to write a variety of texts for a variety of purposes (e.g., opinion, informative/ explanatory, narrative, argument) and audiences, including for building knowledge and engaging in disciplinary practices (e.g., scientific explanations, historical arguments), with scaffolding and with attention to disciplinary context; and explicit instruction in writing conventions, handwriting, keyboarding, word processing, and additional areas addressed in this strand of the standards.

L.18. Speaking and Listening

a. **What it is:** Teacher candidates will learn that speaking and listening involve receptive and expressive communication skills, including, and not limited to, engaging in high quality discussions of topics and the meaning and critical analysis of texts across disciplines to support and extend comprehension of multiple and multimodal texts; reporting on a topic; adapting speech to a variety of contexts and tasks, using formal language when appropriate to task and situation; interpreting multiple perspectives and information presented in diverse media and formats.
b. **How it develops:** Teacher candidates will learn that speaking and listening develop through integrated and reciprocal relationships with reading, viewing, composing and representing information in diverse media and formats across disciplines.
c. **How to assess it:** Well-prepared beginning teachers of literacy will learn and be able to assess speaking and listening through observation, discussion protocols, narrative retellings, checklists, rubrics, and other tools and to use intermediary outcomes toward overall quality of expressive and receptive communication, including appropriate use of academic vocabulary, syntax, pragmatics, organization, ideation, voice, discussion moves, and use of reasons and evidence to support claims.
d. **How to teach it:** Cognizant of each child's experiences, strengths, needs, and interests, well-prepared beginning teachers of literacy will learn and be able to select and use research-supported instructional techniques to provide learners opportunities across disciplines to engage in discussions to promote comprehension of complex information from multiple perspectives; to communicate information, understanding, concepts, and ideas to diverse audiences; to engage in read alouds and text-based discussions of age-appropriate books and other materials, print or digital; to use discussion moves (e.g., linking learners' ideas, probing children's thinking, having learners return to the text to support claims about the ideas in the text) that help provide continuity and extend the discussion of the ideas in the text; to provide tasks or discussion routines learners know how to follow when they engage in small group discussions; and to provide regular opportunities for

peer-assisted learning, especially for emergent bilingual learners, by pairing learners at different levels of English proficiency.

Mathematics

In addition to knowing the mathematics their children learn, well-prepared beginning teachers need specialized mathematical knowledge for teaching—mathematics not taught in grades 3-6 but essential for *teaching*. They need an understanding of the concepts behind the mathematics and how mathematical ideas and skills develop in children, as well as the mathematical work they will do as a teacher. For example, teachers need to recognize mathematical patterns in children's strategies and model the standard algorithm for subtraction in a way that makes each step clear. These are demanding activities that require knowledge different from simply knowing the mathematics children are learning.

These standards are organized into two broad topics, Standards for Mathematics-Specific Teaching Practices and Standards for Mathematical Knowledge for Teaching Grades 3-6. The first section details teaching practices in mathematics that all beginning teachers should be able to perform regardless of topic, while the second section details specific mathematics topics for grades 3-6 and corresponding pedagogical concerns. Often, the teacher candidate is presented with broad coverage of all mathematics topics that arise in elementary school curriculum. Additionally, limited time for teacher education leads to a cursory coverage of elementary mathematics. To achieve greater depth and better prepare teachers for their work, these standards for mathematics do three things:

1. Identify mathematics topics that are high-leverage for grades 3-6 teaching, as detailed in the Michigan K-12 Standards for Mathematics for this grade band.
2. Identify pedagogical tasks that come up frequently in mathematics teaching, matter for children's learning, and are mathematically demanding to perform.
3. Identify mathematical competencies that teachers need for the pedagogical tasks identified in #2 when teaching the mathematics topics that are high-leverage.

This approach provides foundational understanding for teaching, assures greater focus, relevance, and usefulness of the mathematics taught to and learned by teacher candidates, and positions teachers to continue to learn mathematics teaching beyond the scope of their pre-service preparation.

I. Standards for Mathematics-Specific Teaching Practices

In addition to knowing mathematical knowledge for teaching, well-prepared grades 3-6 teachers extend general teaching practices to address the unique requirements and opportunities presented by the teaching of mathematics.

Mathematics-Specific Teaching Practices
• Build and draw on *relationships* with children, caregivers, and communities in ways that support children's mathematics learning. • *Plan* mathematics lessons and sequences of lessons. • Use formative and summative mathematics *assessment* to gauge children's learning and to make instructional decisions. • *Enact* instruction that allows all children to engage with significant mathematics and develop productive dispositions.

The following standards for these four mathematics-specific teaching practices attend to children, mathematics, and issues of equity.

M.1. Build and draw on *relationships* with children, caregivers, and communities in ways that support children's mathematics learning.

Well-prepared beginning teachers of mathematics are able to:

a. Hear children's mathematical thinking and engage with curiosity, interest, and understanding in ways that build rapport, provide information about children's interests, strengths, and needs, and inform instruction.
b. Communicate with caregivers about mathematics and their child in relation to current standards and the school's curriculum, supporting caregivers in fostering their child's success with mathematics in and out of school.
c. Use knowledge of children, their caregivers, and their communities to create mathematical learning environments that provide children, in particular children historically marginalized in mathematics classrooms, with access to significant mathematics and engagement in mathematical activities that are both culturally and instructionally appropriate.
d. Attend to and build children's positive mathematical identities, disrupting patterns of marginalization that reinforce inequities and exclusion.

M.2. *Plan* mathematics lessons and sequences of lessons.

Well-prepared beginning teachers of mathematics are able to:

a. Consider who children are as learners of mathematics and design ways to interest children and to use their resources and affinities to build access and participation, including taking stock of the mathematical capacities children bring to lessons, anticipating common patterns of mathematical thinking, and planning for the mathematical participation of particular children.
b. Analyze the mathematics content in instructional resources, referencing standards and progression documents to clarify learning goals and to identify connections among mathematical concepts and across grade levels.
c. Solicit broad participation in mathematical work (for instance, by choosing activities and planning activities that provide children with multiple entry points and ways of being successful), make children's thinking central to the lesson, and give children opportunities to show their thinking and see value in the contributions they make.

M.3. Use formative and summative mathematics *assessments* to gauge children's learning and to make instructional decisions.

Well-prepared beginning teachers of mathematics are able to:

a. Elicit children's thinking and solution strategies in multiple forms in writing, through speaking, in drawings, etc. Identify evidence of understanding in children's thinking and strategies and use this information to make in-the-moment instructional decisions.
b. Understand the meanings and purposes of summative assessment and the process of formative assessments in mathematics. Interpret the results of assessments and use the interpretations in ways that respond to children's needs, promote learning, and improve instruction.

c. Consider the language, format, and context of mathematics assessments (and assessment questions) for demonstrating children's thinking and consider how formative and summative mathematics assessments are used and the consequences for children, both intended and unintended.
d. Distinguish between superficial and deeper evidence about children and attend to key aspects of children's understanding, skill, and engagement, as well as ignore irrelevant aspects.
e. Use assessment data to plan next steps for instruction, understanding that evidence of children's learning (vs. topic coverage) is necessary for moving on from a topic.

M.4. *Enact* instruction that allows all children to engage with significant mathematics and to develop productive dispositions toward mathematics.

Well-prepared beginning teachers of mathematics are able to:

a. Support children, in particular children historically marginalized in mathematics classrooms, in identifying themselves as mathematical thinkers and design instruction that helps children to recognize their own and other children's mathematical strengths.
b. Use a variety of participation structures and instructional routines, including whole-class, small group, and independent work and a variety of materials. Foster children's talk about mathematics, with particular attention to disrupting patterns of over and under participation that reinforce inequities and exclusion.
c. Develop classroom organizational routines and strategies that allow children access to mathematical tools and ensure the effective use of manipulatives and resources.
d. Develop strategies for creating a classroom culture that values productive struggle, challenging mathematical ideas, constructing mathematical meanings together, and enjoyment of mathematics.

II. Standards for Mathematical Knowledge for Teaching Grades 3-6

Four criteria guide the identification of a *high-leverage mathematics topic*.

- It underlies and is foundational to the school mathematics curriculum.
- It occupies significant space in the school curriculum and is taught in some form across several grade levels.
- It is fundamental for children's learning and often leads to persistent difficulty when not taught well.
- It is often known only superficially by beginning teachers or requires significant unpacking of beginning teachers' established mathematical knowledge.

For instance, for teachers of grades 3-6, two mathematics topics meet all four criteria.

Topics of Mathematics High-Leverage for the Mathematical Preparation of Grades 3-6 Teachers
• **Whole** numbers and operations • **Fractions**, decimals, and operations

Strategic tasks of mathematics teaching

To identify mathematical knowledge for teaching these topics, it is necessary to look at the work teachers do and identify strategic tasks of teaching — tasks that, when carried out skillfully, significantly advance the likelihood children learn mathematics, and when badly executed, put children's mathematics learning at risk. Five criteria guide the identification of a strategic task of teaching.

- It centrally shapes instructional interactions among children and teacher.
- It centrally affects equitable access to mathematics instruction.
- It is learnable by beginning teachers.
- It is broad enough to use to organize mathematical knowledge for teaching and specific enough to direct the mathematical preparation of teachers.
- It has significant mathematical demands.

In addition, a set of teaching tasks needs to work together to meet these criteria. Together, they need to span much of teaching and include its most mathematically intensive aspects. Four tasks of mathematics teaching meet these criteria and provide a useful organization of the mathematical knowledge crucial to beginning teachers.

Tasks of Mathematics Teaching Strategic for the Mathematical Preparation of Teachers
• Unpack mathematical **content** and identify mathematical **competence** • Talk (perform) mathematical explanations and support children's mathematical **explanations** • Choose, interpret, and talk (perform) with **representations** • Elicit, interpret, support, and extend **other's mathematical thinking**

Mathematical competencies needed for performing strategic tasks when teaching high-leverage topics

The high-leverage topics and strategic tasks together provide a context for identifying essential mathematical competencies for teaching. It is important to note that these are mathematical competencies, not pedagogical competencies — they isolate a mathematical skill that assists in carrying out a task of mathematics teaching without becoming that task of teaching. For instance, gaining skill in solving mathematics problems in multiple ways, which requires only mathematical competence, serves as a resource for anticipating different ways children may solve problems, but anticipating what children will do requires also considering children and instructional design.

Five criteria guide the identification of a mathematical competency for teaching.

- It is central to carrying out a strategic task of teaching a high-leverage mathematics topic.
- It is an appropriate goal for a mathematics content course taught by a professional who may or may not have experience with PK-12 teaching and it is not expressed in terms of learners, classrooms, or instruction, instead isolating a focused mathematical skill.

- It is broad enough to use to organize mathematical knowledge for teaching and specific enough to direct the mathematical preparation of teachers.
- It is formulated to capture productive ways of mathematically developing and assessing beginning teachers in teacher education programs, in particular suggesting activities and instructional units appropriate for mathematics content and methods courses.

In addition, a set of mathematical competencies needs to work together to meet these criteria, spanning different aspects of mathematics teaching and different mathematics topics.

M.5. Unpack mathematical *content* and identify mathematical *competence* for *whole* numbers and operations.

Well-prepared beginning teachers of mathematics are able to:

a. Identify mathematical affordances in problems and sequences of problems that can be solved by counting, operations of addition and subtraction, or approaches that integrate these.
b. Identify mathematical affordances in a spread of questions that can be asked regarding composition and decomposition and their role in representing numbers with drawings or materials, for example, when using ten frames or base-ten blocks, asking "What number is this? Show me 123. Show me 123 in a different way. How might we show 1000 with this drawing or material?"
c. Provide a narrative of the mathematical work to be done to solve a problem involving any of the four operations, or that is being done or has been done to solve it.
d. Recognize and articulate the goals and conditions, resources, and problem (quandary) of a mathematics problem involving addition, subtraction, multiplication, or division.
e. Recognize and analyze differences in the mathematics content for math problems for any of the four operations when wording, context, or structures are modified.
f. Generate and recognize multiple approaches to mathematics problems involving addition, subtraction, multiplication, and division, including geometric interpretations of each and connections among them.

M.6. Perform mathematical *explanations* and support children's mathematical explanations for *whole* numbers and operations.

Well-prepared beginning teachers of mathematics are able to:

a. Formulate questions about how one knows that a count is correct when it is generated in indirect or alternative ways, such as when counting on or back as objects are added, removed, and combined or when using base-ten knowledge to support counting.
b. Perform clear mathematical explanations connecting new terminology (e.g., ones, tens, hundreds) to objects and coordinating different strategies of grouping, for instance showing that 345 ones is equivalent to 34 tens and 5 ones and to 3 hundreds and 5 tens minus 5 ones with language that correctly and clearly references objects and symbols in meaningful ways.
c. Explain what is similar and different for problems modeled by the same computation, for instance identifying which involve the same and which involve different meanings of the operations, describing those differences, and

explaining why the computation correctly models both.

d. Recognize the difference between explanations that describe computational procedures with and without explicit mathematical connections to the place value meanings and to the meaning of operations.
e. Perform explicit and elaborated explanations that unpack the structure of and mathematically justify algorithms.
f. Interpret and contrast alternative or novel approaches to computations, determining whether approaches, use of models, and explanations are mathematically consistent and correct and, if not, how they might be adapted to be.

M.7. Choose, interpret, and talk with *representations* for *whole* numbers and operations.

Well-prepared beginning teachers of mathematics are able to:

a. Accurately interpret and represent meanings of counts expressed in others' talk and recognize mathematical affordances of different representations of counts and the connections and mathematical progression among them.
b. Recognize whether or not drawings and their implied use accurately model identified operations, including whether drawings (e.g., geometric interpretations) are consistent with specific meanings of operations.
c. Recognize affordances and limitations of different representations for modeling numbers and operations (e.g., ten-frames, bundling sticks, base-ten blocks, arithmetic rack, money, arrays, number lines, and area models), for instance, ways in which units are visible or not in groups of units and distinctions between grouping and trading models.
d. Choose and use materials, drawings, and symbols to model a variety of computational strategies based on place value, properties of operations, or relationships between operations, for instance, reasoning about addition and subtraction as reversing operations or division as repeated subtraction, and contrast and connect solutions that use different representations.
e. Use materials, drawings, and symbols to model child-constructed and conventional algorithms, attending carefully to language, making connections among representations, matching the steps in each representation, and coordinating the talk with the use of the representations when explaining solutions to the problems.

M.8. Elicit, interpret, support, and extend *others' mathematical thinking* for *whole* numbers and operations.

Well-prepared beginning teachers of mathematics are able to:

a. Formulate claims about mathematical understanding based on evidence from performance on counting activities, in particular understandings of quantity and flexible use of structure in base-ten numbers.
b. Formulate claims about mathematical understanding based on evidence from performance on computational problems, addressing issues of conceptual understanding, procedural fluency, and adaptive reasoning.
c. Recognize which among a set of partially expressed ideas about the solution to a problem involving whole numbers and operations is most germane to a given mathematical focus, such as an interpretation of subtraction as comparison or the role of place value in computational algorithms.
d. Clarify and record others' approaches to solving whole-number problems

involving operations.

e. Examine the meaning of operations and method for solving a computational problem as exemplified in others' talk or work, and then apply the approach on different problems.

M.9. Unpack mathematical *content* and identify mathematical *competence* for *fractions*, decimals, and operations.

Well-prepared beginning teachers of mathematics are able to:

a. Gauge what one must know about fractions and be able to do to solve different kinds of problems involving different interpretations of fractions in different representational environments.
b. Formulate questions that meaningfully reveal and challenge understanding of the magnitude of fractions and support flexible ways of comparing and ordering fractions.
c. For a given problem in which quantities vary together in a proportional relationship, rewrite the problem to be either easier or harder, to change the context, or to assess the mathematics addressed in the problem, while maintaining the original mathematical focus.
d. Recognize mathematical competence in others' approaches to and explanations for fraction problems using multiple representations involving different interpretations.
e. From observing or participating in a group engaged in comparing or solving a computation involving fractions or decimals, provide a description of the mathematical work carried out by the group.

M.10. Perform mathematical *explanations* and support children's mathematical explanations for *fractions*, decimals, and operations.

Well-prepared beginning teachers of mathematics are able to:

a. Recognize whether or not an explanation regarding the equivalence, comparison, or computation of fractions uses the standard definition of a fraction.
b. Identify and appraise features of explanations, performed by others, for comparing or computing with fractions.
c. Perform clear, elaborated explanations, attuned to an audience, of the meaning of a fraction $\frac{a}{b}$ for different interpretations of fractions in different representational environments.
d. Perform clear, elaborated explanations, attuned to an audience, for the equivalence, comparison, and basic computation of decimals based on place-value ideas.
e. Interpret and contrast alternative, novel approaches to computations, determining whether approaches, use of models, and explanations are mathematically consistent and correct and, if not, how they might be adapted to be.
f. Interpret and contrast different approaches to reasoning about situations in which quantities vary together in a proportional relationship, determining whether approaches, use of models, and explanations are mathematically consistent and correct and, if not, how they might be adapted to be.

M.11. Choose, interpret, and talk with *representations* for *fractions*, decimals, and operations.

Well-prepared beginning teachers of mathematics are able to:

a. Identify affordances and limitations of different materials, manipulatives, and drawings as representations of fractions.
b. Choose appropriate representations, including geometric and linear models, for supporting the solving of problems involving fraction quantities.
c. Recognize whether or not drawings and their implied use accurately model identified computations with fractions and decimals, including whether drawings are consistent with specific meanings of operations.
d. Use unmarked or partially marked number lines to interpret and compare fractions with various numerators and denominators, attending carefully to the unit interval as the conventional whole, the role of unit fractions and iteration, and estimation of magnitudes.
e. Model decimal multiplication and division using visual representations with care and precision regarding place-value interpretations of the numbers and with clear distinctions between linear and area quantities.
f. Use tables, charts, graphs, double number lines, and bar models to present solutions to problems in which quantities vary together in proportional relationships, coordinating the talk with the use of the representations in solving the problems and explicitly mapping among the solutions using the different representations.

M.12. Elicit, interpret, support, and extend *others' mathematical thinking* for *fractions*, decimals, and operations.

Well-prepared beginning teachers of mathematics are able to:

a. Pose questions to draw out particular ways of thinking about comparing or computing with fractions when that thinking is not transparent.
b. Formulate claims about mathematical understanding based on evidence from performance on fraction or decimal comparison problems.
c. Clarify and record others' approaches to solving fraction problems involving operations.
d. Identify incorrect reasoning about fractions, including reasoning about their magnitude, comparison, and computation, and formulate counter-speculations for that reasoning.
e. Interpret reasoning about solutions to problems in which quantities vary together in a proportional relationship as exemplified in others' talk or work, and then apply the approach to different problems.
f. Identify which key aspects of a given fraction interpretation are present and absent in others' talk or work.

Science

The science standards for grades 3-6 teachers reflect a vision for classrooms where grades 3-6 learners make sense of the world by engaging in 3-Dimensional science and engineering learning, as defined in the Framework for K-12 Science Education (i.e., science and engineering practices, disciplinary core ideas, and crosscutting concepts). This framework provides detailed research-based knowledge of how people learn science and what Michigan classrooms can look like. Science learning at the grades 3-6 level should be focused on reasoning and arguing from evidence, making thinking public and critiquing the thinking of others, creating and interpreting increasingly complex text and participating in and supporting a culture of talk. By leveraging literacy and mathematics connections, well prepared beginning teachers can engage all grades 3-6 learners in complex and age-appropriate problems and the investigation of natural and designed phenomena. The classroom in which this type of science learning takes place is led by a knowledgeable and prepared teacher. To meet this expectation, preservice teachers must engage in multiple science learning experiences that mirror these expectations and reflect on those experiences as beginning teachers.

Engaging Learners in 3-Dimensional (3D) Science Learning

S.1. Scientific Phenomena

Well-prepared beginning teachers of science are able to:

a. Articulate the role of scientific phenomena in three-dimensional science teaching and learning.
b. Identify, evaluate, and use productive scientific phenomena for learners' science learning including everyday noticings of the world (for example, a puddle disappearing over time).[1]

S.2. Engaging Learners in *Science and Engineering Practices (SEPs)* as Identified in the Framework

Well-prepared beginning teachers of science are able to:

a. Articulate the nature and importance of scientific and engineering practices, giving priority at this grade band to the practices of asking questions and defining problems, developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, and engaging in argument from evidence.
b. Identify grade appropriate elements of scientific and engineering practices, including developing and using models and engaging in argument from evidence.
c. Demonstrate knowledge of the key aspects of engineering design process and how it is similar or different from science (e.g., engage in a problem to try and revise in iterations such as building a bridge).

[1] Boundary: Beginning teachers should not be expected to know how to create driving phenomena for all science and engineering topics.

S.3. Engaging Learners in Developing and Using *Disciplinary Core Ideas* (DCIs) as Identified in the Framework

Well-prepared beginning teachers of science are able to:

a. Demonstrate an understanding of and articulate the importance of life, earth and physical science disciplinary core ideas[2] consistent with the Michigan Grades 3-6 Science Standards.
b. Identify grade appropriate elements of the disciplinary core ideas within instructional materials.

S.4. Engaging Learners in Developing and Using *Crosscutting Concepts* as Identified in the *Framework*

Well-prepared beginning teachers of science are able to:

a. Articulate the nature of the crosscutting concepts and relate them to 3D learning (giving priority to patterns, cause and effect, systems and systems models, scale, proportion and quantity, and energy and matter) and identify them within instructional materials.
b. Integrate crosscutting concepts in lessons, curricula and assessments.

Learners' Sense-making and Science Teaching Pedagogy

S.5. Selecting and modifying instructional materials for 3D learning

Well-prepared beginning teachers of science are able to:

a. Select and modify instructional materials to create learning environments that engage learners in using the disciplinary core ideas, science and engineering practices and crosscutting concepts to explore, describe, and explain phenomena.[3]
b. Articulate and incorporate connections between science and other discipline areas (e.g., engagement in measurement, analysis and the cross-cutting concept of patterns within science learning; writing to explain science understanding).

S.6 Learners' scientific sense-making

Well-prepared beginning teachers of science are able to:

a. Articulate how learners make sense of scientific phenomena, ideas, experiences and data and what scientific sense-making looks like in individuals (e.g., speaking, writing, visually representing, enacting) and whole class interactions (e.g., speaking and listening).
b. Identify instances of sense-making and elicit learner ideas, in individual, small group, and whole class interactions that embrace the complexity and iterative nature of sense-making and move beyond indicating whether the ideas are correct vs. incorrect, accurate vs. misconceptions.

[2] Content

[3] Boundary: Beginning teachers should not be expected to modify entire units, but instead identify opportunities for improving/altering existing lessons to include *Practices and DCIs.*

S.7. Pedagogical strategies that support culturally relevant sense-making in 3D learning

Well-prepared beginning teachers of science are able to:

a. Articulate research-based pedagogical strategies that support learners' sense-making in grade level and culturally appropriate ways including leveraging learners' prior experiences and knowledge, varying activity structures, talk and group work for science. For example, they should be expected to elicit learners thinking, cultural and community connections, and curiosity when making sense of phenomena.
b. Choose, modify and/or design lessons and lesson sequences and/or assessments to create learning environments that provide opportunities for iterative learners' sense-making and explanation building through classroom talk, written words, diagrams and/or movement.[4]
c. Create an inclusive linguistic culture that leverages individual interactions, small group work and whole group talk strategies for eliciting learner ideas and engaging learners in sense-making through 3D learning (e.g., partner talk, asking for clarification, asking for evidence and reasoning, asking for others to agree/disagree and asking for contributions to build on one another).[5]
d. Demonstrate initial strategies for navigating tensions between alternative ideas and ways of knowing (which may be derived from various cultures) and canonical science ideas including: referring to evidence, continuing to consider/debate to work through the ideas, focusing on the most important disciplinary/explanatory ideas and understanding when it is appropriate and necessary to create space for learners to grapple with alternative ideas.
e. Select or modify formative and summative science assessments (diagrammatic, linguistic) that address 3D learning and reveal learners' current sense-making.
f. Recognize and assess learners' ideas, life experiences and learning beyond the technical scientific language by evaluating samples of learners' work and classroom interactions to determine the nature and depth of learner sense-making and leverage ongoing changes in children's learning to adjust instruction.

[4] Boundary: Beginning teachers should not be expected to have mastered complex talk moves such as sequencing learners' ideas.

[5] Boundary: Beginning teachers should not be expected to have mastered skills in navigating whole class conversations. They should be able to provide some opportunities for conversation, and have several strategies to help learners express, elaborate and start building on their own and others' ideas.

S.8 Equity and Access

Well-prepared beginning teachers of science are able to:

a. Explore questions of context of science learning (such as, relevant for whom, who benefits, whose interests are served, what are the costs and for whom, who gets to be scientists and according to what criteria, and from whose perspectives is this understanding of the natural world constructed) and leverages learners' multiple community experiences to provide access to high quality science learning experiences for all learners.
b. Identify learners' and communities' interests, experiences and resources as assets to their science learning and use these assets to select phenomenon, modify or design lessons, and build on during instruction.
c. Develop strategies for creating a classroom culture that values productive struggle, challenging science ideas, constructing science meaning together, and enjoying science.

Social Studies

Candidates demonstrate knowledge, understanding, and application of the major concepts and modes of inquiry (i.e., developing questions and planning inquiries, applying disciplinary tools and concepts, evaluating sources and using evidence; and communicating conclusions and taking informed action) the social studies disciplines – the integrated study of history, geography, political science and economics – to promote all elementary learners' abilities to make informed decisions as engaged citizens to enact change in a culturally diverse, democratic society and interdependent world.

SS.1. Civic Engagement
Well-prepared beginning teachers of social studies will know and demonstrate an understanding of how to teach:

a. The responsibility of public discourse, decision making, and citizen involvement through developing skills for participating in community issues by using representational tools and data to interpret, analyze, and create structured discourse which communicates reasoned positions relative to public issues;
b. Organizational skills for clearly stating a problem as a public policy issue, analyze various perspectives, and generate and evaluate possible alternative resolutions; and
c. Communication skills to generate a reasoned position on a public issue in order to act constructively to further the public good.

SS.2. History
Well-prepared beginning teachers of social studies will know and demonstrate an understanding of how to teach:

a. History as an organizing framework for developing a sense of time and chronology using events from personal experiences and expanding into the events of larger communities and countries;
b. Historical thinking that consists of understanding and evaluating change and continuity over time, and make appropriate use of historical evidence in answering questions and developing arguments about the past;
c. Historical thinking to understand the past in the local community, Michigan, and the United States, as detailed in Michigan 3-6 content standards for social studies for the appropriate grade level bands.

SS.3. Geography
Well-prepared beginning teachers of social studies will know and demonstrate an understanding of how to teach:

a. Geography as an organizing framework to identify and interpret geographic environment using representational tools, spatial perspective, and concepts that explain human needs and wants and their relationship to their environment;
b. Geographic reasoning that consists of using spatial and environmental perspectives, skills in asking and answering questions, and being able to apply geographic representations;
c. Geographic reasoning to understand the geography of the local community, Michigan, the United States, and the world, as detailed in Michigan 3-6 content standards for social studies for the appropriate grade level bands.

SS.4. Civics and Government
Well-prepared beginning teachers of social studies will know and demonstrate an understanding of how to teach:

a. Civics and Government as an organizing framework for understanding productive civic engagement, the development of individual rights and societal structures, and relationships between these dynamic forces;
b. Civic reasoning that consists of conceptual foundations of governments, applying civic virtues and principles of American constitutional democracy, explaining important rights and how, when, and where American citizens demonstrate their responsibilities by participating in government;
c. Civic reasoning to understand the government and political processes at the local, state, federal, and global levels as detailed in Michigan 3-6 content standards for social studies for the appropriate grade level bands.

SS.5. Economics
Well-prepared beginning teachers of social studies will know and demonstrate an understanding of how to teach:

a. Economics as an organizing framework for study of the interaction of individual wants, goods, services, and the resulting exchanges in a structured society;
b. Economic way of thinking to identify, analyze, and evaluate the causes and consequences of individual economic decisions and public policy (e.g. all choice involves cost, individuals make economic choices, people respond to incentives in predictable ways, individuals participate in economic systems, all decisions have consequences which lie in the future, trade and labor create wealth);
c. Economic way of thinking to understand economic activities as detailed in Michigan 3-6 content standards for social studies for the appropriate grade level bands.

Appendix to Standards for the Preparation of Teachers of Lower Elementary (PK-3) Education

Glossary

Professional

504 Plan: Section 504 of the Rehabilitation Act of 1973 is the civil rights law that does not allow discrimination on the basis of disability and guarantees individuals with disabilities equal access to an education. The 504 plan is a written plan created for students with disabilities who require support in order to be successful in the classroom. A 504 plan is not an Individualized Education Plan and is not special education. 504 plans provide accommodations, modifications, and/or supplemental services for children with disabilities in typical classroom settings.

Accommodation: An accommodation does not change a learning expectation or modify what a child learns but rather provides an alteration in the environment, equipment, or access to the curriculum addressing how a student with a disability, or any student gains access to the typical learning environment or experience. Accommodations can occur in the general or special education classroom.

Curriculum: The overall design of instruction or opportunities provided for learning. A curriculum may include materials and textbooks, planned activities, lesson plans, lessons, and the total program of formal studies or educational experiences provided by a teacher or school. (*Note*: Definitions of *curriculum* vary widely because of alternative perceptions held by theorists about the nature and organization of formal schooling.)

Differentiated Instruction: Instruction designed to be specific for individuals or groups of learners to enhance the learning of skills, concepts, and strategies. Modifying the content, the style of teaching, and the products signifies that a customized experience that grew out of a student's specific learning needs has occurred.

Individualized Education Program (IEP): Each public school child identified with a disability who receives special education and related services must have an Individualized Education Program, a legal document ensuring access to the general education curriculum and providing a planned program of intervention goals and supports to address the needs of the child. The IEP provides opportunities for teachers, parents, school administrators, related services personnel, and the individual student (when appropriate) to work together to ensure success and improve educational results for the child with disabilities.

Learner-Centered Supports: Instructional tools used to support all students, include differentiated supports, multi-tiered system of supports, personalized learning, aligned curriculum, deeper learning, and feedback for learning.

Multi-tiered System of Supports: A Multi-Tiered System of Supports (MTSS) is a comprehensive framework comprised of a collection of research-based strategies designed to meet the individual needs and assets of the whole child. MTSS intentionally interconnects the education, health, and human service systems in support of successful learners, schools, centers, and community outcomes. The five

essential components of MTSS are inter-related and complementary. The MTSS framework provides schools and districts with an efficient way to organize resources to support educators in the implementation of effective practices with fidelity so that all learners succeed.

Motivation to Learn: The goals, values, beliefs, and dispositions that catalyze a willingness to undertake and sustain engagement in a learning activity.

Reflective Practices: The ability to reflect on one's actions so as to engage in a process of continuous learning.

Whole Child: A unique learner comprised of interacting dimensions, such as cognitive, physical, behavioral, social and emotional. The whole child lives within multiple and interconnected environments including home, school, and community.

Literacy

Academic language: Language that is used and valued within academic professions and schools. Extending beyond isolated words and phrases, academic language can be contrasted with conversational or vernacular language. These forms serve different purposes and thus make different use of syntax, lexical terms, and forms of organization (e.g., *There appears to be no compelling reason to argue that ___. The data appear to suggest that ___. To foster discussion, I would like to argue that___.*). Academic language is used in the disciplines of math, science, literature, and history.

Affect: Feeling, emotion, or attitude.

Affixes: Morphemes that are attached to a base word or stem to form a new word, affixes include prefixes, suffixes and connecting vowel letters (e.g*., -ness*, *pre-*, *-ed*, *-s*).

Alphabetic principle: The understanding that, in alphabetic written language systems, letters represent sounds and there are systematic and predictable relationships between them.

Attention: Keeping one's mind closely focused on something to be perceived or understood or the ability to do this; mental concentration.

Attitude (specific to written, spoken, and visual text): Student perspective that can color thinking or feeling about literacy (e.g., a disposition to read actively to make sense of a text).

Automaticity: The process of automatically recognizing words quickly and effortlessly during reading (without conscious attention).

Base (-s): A shortened form of the term base element. Each word contains a base element that holds the core of its meaning. Words containing the same base element generally have connected meanings, though sometimes the connection can be more metaphorical than literal. A **free base** element is a word that is capable of standing

on its own as a word whereas a **bound base** element requires at least one affix to surface as a word in English.

Blending sounds: Putting together individual sounds or syllables within words.

Collaborative discussion: Verbal, or real-time online written, communication to share ideas or solve problems.

Concepts of print: Print concepts, or concepts of print, are foundational knowledge about how print, in general, and books in particular, "work," such as understanding that print carries meaning, that print is authored, and that print is permanent; that graphics and print relate; that print is made up of graphemes which are associated with phonemes (alphabetic principle) and includes, but is not limited to, knowledge and parts of text (e.g., front cover, table of contents, diagrams), where to start reading within a text, directionality, return sweep, alphabetic principle, orientation of letters, concept of word, capitalization, and ending punctuation.

Consonant: A basic speech sound in which the breath is at least partly obstructed and which can be combined with a vowel to form a syllable.

Consonant blend (also called *consonant cluster*): A group of two or three consonants positioned and pronounced in immediate succession within a syllable (e.g., bl, spl).

Decoding: Ability to apply the knowledge of letter-sound relationships to correctly pronounce written words.

Dialogic: Communication between two or more people (e.g., teacher and student or student and student) that involves jointly constructed meaning-making, and is characterized by purposeful sharing, listening to others' ideas, and building on others' ideas.

Digital text: A text displayed on an electronic device. Single images, short messages, and full-length articles and books can all be presented on electronic devices, either online or offline. Research has indicated that reading these texts requires some of the same skills and some different skills than reading print because of special features available in digital texts, such as hyperlinks, search capability, and various graphic features.

Diphthong: A sound formed by the combination of two vowels or semi-vowels in a single syllable, in which the sound begins as one vowel and moves toward another (e.g., as in *coin*, *shout*).

Directionality: The sequence in which written language is in intended to be read or written, which may vary according to language. For example, in English, print's directionality flows left to right and top to bottom, whereas in Arabic, print's directionality flows from right to left and top to bottom.

Disciplinary context: A situation in which students read, write, speak, and listen in disciplinary ways for purposes consistent with the activities of that discipline, such as

in the disciplines of science (e.g., writing a scientific explanation) or history (e.g., reading multiple historical sources to construct an argument).

Diversity: Within the field of education, diversity refers to differences that make a person unique, which may include interests, attitudes, attributes, culture, experience, socioeconomic status, family composition, racial identity, region, and others, bearing in mind that among those who share a certain characteristic (e.g., culture) there will also be diversity (e.g., Everyone from the same region is not the same, though there may be some commonalities among those who live in the same general area).

Dyslexia: A type of specific learning disability that is neurobiological in origin that affects phonological processing. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities.

Emergent bilingual learners: Students who are learning an additional language.

Encoding: The process of using letter/sound knowledge to write, also known as spelling.

Engaging/Engagement: The behavioral, cognitive, and emotional activities and processes that enable individuals to participate in particular tasks for particular purposes.

Etymology: The study of the origins of words, including the historical linguistic change in words and word elements; English spellings reflect the varied historical roots of English; these include influences from Anglo-Saxon, Norse, and Norman-French as well as classical Latin and Greek and other languages.

Executive function: The conscious control of thought and action.

Experiences: What has occurred in a person's life, such as what the person has done or seen; students' experiences are shaped in part by their cultural and linguistic backgrounds.

Explicit instruction: Highly structured, teacher-directed instruction, focused on knowledge or skill outcomes, in which students are told what they are learning and why.

Figurative language: Non-literal language, which includes literary devices, such as metaphor, simile, personification, and hyperbole, that adds imagery and appeal to the five senses. *Figurative language* communicates something, other than literal meaning.

Fluency (handwriting, oral, reading):

> **Handwriting:** The ability to write legibly and efficiently and with automaticity so as to minimally impede the thoughts as they are translated to paper.
>
> **Oral:** The ability to convey ideas clearly, accurately, and with automaticity in speech.

Reading: The ability to read with accuracy, automaticity, and prosody.

Genre: A purpose for language use that has given rise to particular forms and features to achieve that purpose.

Grapheme: One or more letters that represent a phoneme.

Grouping strategies: Placing students into pairs, small groups, or large groups for learning activities; students may be grouped according to interest, prior knowledge, or academic skill and these groups may be mixed or homogeneous.

Ideation: The creative process of generating, developing, and communicating new ideas; can be for use in oral or written composing.

Implicit instruction: Instruction that is indirectly presented, with students expected to infer the knowledge or skill.

Lexicon: Vocabulary or stock of existing words. A lexicon can consist of all words or all words within a particular domain (e.g., words to describe plant parts, such as *stem, root, leaf*).

Literacies: The distinct written and oral language practices evident across varying social contexts and domains. As such, literacies are plural, with multiple manifestations, that cover various aspects of human life and organization (e.g., school literacy, workplace literacy, science literacy).

Literacy: The ability to use written and oral language practices of reading, writing, speaking, listening, viewing, and visually representing, in varying social contexts and domains to accomplish one's purposes.

Meaningful literacy experiences: Experiences that carry significance for the person/people involved in them.

Mechanics: The conventions of print that do not exist in oral language, including spelling, punctuation, capitalization, and paragraphing. Because they do not exist in oral language, students typically have to consciously learn how mechanics function in written language.

Metacognition: Awareness and control of one's own learning processes.

Modes of communication: The sensory avenues through which communication is produced or received including gesturing, feeling, listening, speaking, reading, writing, viewing, and visually representing.

Morphemes: The smallest meaningful unit in a language (e.g., letter *s* at the end of "dogs" is a morpheme indicating "more than one").

Morphological awareness: The recognition, understanding, and use of word parts that carry significance. For example, one who has strong morphological awareness recognizes that base words, prefixes, suffixes, and grammatical inflections (e.g., -s

or –es for plurals) are all morphemes that can be added or taken away from a word to alter its meaning.

Morphology: The study of the smallest meaningful units in words, how they are combined to form words, and their relationship to other words in the same language. It analyzes the structure of words and parts of words, such as stems, base words, prefixes, and suffixes.

Motivation: The willingness to undertake and sustain an activity.

Multimodal techniques: Instruction that integrates multiple modes (see **modes of communication**) such as speaking, gesturing, viewing, writing, and visually representing.

Oral Language: System through which we use spoken words to express knowledge, ideas, and feelings. Language is influenced by culture and context, and includes the components of form, content, and use.

Orthographic knowledge: The information that is stored in memory that tells us how symbols are used within a writing system.

Pace: Speed or rate at which a particular text is read. This is influenced by what is being read, the purpose for reading, the difficulty of what is being read, the reader's current skill, and other factors.

Phonemes: Smallest unit of sound that carries meaning which allows us to distinguish one word from another in a particular language (e.g., in English /b/ and /p/ are phonemes as /bat/ and /pat/ are understood to be different words).

Phonemic awareness: A type of phonological awareness that involves conscious attention to the phonemes of spoken language, typically understood to include the ability to distinguish, identify, and manipulate (blend, segment, add, delete, and substitute) phonemes.

Phonics: The connections between graphemes and phonemes in a language. The term used to refer specifically to instruction in these connections, but has come to have a broader meaning. Another term for *phonics* as defined here is *graphophonemic*.

Phonological awareness: Conscious attention to the sounds in spoken language, typically understood to include a broad range of skills that involve distinguishing, identifying, and manipulating units of oral language (words, syllables, onsets and rimes, and phonemes). **Phonemic awareness** is a type of phonological awareness.

Phonology: Study of how phonemes are organized and used in a language or across languages (e.g., the distribution of sounds in a language and the interaction between those sounds).

Print concepts (see *Concepts of print*)

Processing speed: A measure of cognitive efficiency or cognitive proficiency. It involves the ability to automatically and fluently perform tasks.

Prosody: The patterns of stress and intonation in a language; one defining feature of reading fluency sometimes referred to as *expression.*

Rapid Processing: Relatively quick processing speed.

Research-supported: Instruction or interventions that have been found to be effective, based on studies that involve the systematic collection and analysis of data.

Segmenting sounds: Skill of breaking words down into smaller parts (e.g., individual sounds or syllables).

Sentence combining: Merging short, simple sentences into longer, more complex ones.

Sentence expanding: Adding words, phrases, or clauses to an independent clause (simple sentence) to make sentences more interesting or complex.

Sentence framing: Method of scaffolding that provides portions of a sentence (e.g., I like_____. I agree because _____) for the speaker or writer to use as part of their utterance or sentence.

Sentence structure: How words, phrases, and clauses are arranged in a sentence. A sentence has to include at least one independent clause. For example, sentences with more than one independent clause are *compound*; sentences with an independent clause and one or more dependent clauses are *complex*.

Specialists: A group of individuals with expertise in a particular area, such as occupational therapists, speech and language pathologists, English learner specialists, and literacy specialists. Within a school context, specialists can be consulted for assessment and/or instructional support.

Text complexity: The complexity of text refers to features, such as general readability, levels of meaning, structures, and language clarity. Reader and task variables, in combination with the inherent difficulty of the text, determine complexity.

Text structure: Refers to elements of a text and/or the way a text is organized (e.g., in narrative text, with characters, setting, problem, resolution, and so on; in informational text with sequence, cause/effect, problem/solution, and so on).

Types of syllables: Syllables are a unit of pronunciation organized around one vowel sound, with or without surrounding consonant sounds, that form the whole or a part of a word. There are 6 commonly used types in English:

Closed: A syllable with a short vowel, spelled with a single vowel letter ending in one or more consonants (e.g., *kid*, *match*).

Open: A syllable that ends with a long vowel sound, spelled with a single vowel letter (e.g., the va- in *vapor* is an open syllable).

Vowel-Consonant-E: A syllable with a long vowel, spelled with one vowel + one consonant + silent e (e.g., *rake*, *whale*).
Vowel-team: A syllable with long or short vowel spellings that use two to four letters to spell the vowel (e.g., train); diphthongs ou/ow and oi/oy are included in this category.
Vowel -r: A syllable with er, ir, or, ar, or, ur; vowel pronunciation is often different than when not immediately preceding /r/ (e.g., *bird*, *word*).
Consonant le: An unaccented final syllable that contains a consonant before /l/, followed by a silent e (e.g., the -gle part of beagle).
Vowel: A syllable consisting exclusively of a vowel sound, typically written letters a, e, i, o, u, y, or the letter w if combined with a, e, i, o, or u.

Word recognition: The ability of a reader to readily pronounce a word and associate it with the word's meaning.

Word study: An instructional method that can be performed within and across disciplines that requires analysis, manipulation, and comparing and contrasting features of words through the incorporation of a variety of literacy constructs (e.g., phonological awareness, morphology, spelling, and word recognition).

World knowledge: Experiential or text-based information such as about topics in science and social studies, or community and family, that can help a reader or listener interpret the meanings of words and sentences.

Working memory: Refers to the use of memory to plan and carry out behaviors. We use working memory to keep information in mind as we are reading and to integrate that information to construct meaning.

Mathematics

Adaptive reasoning: The capacity to think logically about the relationships among concepts and situations and to justify and ultimately prove the correctness of a mathematical procedure or assertion.

Affordances: The properties of objects, systems, institutions, or environments that potentially enable or facilitate particular actions or behaviors.

Algorithm: A process or set of rules that precisely defines a sequence of operations to be followed, such as when performing calculations.

Composition: The action of putting together or combining of things as parts or elements of a whole, as in adding parts to obtain a number or arranging shapes to form a larger shape.

Conceptual understanding: An integrated and functional grasp of mathematical concepts, operations, and relations.

Counting: The action of finding the number of elements of a finite set of objects.

Decomposition: The action of separating or resolving anything into constituent parts, such as decomposing 456 into 400+50+6 or a hexagon into four triangles.

Fraction: A number expressible in the form $\frac{a}{b}$ where *a* and *b* are integers and *b* is not zero.

Magnitude: The size of a mathematical object; a property which determines whether the object is larger or smaller than other objects of the same kind.

Manipulatives: Objects designed so learners can perceive some mathematical concept by manipulating them. These include but are not limited to:

Bundling sticks: Individual sticks with rubber bands for bundling groups of ten sticks used to understand that a ten is made of 10 ones and that 10 ones can be grouped into a ten. Bundling sticks are a place value model for engaging students in composing and decomposing tens as they represent and reason about numbers.

Ten frames: Two-by-five rectangular frames into which counters are placed to illustrate numbers less than or equal to ten. Accessible to very young learners, it encourages mental images for numbers 1 to 10 organized by benchmarks of 0, 5 and 10.

Arithmetic rack: The original arithmetic rack, also known as a Rekenrek, consists of two rows of 10 beads, each broken into two sets of five. It encourages children to 'privilege 5' and 'think 10', supporting number sense, math facts, and efficient calculation. Accessible to very young learners, it is used to generate a variety of addition and subtraction strategies.

Base-ten blocks: Blocks used to learn place value, addition, subtraction, multiplication, and division. Base ten blocks consist of cubes (ones place), rods (tens place), flats (hundreds place), and blocks (thousands place). Base ten blocks are a place value model that involves trading to regroup.

Operation: In this context, a binary operation on numbers, namely a calculation that combines two numbers to produce another number, in particular the four operations addition, subtraction, multiplication, division, together with basic associative, commutative, and distributive properties.

Place value: The value of the place of a digit for a number represented in positional notation. For example, the place value of the 3 in 237 is ten.

Procedural Fluency: Knowledge of procedures, knowledge of when and how to use them appropriately, and skill in performing them flexibly, accurately, and efficiently.

Representations: Ways to symbolize, describe, and refer to mathematical entities. They are used to understand, develop, and communicate mathematical features of objects or operations, as well as connections between different properties. Representations may be visible, such as a number sentence, a display of manipulative materials, or a graph, but may also be internal ways of seeing and thinking about a mathematical idea.

Number line: A picture of a line that serves to model real numbers. Every point of a number line is assumed to correspond to a real number and every real number to a point.

Area model: A rectangular diagram that uses an area interpretation of multiplication to model computations, in particular place-value-based algorithms.

Arrays: An arrangement of objects in rows and columns to model multiplication and division of whole numbers.

Science

Activity structures: There are a variety of participation structures that can support dialogue and interactions for scientific sense-making. (Himmele & Himmele, 2017)

Boundary: The limit of the expectation for knowledge for new teachers. Additional learning around the topic may occur in professional development.

Diagrammatic: Information presented as a diagram including sketches, concept maps, graphs and others.

Group work: How to organize groups of students to work together in exploring and discussing phenomena, data, and explanations (For example, know some initial strategies for sharing student thinking about and experiences related to phenomena (e.g., think/pair/share; whole class).

Linguistic: The study of language, form, meaning, and context.

Prior experiences and knowledge: The experiences, backgrounds, skills, and ideas that students have about a topic.

Scientific phenomena: Natural phenomena are observable events that occur in the universe and that we can use our science knowledge to explain or predict. The goal of knowledge in science is to develop general ideas, based on evidence, that can explain and predict phenomena. Engineering involves designing solutions to problems that arise from phenomena, and using explanations of phenomena to design solutions. In this way, phenomena are the context for the work of both the scientist and the engineer. Additional resources can be found at: https://www.nextgenscience.org/resources/phenomena.

Sense-making: The process by which people give meaning to their collective experiences. In science and engineering, "Sense-making is the proactive engagement in understanding the world by generating, using, and extending scientific knowledge within communities." (Schwarz, Passmore & Reiser, 2017, p. 6) Warren, et al. (2001) describe sense-making as: "encompassing a varied complex of resources, including practices of argumentation and embodied imagining, the generative power of everyday experience, and the role of informal language in meaning making." (p. 532)

Talk (science): Various tools and strategies can facilitate sense-making through talk by: asking students to share their own thoughts, asking students to listen to one another, asking students to deepen their own reasoning, and engaging with others' reasoning. (Michaels & O'Connor, 2012)

Resources

Social Emotional Learning Competencies

In combination with the Michigan Health Education Standards, Social Emotional Learning (SEL) competencies help support a well-rounded education that teaches to the whole child. When caregivers and schools focus on the development of the whole child, utilizing SEL competencies to guide instruction and interactions with children and students, academic achievement improves, as well as the skills needed for college and career readiness. Furthermore, a focus on SEL helps create an environment that enables teachers to teach and students to learn which research shows is necessary for school and life success.

Family Engagement

Family engagement is a collaborative relationship between families, educators, providers, and partners to support and improve the learning, development, and health of every learner.

National Association for the Education of Young Children (NAEYC) Online Learning Modules

NAEYC's online learning modules are created with early childhood educators in mind. The catalogue of modules includes a variety of topics, each designed to provide practical tips and strategies to bring to the classroom. Modules are self-paced, interactive, based on research, and approximately one hour in length.

Early Childhood Standards of Quality for Prekindergarten

Michigan's *Early Childhood Standards of Quality for Prekindergarten* is meant to provide guidance to all early care and education programs for providing all three- and four-year-old children with opportunities to reach essential developmental and educational goals. Carefully developed early learning expectations linked to K-12 expectations can contribute to a more cohesive, unified approach to young children's education. This document includes both *Quality Program Standards for Prekindergarten Programs* and *Early Learning Expectations for Three- and Four-Year-Old Children*. Clear research-based expectations for the content and desired results of early learning experiences can help focus curriculum and instruction. By defining the content and outcomes of young children's early education, the early learning expectations will lead to greater opportunities for preschoolers' positive development.

K-3 Components of Quality for Classroom Environments: A Guide for Elementary Administrators and Teachers

The K-3 Components of Quality for Classroom Environments starts from the premise that professional, program, content, and performance standards exist, but typically overlook the critical element of success: context standards.

Context standards (or, as referred to in this document, context components of quality) are nothing new, but are sometimes hard to categorize and characterize. They might be referred to as "school climate standards," "safe school standards," or "educational equity and opportunity standards"; in general, they are the components that address the physical and psychological conditions that establish a supportive, engaging environment that fosters learning.

The following nine components of quality emerged from this work, covering key topics and developmental domains for administrators, teachers, and other staff in K-3 settings. For each of the components of quality, competencies and supporting practice examples are offered as indicators of success.

1. Mission, Vision, Beliefs, and Guiding Principles
2. Community Collaboration
3. Family Engagement
4. Transitioning into Kindergarten
5. Learning Environment
6. Teaching Practices
7. Qualifications and Professional Development
8. Curriculum
9. Student Assessment and Intervention

Michigan Academic Standards

According to the dictionary, a standard is "something considered by an authority or by general consent as a basis of comparison". Today's world is replete with standards documents such as standards of care, standards of quality, and even standard operating procedures. These various sets of standards serve to outline agreed-upon expectations, rules, or actions which guide practice and provide a platform for evaluating or comparing these practices.

The state academic standards serve to outline learning expectations for Michigan's students and are intended to guide local curriculum development. They should be used as a framework by schools for curriculum development with the curriculum itself prescribing instructional resources, methods, progressions, and additional knowledge valued by the local community. Furthermore, these standards provide a platform for state assessments, which are used to measure how well schools are providing opportunities for all students to learn the content outlined by the standards.

Literacy Essentials

Developed by the Early Literacy Task Force, a subcommittee of the Michigan Association of Intermediate School Administrators (MAISA) General Education Leadership Network (GELN), which represents Michigan's 56 Intermediate School Districts, the *Essentials* are a collection of documents detailing research-supported instructional practices in literacy. There are *Essentials* documents for instructional practices in prekindergarten, kindergarten through grade 3, and grades 4 and 5; for literacy coaching practices; and for school-wide and center-wide literacy practices. The LiteracyEssentials.org website also includes professional learning modules aligned to the *Essentials*.

Michigan's Action Plan for Literacy Excellence (MAPLE)

Michigan's Action Plan for Literacy Excellence serves as a vision for educational leaders and stakeholders to support a P-20 system that will move Michigan to be a Top 10 Education State in 10 years. This plan provides common goals and activities necessary for effective and efficient implementation of the strongest research-validated literacy practices for driving policy, professional learning, instruction, and literacy leadership.

Science and Literacy Instruction in the Early Grades

Developed by a panel of Michigan and nationally recognized experts in science and literacy, this document presents a set of research-informed belief statements about instruction in literacy and science in grades K-3.

Framework for K-12 Science Education

A Framework for K-12 Science Education outlines a broad set of expectations for students in science and engineering in grades K-12. These expectations will inform the development of new standards for K-12 science education and, subsequently, revisions to curriculum, instruction, assessment, and professional development for educators. This book identifies three dimensions that convey the core ideas and practices around which science and engineering education in these grades should be built. These three dimensions are: crosscutting concepts that unify the study of science through their common application across science and engineering; scientific and engineering practices; and disciplinary core ideas in the physical sciences, life sciences, and earth and space sciences and for engineering, technology, and the applications of science. The overarching goal is for all high school graduates to have sufficient knowledge of science and engineering to engage in public discussions on science-related issues, be careful consumers of scientific and technical information, and enter the careers of their choice.

College, Career, and Civic Life (C3) Framework for Social Studies State Standards: Guidance for Enhancing the Rigor of K-12 Civics, Economics, Geography, and History

The result of a three year state-led collaborative effort, the College, Career, and Civic Life (C3) Framework for Social Studies State Standards was developed to serve two audiences: for states to upgrade their state social studies standards and for practitioners — local school districts, schools, teachers and curriculum writers — to strengthen their social studies programs. Its objectives are to: a) enhance the rigor of the social studies disciplines; b)

build critical thinking, problem solving, and participatory skills to become engaged citizens; and c) align academic programs to the Common Core State Standards for English Language Arts and Literacy in History/Social Studies.

Phenomenal Science Teacher's Guide

This guide is intended to outline the Core Principles and Key Instructional Strategies for high quality elementary science instruction and describe practical applications with links to resources. Many of these practical instructional strategies are appropriate in all content areas. It also contains the theoretical and research-based underpinnings of these powerful instructional strategies.

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3-6 Mathematics Matrix

Expanded High-Leverage Mathematics Topics for Teaching Grades 3-6

The Michigan initial preparation standards focus the mathematical preparation of beginning teachers on high-leverage aspects of number and operation, but it is expected that relevant aspects of geometry, measurement, and early algebraic thinking will be addressed in the context of number and operation competencies. Within the topic of number and operation, the strategic topics listed below synthesize recommendations of the Conference Board of the Mathematical Sciences (2012) and the Association of Mathematics Teacher Educators (2017).

High-leverage mathematics topics for teaching grades 3-6

1. Whole numbers and operations
    a. Counting to indicate quantity based on one-to-one matching as distinct from listing numbers, flexibility in counting on and counting back by different increments, and coordination of counting with base-ten number representation and elementary addition and subtraction, for instance using 5s and 10s to aid counting and using convenient decomposition and counting on or back to aid addition and subtraction.
    b. Repeated bundling of groups of 10 into a unit and higher-ordered units as the foundation of the place-value number system, as well as division of a unit into a group of 10 when extending to decimals and geometric support for visualizing iterated units.
    c. Different types of problems solved by addition, subtraction, multiplication, and division, and the meanings of the operations illustrated by these problem types, including geometric interpretations of each and connections among them.
    d. Composing, decomposing, and recomposing of numbers as fundamental to efficient base-ten computation.
    e. Different approaches to, comparisons of, and justifications for addition, subtraction, multiplication, and division problems, including conventional algorithms.
2. Fractions, decimals, and operations
    a. Multiple interpretations of fractions (part-whole relationships, quotients, ratios, and as single entities or numbers characterized by relationships between pairs of integers) in multiple representational environment (portions of groups of objects, portions of areas of shapes, and points or lengths on number lines).
    b. Definitions of a unit fraction $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into b equal parts and a fraction $\frac{a}{b}$ as a parts, each of size $\frac{1}{b}$, and the use of these definitions to reason about different interpretations of fractions in different representational environments.
    c. Explanations of the equivalence of distinct fractions, the comparison of fractions, and different approaches for adding, subtracting, multiplying, and dividing fractions, including understanding the importance of unit fractions and the relationship between linear measures and measures of area in representing multiplication and division.
    d. Decimal notation and computation as extensions of the base-ten place-value ideas established for whole numbers and the representation of finite decimals as fractions and fractions as decimals, by means of long division.

e. Distinguishing features of additive and multiplicative situations and different approaches to reasoning about how quantities vary together in a proportional relationship, using tables, double number lines, bar models, and equations as supports.

Although the meaning of the equals sign and number properties are not explicitly identified above, they are embedded in several of the listed topics. For instance, equivalence of numbers is prominent in several of the topics listed, where teachers' meaningful use of language and notation is expected. Likewise, the number properties are embedded in the equivalence of numbers and the solving of computational problems and associated justifications. These two topics are fundamental for both children and teachers, but run the risk of being trivialized when not serving larger issues such as the equivalence of numbers and computation with numbers.

The sub-topics identified intersect and overlap, but they represent strategic foci for guiding the mathematical preparation of teachers. For instance, 1b and 1d are closely related, but the former emphasizes the structure of the base-ten number system while the latter emphasizes the central role of renaming numbers in the context of computation. Distinguishing these helps prospective teachers deepen and connect their understanding of elementary mathematics to its teaching.

Expanded Tasks of Mathematics Teaching Strategic for the Mathematical Preparation of Teachers

The Michigan initial preparation standards focus the mathematical preparation of beginning teachers on a set of tasks of mathematics teaching that contribute, as a whole, to meeting the following five criteria and to providing a useful organization of mathematical knowledge for teaching.

- Shape instructional interactions among students and teacher.
- Affects equitable access to mathematics instruction.
- Are learnable by beginning teachers.
- Are broad enough to use to organize mathematical knowledge for teaching and specific enough to direct the mathematical preparation of teachers.
- Have significant mathematical demands.

The tasks below are informed by the Council of Chief State School Officers' (2013) Interstate New Teacher Assessment and Support Consortium (InTASC) report and TeachingWorks' high-leverage practices (Davis & Boerst, 2014). When carried out skillfully, these tasks of teaching significantly advance the likelihood that children learn mathematics; badly executed, these tasks put children's mathematics learning at risk.

1. Unpack mathematical **content** and identify mathematical **competence**. Well-prepared beginning teachers of mathematics have mathematical knowledge that contributes to seeing the mathematical affordances of problems and the mathematical competence of others engaged in those problems, including those different from themselves — by age, gender, ethnicity, race, language, and class. They can express clearly and accurately the mathematical work involved in solving problems and can identify the many ways in which people can be engaged in and contribute to doing mathematics.
    a. Recognize and use mathematically rich problems, including seeing and saying the mathematical opportunities afforded by a problem and whether it enables multiple approaches and helps make children's thinking visible.
    b. Adapt mathematics problems without undermining their intended mathematical focus, for instance adjusting a problem to be easier or harder

or changing the context of a problem, as well as crafting an ancillary problem to assess progress on intended goals.

c. Recognize and maintain cognitive demand of mathematics activities, including being able to identify concepts and tools for working on a problem that are distinct from — prerequisite to or resources for — the focal work of the problem.
d. Identify explicitly the goals, conditions, and challenges of mathematics problems, name explicitly what someone is doing mathematically, and narrate mathematical work in ways that articulate what has been accomplished and what remains.
e. Recognize mathematical competence in broader terms than giving correct answers, for example hearing mathematical competence in emergent thinking, different approaches to mathematical problems, comments about mathematical structure, comments about mathematical generalization and connection, and questions that are mathematically on point.

2. Perform mathematical explanations and support children's mathematical **explanations**.
   Well-prepared beginning teachers of mathematics have mathematical knowledge that contributes to giving clear, explicit explanations attuned to audience and supporting other people's mathematical explanations. They understand the nature of mathematical explanation, are skillful in composing and delivering explanations for different purposes and groups of people, readily hear alternative explanations, and are able to ask questions that draw out and develop other's explanations.
   a. Recognize what does and does not count as an explanation in mathematics and formulate mathematical questions and activities to make explanations clear and compete.
   b. Understand the unpacked nature of mathematical justification — for example, the importance of connecting to the question, using definitions, mathematically warranting steps, and linking language and diagrams to steps of the argument.
   c. Perform mathematical explanations that are explicit and clear, including coordinating thought, language, representation, and action attuned to audience.
   d. Generate multiple explanations, recognize and support others' explanations, and contrast and connect different explanations.
3. Choose, interpret, and talk with **representations**.
   Well-prepared beginning teachers of mathematics have mathematical knowledge that contributes to using representations (objects, drawings, visual models, and symbolic notation) for instructional purposes. They recognize the strengths and limitations of different representations and are able to develop, select, and use representations to further develop mathematical concepts, their own and others, and to record other people's thinking in ways that are consistent with other people's meaning.
   a. Choose, identify affordances and limitations, and justify representations for specific purposes, such as illustrating a mathematical concept or procedure, developing a mathematical explanation, or documenting mathematical work.
   b. Interpret different, idiosyncratic representations, recognize whether they are mathematically correct or not, engage with representations in ways that are consistent with children's meaning and are mathematically appropriate, and adapt representations for clarity and productive use.

    c. Use mathematical representations while simultaneously talking, as a key form of communication, in ways that are explicit and clear and that coordinate thought, language, representation, action, and mathematical ideas.
    d. Generate alternative representations and make connections among multiple representations using careful and precise language, including making clear and explicit connections between conventional and unconventional representations.
4. Elicit, interpret, support, and extend **children's mathematical thinking**. Well-prepared beginning teachers of mathematics have mathematical knowledge that contributes to understanding and responding to other people's mathematical thinking. They can elicit other people's mathematical thinking, understand what others express mathematically, and make instructional choices that follow up and extend other people's understanding.
    a. Pose mathematically appropriate questions to draw out children's thinking.
    b. Interpret children's thinking in written and verbal forms, both an individual child's idiosyncratic thinking and patterns of understanding and errors in groups of children, including making claims, supported by evidence, about children's thinking.
    c. Record and re-voice children's mathematical thinking accurately.
    d. Identify key mathematical issues to probe in children's thinking and formulate appropriate follow-up questions and counter-speculations.
    e. Recognize ways of using different student contributions, including apparent errors, to advance mathematical thinking or work on a problem.