STATE OF MICHIGAN
DEPARTMENT OF EDUCATION
LANSING

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GOVERNOR

MICHAEL F. RICE, Ph.D.
STATE SUPERINTENDENT

MEMORANDUM

DATE: January 28, 2020

TO: State Board of Education

FROM: Michael F. Rice, Ph.D., Chairperson

SUBJECT: Presentation of the Proposed Standards for the Preparation of Teachers in Professional Knowledge and Skills, English Language Arts, and Mathematics in Middle Grades (5-9) and High School (7-12)

In pursuit of the Michigan Department of Education's ongoing goal to maintain high quality Michigan educators, this proposal is presented to the State Board of Education (SBE) for the revision and adoption of new Standards for the Preparation of Teachers in Professional Knowledge and Skills, English Language Arts, and Mathematics in Middle Grades (5-9) and High School (7-12). The three sets of standards were developed to support the Michigan Department of Education's goal to "develop, support, and sustain a high-quality, prepared, and collaborative education workforce" and the Michigan Department of Education's strategic priorities in Literacy and Whole Child. These standards will replace Michigan's current preparation standards for teachers of English and Mathematics (Secondary) and will inform program development and continuous improvement efforts at Michigan's educator preparation institutions.

Following the November 13, 2018 SBE adoption of new Standards for the Preparation of Teachers of Lower Elementary (PK-3) and Upper Elementary (3-6) Education, stakeholder groups representing PK-12 teachers and administrators, college and university teacher educators, and education researchers began meeting to revise Standards for the Preparation of Teachers in Professional Knowledge and Skills, English Language Arts, and Mathematics to support the new 5-9 and 7-12 grade bands. Stakeholders included experts in adolescent learning and development and professional teacher preparation, English language arts content and instruction, and mathematics content and instruction. These groups met consistently through July 2019 to develop new sets of preparation standards in these areas, and as the standards were being developed, draft language was shared for feedback with stakeholders at annual conferences of the Michigan Reading Association, Michigan Council of Teachers of English, and the Michigan Council of Teachers of Mathematics. Additional feedback was solicited from selected stakeholders representing PK-12

schools and districts, intermediate school districts, college and university teacher education programs, the education research community, and teacher and administrator professional organizations. All feedback was reviewed by the original stakeholder groups for refinement of the draft standards.

Attachment A describes the development of each set of standards, including the stakeholders involved in the drafting process. Attachment B provides the Standards for Professional Knowledge and Skills for the Preparation of Teachers in Middle Grades (5-9) and High School (7-12). Attachment C provides the Standards for the Preparation of Teachers in English Language Arts in Middle Grades (5-9) and High School (7-12). Attachment D provides the Standards for the Preparation of Teachers in Mathematics in Middle Grades (5-9) and High School (7-12).

These standards are being submitted to the SBE for presentation. The standards are used to prepare educators in the content that will be placed on their certificate. Historically, placement of teachers in the classroom was limited to how a teacher was prepared and what was listed on the certificate. Under the new certification structure, it may also be appropriate in some situations to place educators outside of the grade range/content area listed on the certificate.

This presentation will be followed by a period of public comment and a request for approval at the June 9, 2020 SBE meeting.

Introduction to Standards for the Preparation of Teachers in Professional Knowledge and Skills, English Language Arts, and Mathematics in Middle Grades (5-9) and High School (7-12)

Development of the Proposed Standards

Since 2015, 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, developmental, and socio-emotional needs of children at each grade level. This structure includes focused grade bands to provide new teachers with specialized knowledge about the students and content they will teach and defined clinical experiences and foundational coursework for each grade band.

Building on the work of the certification restructuring and the revision and adoption of Early Elementary (PK-3) and Upper Elementary (3-6) Standards for Teacher Preparation, stakeholder committees consisting of individuals with expertise in secondary level teacher professional knowledge and skills, English language arts (ELA), and mathematics were convened to revise standards to align with the new middle grades (5-9) and high school (7-12) grade bands. These three areas were selected due to the primacy of importance to teacher preparation programs, the critical need subjects represented and the alignment with MDE's Whole Child and Literacy foci.

In line with these initiatives, and in response to feedback from educators around the state, each of these sets of standards has a deep focus on equity, shifting the vision of a well-prepared beginning teacher at the secondary level from an emphasis on decontextualized content knowledge and toward an emphasis on classroom practices that address the diverse social, emotional, developmental, and learning needs of the whole child.

While the preparation standards for middle grades and high school presented here are in most areas identical for both grade bands, they are not intended to be addressed in isolation from other core elements of the teacher preparation curriculum. Candidates seeking endorsement in either or both grade bands must engage in clinical experiences across the range of grades incorporated in these bands (in accordance with Michigan's Clinical Experiences Requirements) that allow them to demonstrate proficiency in these standards as well as the Core Teaching Practices in authentic classroom contexts. Expectations for K-12 student performance in these discipline areas also vary across the two grade bands, requiring that enactment of the core instructional competencies and dispositions detailed in these standards may vary in accordance with the K-12 academic standards and locally adopted curriculum being addressed in a specific classroom context.

Professional Knowledge and Skills

The purpose of the Professional Knowledge and Skills Standards for the Preparation of Teachers of Middle Grades (5-9) and High School (7-12) is to establish a shared vision for the professional knowledge, skills, and dispositions that entry-level teachers of middle level and high school students in Michigan should possess and demonstrate in their teaching. The standards reflect a vision of a well-prepared

beginning teacher who is prepared to enact high-quality instruction in one or more content areas; 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 adolescent's needs.

A stakeholder committee representing Michigan PK-12 educators and administrators, college and university teacher educators and researchers with specialized knowledge in secondary teacher education, special education, social-emotional learning, English-language learners, and trauma-informed instruction began meeting in January of 2019 to create a set of standards outlining professional knowledge and skills for teachers in grades 5-9 and 7-12. The committee began work by reviewing the Professional standards of Michigan's Standards for the Preparation of Teachers of Upper Elementary (3-6) and utilized the following documents as source material for this work:

- Michigan Standards for the Preparation of Teachers of Upper Elementary (3-6) – Professional (2018);
- Association of Teacher Educators (ATE) Standards for Teacher Educators (2008);
- Association for Middle Level Education (AMLE) Middle Level Teacher Preparation Standards (2012);
- International Literacy Association (ILA) Standards for the Preparation of Literacy Professionals, Middle/High School Classroom Teacher (2017);
- American Psychological Association Developing Adolescents: A Reference For Professionals (2002);
- Massachusetts Advocates for Children Helping Traumatized Children Learn: Supportive School Environments for Children Traumatized by Family Violence (2009);
- Center for American Progress Preparing All Teachers to Meet the Needs of English Language Learners: Applying Research to Policy and Practice for Teacher Effectiveness (2012); and
- Region X Equity Assistance Center at Education Northwest Culturally Responsive Teaching: A Guide to Evidence-Based Practices for Teaching All Students Equitably (2016).

These standards related to professional knowledge and skills in the areas of Learner-Centered Supports, Ethics and Professional Growth, and Strategic Partnerships were designed to describe what all beginning teachers should know and be able to do regardless of the specific discipline area of specialization or instruction.

In developing these Professional Knowledge and Skills standards, there are three key considerations that guided the work of the committee. First, there is the recognition that at the middle level, beginning teachers must have sufficient depth and breadth of content knowledge and skills; strong understanding of the social-emotional developmental stages of adolescents; a knowledge of culturally-responsive and trauma-informed instruction; and strategies to promote equitable learning for all students in the classroom.

Second, these standards reflect the integration of newly adopted Clinical Experiences Requirements and the Core Teaching Practices. The full implementation of the Clinical Experiences Requirements in P-12 classrooms where teacher candidates have

opportunities to demonstrate and practice professional knowledge and skills, necessitates stronger, mutually beneficial partnerships between educator preparation programs and middle and high school faculty, and administrators. The shared understanding of and commitment to these Professional standards among those involved in these partnerships will strengthen the preparation of beginning teachers.

The final consideration that underlies the development of these standards is the need for intentional collaboration between general education, special education, and English as a Second Language preparation programs, as the focus on the whole child and on learner-centered supports blurs the traditional line between these aspects of the grade 5-9 and 7-12 school context. By building this integration into preparation programs, all beginning teachers will enter the work force better prepared to engage in inclusive, equitable teaching through collaboration with other professionals who are also focused on the needs of the whole child.

English Language Arts

In late October 2018, just prior to State Board of Education approval of the Standards for Preparation of Teachers of Lower (PK-3) and Upper Elementary (3-6) Education, a stakeholder committee representing Michigan PK-12 educators and administrators, college and university teacher educators, education researchers, and professional associations in English language arts (ELA) education began meeting to revise teacher preparation standards in ELA to support the new 5-9 and 7-12 grade bands. The stakeholder committee began its work by reviewing Michigan's Standards for the Preparation of Teachers of English (BA) and Language Arts (BX), adopted by the State Board of Education (SBE) in 2000, to determine whether they provided adequate guidance to prepare teachers to support students in the 5-9 and 7-12 grade bands in achieving the Michigan K-12 Standards for English Language Arts, adopted by the SBE in 2010. The committee considered the question of whether to reaffirm existing Michigan teacher preparation standards, compose new standards, or adopt a national set of standards as Michigan's standards. The stakeholder committee was unanimous in recommending that new standards be composed for Michigan teacher preparation in ELA, and utilized the following documents as source material for composing these standards:

- Michigan K-12 Standards for English Language Arts (2010); Standards for the Preparation of Teachers of Upper Elementary (3-6) – Literacy (2018); and Standards for the Preparation of Teachers of English (BA), Language Arts (BX), Speech (BD), and Journalism (BC), (2000);
- Michigan Association of Intermediate School Administrators' General Education Leadership Network Essential Instructional Practices in Early Literacy, Grades 4 to 5 (2016) and Essential Practices for Disciplinary Literacy Instruction in the Secondary Classroom (2019);
- National Council of Teachers of English (NCTE) Standards for Initial Preparation of Teachers of Secondary English Language Arts, Grades 7-12 (2012);
- International Literacy Association Standards for the Preparation of Literacy Professionals, Middle/High School Classroom Teacher (2017);
- Council of Writing Program Administrators, NCTE, and the National Writing Project Framework for Success in Postsecondary Writing (2011); and

- International Dyslexia Association Knowledge and Practice Standards for Teachers of Reading (2018).

The stakeholder committee met twice monthly beginning in late October 2018 and completed a first draft of teacher preparation standards for grades 5-9 and 7-12 in April 2019. The committee solicited feedback from additional stakeholders with expertise in ELA instruction and teacher preparation for middle grades and high school and met twice during the summer of 2019 to refine the draft standards in response to this feedback and to ensure alignment between the standards and research into effective literacy instruction.

These standards embody five key shifts from the standards in place since 2000, defining in more detail the knowledge and skills of well-prepared teachers of ELA in middle grades and high school. First, these standards emphasize equity in ELA instruction, with heightened expectations for teachers of ELA to understand the multidimensionality of diversity in their students and how that diversity can be recognized as an asset to support diverse students' achievement of common career and college ready outcomes in ELA. Second, the standards emphasize observable, contextualized instructional practices over discrete content knowledge. In alignment with the Upper Elementary Education teacher preparation standards, these standards shift primary focus from mastery of a body of knowledge of specific texts, authors, and literary concepts to focus more deeply on teachers' practices within a language rich classroom environment and culture to support students' mastery of the academic standards for their respective grade level. Third, the integration of content knowledge and instructional practices in these standards will necessitate an approach to ELA teacher preparation that interweaves teacher candidate development across multiple domains of these standards, rather than addressing these standards in isolation. Fourth, these standards contextualize many of the Core Teaching Practices in ELA-specific teaching contexts. Lastly, these standards promote a vision of beginning teachers of ELA as both active teacher readers and teacher writers in order that they recognize that processes of reading and writing often overlap. It is in that overlap of ELA processes where both beginning teachers and their students identify as readers and writers, which will allow them to switch between each lens, as well as use both, to make significant growth in their literacy.

Mathematics

As a direct result of the restructuring of teacher certification and concurrently with the Professional Knowledge and Skills and English Language Arts standards workgroups, a stakeholder committee representing grades 5-12 mathematics educators and administrators, college and university teacher educators and mathematics educators, and education researchers began meeting in October 2018 to revise secondary mathematics teacher preparation standards to support the new middle grades and high school grade bands.

The stakeholder committee began its work by reviewing Michigan's Standards for the Preparation of Teachers of Mathematics – Secondary (EX), adopted by the State Board of Education (SBE) in 2000, to determine whether they provided adequate guidance to prepare teachers to support students in the 5-9 and 7-12 grade bands in achieving the Michigan K-12 Standards for Mathematics, adopted by the SBE in 2010. The committee considered the question of whether to reaffirm existing Michigan

teacher preparation standards, compose new standards, or adopt a national set of standards as Michigan's standards. The stakeholder committee was unanimous in recommending that new standards be composed for Michigan teacher preparation in mathematics.

At the start, the committee determined that a framework for the mathematics standards would be required. This framework allowed for the revision of the standards in such a way that they aligned with current research in the field from such groups as the National Council of Teachers of Mathematics (NCTM) and the Association of Mathematics Teacher Educators (AMTE), supported alignment with MDE's Whole Child and Equity focuses, and ensured a balance and integration of pedagogy and content, all critical aspects of preparation of a strong well-prepared education workforce in mathematics. As this framework was developed, in addition to the three key aspects of Pedagogy, Content, and Dispositions (PCD), several crosscutting focuses were also determined to be important. These include a focus on equity, integration of technology, deeper inclusion of mathematical modeling, and reasoning and argument. A next step for the committee was to use the developed PCD framework as a lens to guide the standards writing process.

Starting with the Michigan Standards for Preparation of Teachers of Mathematics - Secondary (2000) and recently adopted Michigan Standards for Preparation of Teachers of Upper Elementary – Mathematics (2018), key source documents were identified, including NCTM's Standards for Mathematics Teacher Preparation (2019 Draft), AMTE's Standards for Preparing Teachers of Mathematics (2017), and the NCTM publications *Principles to Actions: Ensuring Mathematical Success for All* (2014) and *Catalyzing Change in High School Mathematics: Initiating Critical Conversations* (2018). With the above framework as a guide, the committee members followed a process in which they considered these source documents and chose whether to affirm existing language, adopt or adapt new language from a key source, or draft original language to capture an important idea promoted by a key source. As the initial draft was complete in June, reviewers from the field of mathematics and mathematics education provided feedback. The reviewers included representatives across the spectrum of PK-12 and teacher preparation programs. This feedback was compiled and responded to by the committee, in such a way that incorporated all of it into the current draft. Each piece of feedback was discussed and either accepted as is, accepted with modifications, or rejected with rationale.

The resulting mathematics standards for teacher preparation represent several shifts in that they: embed Core Teaching Practices throughout; are equity focused; are written as performance objectives; integrate pedagogy, content, and dispositions; and have a narrower but deeper focus on content through conceptual understanding and application particularly needed by teachers. The four domains of the standards were intentionally ordered to reflect these shifts: 1. Pedagogical Knowledge and Practices for Teaching Mathematics; 2. Students as Learners of Mathematics; 3. Understanding of Social Contexts of Mathematics Teaching and Learning; and 4. Understanding Mathematics Concepts, Practices, Dispositions, and Curriculum. Educator preparation programs are expected to implement these standards in tandem with the Professional Knowledge and Skills standards and with Clinical Experiences Requirements in order that teacher candidates experience coherent, connected preparation experiences across the grade band(s) in which they are seeking endorsement.

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Standards for the Preparation of Teachers in Professional Knowledge and Skills in Middle Grades (5-9) and High School (7-12)

SBE PRESENTATION DRAFT

P.1. Learner-Centered Supports

Well-prepared beginning teachers of students in grades 5-9 & 7-12 will:

a. Purposefully incorporate approaches to address the cognitive, physical, behavioral, social, and emotional needs/development of adolescents (5-9 whole learner, 7-12 whole learner) throughout all aspects of teaching and learning.
b. Recognize and respond appropriately to the multiple influences on adolescent development, including but not limited to cultural, linguistic, religious, gendered, historic, economic, and social-emotional contexts throughout all aspects of teaching and learning.
c. Evaluate and analyze available curriculum and demonstrate ability to adapt or design rigorous, standards-aligned curriculum that reflects students' needs, assets, and interests; and connects the learners' language, culture, and experiences to learning.
d. Design challenging, standards-based instruction aligned with curriculum that reflects learners' needs, assets, and interests; and connects the learners' language, culture, and experiences to learning.
e. Cultivate and manage a student-centered classroom that leads to student empowerment / ownership, active engagement in exploration and learning, positive social interaction and behaviors, and an inclusive classroom community through norms, routines, restorative practices, and other non-punitive measures.
f. Utilize individual and collaborative learning environments. Incorporate and model for learners inter- and intra- personal problem-solving techniques and strategies for conflict resolution to develop positive and supportive relationships.
g. Design and enact appropriate instruction (e.g., asset-based, inclusive instruction) that leverages the strengths and contributions of all learners including the unique developmental needs and related instructional and behavioral goals of adolescents with disabilities.
h. Demonstrate knowledge of and apply a variety of strategies, instructional approaches, behavioral assessments, and positive behavioral interventions within the general education learning environment to promote the full participation of all adolescents, including exceptional learners such as adolescents with disabilities, English learners, and advanced learners.
i. Demonstrate knowledge of Individuals with Disabilities Education Act (IDEA) and Americans with Disabilities Act (ADA) by engaging in the procedural development, assessment, and enactment of Individualized Education Programs (IEPs), including the Multidisciplinary Evaluation Team process, and/or 504 plans.
j. Design, manage, and implement standards-based content instruction to support English learners' successful engagement with the core curriculum while developing English language proficiency, content-area literacy, and academic content knowledge.
k. Demonstrate knowledge and use of a variety of strategies to promote full participation of English learners in classrooms.
l. Acknowledge and reflect on the impact of personal beliefs, biases, privileges and experiences on the equitable interpretation of learner communication and behavior.

m. Address the impact of curriculum, policies, processes, and practices on the education of all adolescents, with particular attention to historically underserved communities and social identity groups through culturally-responsive curriculum, instruction, and advocacy.
n. Identify signs of trauma in adolescents and respond with trauma-informed and resiliency-informed instruction that promotes communication, safety, and a sense of belonging in the classroom. Appropriately adjust instruction in response to the emotional and social distress in the classroom through positive relationships with learners and families.
o. Administer and analyze outcome-aligned, systematic, formative, summative, and standardized assessments. Use assessment data to monitor learners' progress, inform instruction, and provide timely and constructive feedback to learners and their families.
p. Engage learners in using metacognitive strategies to reflect on their own learning and self-regulation, including self-assessment, self-reflection, feedback from others, and goal setting (e.g., aligning with IEPs, 504 Plans, Personal Curricula, or other official goal documents) as part of the assessment process.
q. Integrate instructional technology, aligned with International Society for Technology in Education (ISTE) Standards for Students to empower learners as knowledge constructors, creative and analytical thinkers, collaborators, and good digital citizens.

P.2. Ethics and Professional Growth

Well-prepared beginning teachers of students in grades 5-9 & 7-12 will:

a. Enact ethical practices aligned with professional and legal codes of conduct for educators including but not limited to maintaining student and family privacy (in accordance with the Family Educational Rights and Privacy Act), adhering to the Michigan Policy for the Emergency Use of Seclusion and Restraint, and the Michigan Code of Educational Ethics.
b. Use reflective practices to design, monitor, and adapt instruction as a means for gauging professional growth.
c. Engage in formal and informal ongoing professional learning opportunities that strengthen instructional practice, understanding of adolescent development, and student outcomes.
d. Model responsible digital citizenship as outlined in ISTE Standards for Teachers.
e. Enact ethical practices aligned with state laws related to the responsibilities and rights of the teacher in reporting known or suspected abuse, neglect, or maltreatment (mandated reporting).

P.3. Strategic Partnerships

Well-prepared beginning teachers of students in grades 5-9 & 7-12 will:

a. Identify valuable contributions and input that all families, caregivers, and community stakeholders provide for learners, by engaging with them as partners and agents in their learners' education.
b. Describe the roles and responsibilities of school professionals and utilize them as resources to support learners, classroom instruction, and positive classroom climate and culture.

c. Demonstrate intentional collaborative approaches aimed at assisting a learner's unique social-emotional health, well-being, and academic growth through mutually beneficial partnerships with colleagues.
d. Identify appropriate agencies and other resources in the larger community, in partnership with school resources, to support academic growth, social-emotional growth, and well-being of the whole learner.
e. Use a variety of communication strategies to create mutually beneficial relationships with students, families, caregivers, and communities that promote engagement, learning, and agency.
f. Engage in intentional community and business partnerships beyond the school setting to support learners' interests, expose learning opportunities and skills not offered in the classroom, scaffold college and career readiness, and develop pipelines to the workforce.

Standards for the Preparation of Teachers in English Language Arts in Middle Grades (5-9) and High School (7-12)

SBE PRESENTATION DRAFT

ELA.1. English Language Arts Learning Environments

Well-prepared beginning teachers of English language arts 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 inclusive, organized, safe and respectful learning environments that foster collaborative and meaningful opportunities for inquiry and learning (e.g., classroom libraries, choice reading, peer conferencing, writing/reading workshop, literature circles).
c. Develop a language-rich environment through active use of visual aids, resources, and artifacts that promote learning (e.g., classroom libraries; anchor charts; graphic organizers; interactive word walls; everyday, academic, and discipline-specific language; digital and non-digital tools).
d. 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 (e.g., through school and classroom libraries, mentor texts, digital resources).
e. Critically select and evaluate digital technologies to aid ELA learning, and facilitate learners' engagement with these resources (e.g., opportunities to create digital artifacts of learning, interactive simulations, game-based learning, digital narrative, informational texts).
f. Use a variety of flexible grouping strategies that address learners' specific literacy strengths, needs, prior knowledge, interests, and other factors, and capitalize on the social, cultural, and linguistic diversity of the classroom to maximize ELA learning for all students.
g. Cultivate dialogue across differences to promote social justice, critical engagement, and civil discourse around complex issues related to creating and maintaining a diverse, inclusive, and equitable society.
h. Create learning opportunities and contexts that leverage student and community literacies, learning, and knowledge to connect and engage with authentic audiences and communities beyond the classroom walls.

ELA.2. Culturally Responsive Practices in English Language Arts

Well-prepared beginning teachers of English language arts will be able to:

a. Use knowledge of theories and research about social justice, diversity, equity, student identities, and schools as institutions to enhance students' opportunities to learn in English language arts.
b. Create learning experiences responsive to students' local, national and international histories, individual identities (e.g., race, ethnicity, gender expression, age, appearance, ability, spiritual belief, sexual orientation, socioeconomic status, community environment), and languages/dialects as they affect students' opportunities to learn in ELA.
c. Acknowledge and value learners' use of their home and community language(s) and dialect(s) in the development of additional languages and literacies by providing opportunities to deconstruct and investigate the intersections between language, identity, and power. Develop and refine

understanding that monolingual American English speakers have multiple language identities.

d. Plan and implement instruction that builds upon learners' use of their first or home language(s) to enable rhetorical choices and language practices including code switching and code meshing for a variety of audiences, contexts, and purposes (including those beyond schooling/academia).
e. Select instructional materials —classic and contemporary, print and non-print texts, including young adult—that represent a range of world literatures, cultural and historical traditions, genres, and the experiences of a range of genders, ethnicities, and social classes.
f. Guide learners in applying literary theory to critically analyze print and non-print texts to identify themes, patterns, and biases that perpetuate or challenge stereotypes, injustices, and inequalities.
g. Gather and leverage information about students' individual differences, identities, and funds of knowledge as data to create inclusive, relevant, and socioculturally-meaningful learning opportunities that engage all students as active participants in their own ELA learning.
h. Establish and maintain high expectations for students by challenging them with increasingly complex texts to create equitable access to high quality learning experiences.

ELA.3. English Language Arts Curriculum Design and Assessment

Well-prepared beginning teachers of English language arts will be able to:

a. Establish authentic purposes for students to read and write beyond being assigned or expected to do so, including: for their enjoyment/interest; to ask and answer questions about humanity, society, their communities and/or individual lives; to address needs in their communities and diverse communities unlike their own; or to communicate with specific audiences.
b. Develop and implement interactive units of instruction that frame important relationships, explorations, problems or questions in order to provide opportunities to read and compose texts; study literature and language variation; listen, speak, and view; represent ideas in multiple modalities; and use language effectively and intentionally.
c. Design or adapt and implement ELA curricula that support learning in a variety of participation structures (e.g., whole class, small group, individual) across domains of literacy.
d. Select diverse texts and materials of varying complexity that align with instructional purposes (e.g., independent practice; study of author's craft, structure, and purpose, including argumentative writing; expand cultural perspectives; integrate knowledge and ideas).
e. Evaluate, adapt and supplement curriculum and assessment with an understanding of principles of language acquisition and the impact of language on society, while also aware of students' home languages.
f. Plan and implement instruction informed by ongoing observation and assessment of students' language, literacy, and social development and evolving identities as readers and writers.
g. Plan and implement coherent and relevant learning experiences in English language arts using evidence-based instruction aligned to Michigan standards for ELA in grades 5-9/7-12.

h. Involve students in self-assessment, including developing success criteria, identifying learning goals, and monitoring their own progress.
i. Design or knowledgeably select and use various assessment practices (e.g., formal, informal, formative, and summative assessments) for reading and writing processes, interests, and motivation to generate data to inform instructional decisions.
j. Assess reading comprehension in multiple ways, including questioning, retelling, dialogic conversations, summarizing, and authentic demonstrations of deep understanding of texts.
k. Analyze data patterns that document students' strengths and most critical needs in English language arts to provide relevant feedback for evaluating the effectiveness of instructional practices and informing subsequent instruction.
l. Provide specific, timely, and constructive feedback emphasizing learners' strengths and targeting most critical needs during the process of reading, writing, speaking, listening, viewing, and visually representing, and communicate with students about their performance in ways that actively involve them in their own learning (e.g., peer and teacher conferencing, discussion boards, interactive journals).

ELA.4. Accommodations and Differentiated Instruction

Well-prepared beginning teachers of English language arts will be able to:

a. Differentiate instructional processes, product and content expectations, and classroom environment to account for varying academic needs and capabilities and appropriately challenge all students.
b. Provide scaffolded support to students as needed to assist them in developing their English language arts proficiencies, removing supports over time to generate more independence.
c. Differentiate instruction based on students' self-assessments and formal and informal assessments of learning in English language arts, and communicate with students about their performance in ways that actively involve them in their own learning and in groups with students of differing abilities.
d. Identify factors that contribute to challenges to developing English language arts proficiencies (e.g., linguistic, cognitive, neurodevelopmental, social, cultural, behavioral, identity), adjust instructional contexts and practices to address challenges, and connect students with appropriate strategies, resources, and assistive technologies.
e. Use knowledge of diverse profiles of reading difficulty and how they vary in presentation and degree (e.g., dyslexia, dysfluent reading, language comprehension problems) to recognize and respond with resources and support, understanding that difficulties change as literacy develops, and emphases should change accordingly.
f. Structure learning activities so students simultaneously use multiple learning modalities (e.g., listening, speaking, moving, touching, reading, and/or writing) to increase engagement and support English language arts learning.

ELA.5. New/Digital Literacies

Well-prepared beginning teachers of English language arts will be able to:

a. Select and use a variety of instructional strategies and teaching resources, including contemporary technologies (e.g., software, hardware, supporting

technologies) and digital resources (e.g., websites, videos, games) for instructional purposes, consistent with current research about effective student learning in English language arts.

b. Provide generative learning activities that develop students' critical literacies in order to access, evaluate, and create digital (e.g., websites), media (e.g., audio, video), and visual (e.g., infographics) texts.
c. Engage students in discussion around digital and media literacies and engage students in dialogue using digital tools to share and communicate ideas through text, speech, and visualizations.
d. Design instruction that builds compositional fluency with multimodal rhetoric, adapting various technologies and writing styles for different audiences, purposes, and modalities.
e. Design instruction that encourages strategic, connected reading practices with both print and multimodal texts, inviting students to encounter, evaluate, and engage with texts as an individual reader as well as in a community of readers.
f. Use digital tools in ways that are safe, legal and ethical, recognizing students' rights of transformative use of copyrighted materials while also encouraging the use of public domain and Creative Commons-licensed materials.
g. Facilitate students' use of technology to communicate ideas clearly and express ideas creatively for a variety of purposes by selecting the platforms, tools, styles, formats and digital media appropriate to their goals.
h. Design meaningful learning experiences that allow students to generate ideas, test theories, create innovative artifacts, solve authentic problems, and promote local and global collaboration.

ELA.6. Foundations of English Language Arts

Well-prepared beginning teachers of English language arts will be able to:

a. Demonstrate knowledge of the conventions of English language as they relate to various rhetorical situations (e.g., grammar, usage, mechanics) and model for students appropriate language use across modes of communication and contexts.
b. Understand the relationship between fluency and comprehension, including when these skills support each other and when they develop independently, in order to inform instruction.
c. Recognize when students require support to decode, make meaning, and deeply understand texts and utilize multimodal strategies for building fluency and comprehension that consider students' experiences, strengths, needs, and interests.
d. Understand that comprehension of text occurs as a dynamic interaction between characteristics of readers (e.g., prior knowledge, interest, cultural connection), text (e.g., density, level of abstraction, structure), activity (e.g., purpose, structure, clarity), and context (e.g., classroom climate, culture of expectations), and select and implement instructional practices that shape this interaction.
e. Support and develop reading comprehension by attending to the components of the interaction describe in ELA.6.d during instruction (e.g. by building reader background knowledge modeling and guiding metacognitive strategies; and clarifying the purpose for reading).

f. Understand different levels of comprehension (e.g., the difference between literal and inferential comprehension of text) and use questioning and other means of formative assessment to gauge student comprehension and support students' close reading to develop deep understanding within and across texts.
g. Create intentional and incidental word learning experiences to capitalize on and expand students' expressive and receptive language use across modes of communication and contexts.
h. Plan and implement vocabulary instruction with rhetorical awareness of nuanced meanings that provides opportunities for students to demonstrate the depth to which words are known and can be used with associative, contextual, and generative knowledge.
i. Teach grammar and sentence structure in context to guide students towards an understanding of how grammar functions across contexts and builds the necessary knowledge for reading and writing in and outside the classroom.
j. Understand the concept of dialect and be familiar with relevant grammar systems (e.g., prescriptive and descriptive) while acknowledging and valuing learners' use of their home and community language(s) and dialect(s) in the development of additional languages and literacies.
k. Develop students' understanding of "Standard English" as socially constructed, reproduced, and privileged as part of standard language ideology.
l. Provide opportunities for students to engage in critical dialogue around the power and rhetorical use of language across contexts (e.g., use of first person in writing, oral traditions, language variation, figurative language).
m. Describe the characteristics of various genres and text types, including informational, argumentative, and narrative text; real world, digital, and academic.
n. Explain composition as a social and rhetorical process that serves a variety of purposes (in school and out of school) and relies on different processes and strategies.
o. Encourage habits of mind for good writing (i.e., creativity, flexibility, persistence, curiosity, openness, engagement, responsibility, metacognition).
p. Support and guide students through a recursive writing process that involves prewriting, planning, drafting, revising, feedback, editing, and publishing.
q. Support and develop the multiliteracies and cultural and linguistic assets students bring to writing experiences.
r. Create opportunities for students to write for different authentic audiences (e.g., peers, community members, other public audiences).
s. Provide regular time for students to write both formally and informally in order to reflect on one's thinking and the writing process.
t. Move students to independent levels of research, reading, and writing.

ELA.7. Composition

Well-prepared beginning teachers of English language arts will be able to:

a. Use knowledge of theory, research, and practice in English language arts to plan instruction, provide an environment and design assessments for composing texts (i.e., oral, written, and visual) to promote learning for all students.

b. Use models and mentor texts to illuminate features of a genre, rhetorical moves, and choices made by published authors, student writers, and teachers as writers.
c. Plan coherent and relevant composing experiences that reflect an understanding of writing processes and strategies in different genres using evidence-based instruction aligned to Michigan standards for ELA in grades 5-9/7-12.
d. Design a range of formative and summative assessments and related rubrics or scoring guides at both the student and class levels. Use resulting data to promote students' development as writers of argumentative, narrative, informative, or explanatory writing texts.
e. Provide ongoing feedback to student writing throughout the writing process (prewriting, planning, drafting, revising, feedback, editing, and publishing) and to finished texts in ways that engage students' ideas and encourage their growth as writers (e.g., face-to-face conferences, digital comments, peer review, screencasts).
f. Create opportunities for students to write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.
g. Provide explicit instruction related to the strategic use of language conventions (e.g., grammar, usage, mechanics, textual elements, rhetorical devices) in the context of students' writing for different audiences, purposes, and modalities.
h. Implement instruction that incorporates and sustains students' home and community languages, including code switching and code meshing, for a variety of audiences and purposes.
i. Utilize individual and collaborative approaches and contemporary technologies to compose in multiple modalities and a variety of genres for academic and out-of-school purposes.
j. Orchestrate a writing workshop with a predictable structure reinforcing different recursive stages of process writing.
k. Teach and support students in gathering and organizing evidence through inquiry-based research to demonstrate understanding of the investigated subject.

ELA.8. Vocabulary and Language Study in Context

Well-prepared beginning teachers of English language arts will be able to:

a. Provide practical opportunities for students to learn vocabulary as language in context and encourage students to actively and independently use and analyze their own language(s), as well as those of others.
b. Create a language rich classroom culture through available physical and social resources (e.g., through conversation, read aloud, audio books, silent reading, wide reading, writing, peer reviews, partner talk, inquiry) that expose students to new vocabulary and build sociocultural and academic conceptual knowledge.
c. Encourage students to identify, explore, and use new vocabulary in a variety of contexts and modes, including reading, writing, and discussion, and in print and digital texts.
d. Select appropriate words for instruction that are central to the meaning of a text or topic and likely to generalize to other contexts.

e. Create learning opportunities for students to study multiple facets of words in context, including phonology, word associations, orthography, morphology, etymology, syntax, semantics, and pragmatics through wide reading, inquiry, explicit and implicit instruction while remaining cognizant of students' experiences, strengths, needs, and interests.
f. Plan, modify, and implement evidence based instructional approaches to develop students' accurate use of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level.
g. Assess students' vocabulary strengths and weaknesses, such as range of word use, awareness of multiple meanings of words, understanding of idioms, word retrieval pace, and complexity of definitions through engagement in purposeful reading, writing, and oral language tasks.
h. Identify the intrinsic, extrinsic, and environmental factors that are causally related to vocabulary growth, including adult-child interaction patterns; school, socioeconomic, and community contexts; first language and dialect; and neurodevelopmental differences in language processing.

ELA.9. Literary and Rhetorical Analysis

Well-prepared beginning teachers of English language arts will be able to:

a. Plan and implement instruction respective to reading and interpreting texts through multiple theoretical and critical lenses.
b. Select and analyze texts and text sets that represent multiple points of view and contexts.
c. Select and use model texts to illustrate author's craft and rhetorical moves made by the writer or speaker.
d. Create opportunities for students to rhetorically analyze texts' audiences, purposes, contexts, and craft, including, but not limited to, form, organization/structure, style, register, language, voice, mechanics, and literary devices.
e. Create opportunities for students to engage in literary analysis of author's craft and devices, including, but not limited to, symbolism, figurative language, characterization, dialogue, setting, plot development, theme, and rhetorical moves.
f. Create opportunities for students to engage in genre analysis that includes naming, describing, and modeling the conventions, strategies, and patterns of thinking that are typical of different genres (e.g., literary analysis, creative nonfiction, journalism, poetry, book reviews, technical documents).
g. Support and develop students' ability to reflect on, respond to, and act upon their analyses through writing, reading, research, and speaking in ways that are appropriate to the range of contexts where the texts are being used (e.g., academic, personal, professional, public, community contexts).
h. Model for students and guide them through reading, analyzing, and evaluating print and multimodal texts composed in various styles, tones, and levels of formality.
i. Engage students in critical evaluation of sources for credibility, bias, quality of evidence, and quality of reasoning.
j. Model for students and guide them to analyze and interpret data in order to support claims with specific evidence and examples.

k. Use knowledge of students' social, cultural, and linguistic diversity to support them in analyzing and connecting to texts.

ELA.10. Motivation and Engagement

Well-prepared beginning teachers of English language arts will be able to:

a. Create a motivational context by fostering a community of confident readers and writers, a reading and writing culture, engagement with diverse texts, and habits of lifelong readers and writers.
b. Build rapport and relationships through meaningful interactions around experiences and inquiry activities that validate students' curiosity, questions, and emotional responses.
c. Cultivate students' literate identities and positive self-concept as readers and writers by growing their self-efficacy through multiple scaffolded techniques, including, but not limited to, notebooks, text and task choice, productive feedback, meaningful interactions/talk, conferences, opportunities to read and write for pleasure, self-reflection, goal-setting, and metacognition.
d. Provide access to and regular opportunities to work with a wide range of texts of varying complexity, structure, genres, represented identities, authorship, and modes.
e. Collaborate with librarians and others to curate access to a wide array of books, including children's and young adult literature and other texts.
f. Support students in making independent reading choices through book talks, peer recommendations, book browsing, book clubs/community, and book reviews, cognizant of students' individual experiences, strengths, needs, interests, emotions, and personal and social identities.
g. Assess students' developing reading and writing identities and engagement with text through formative assessment tools such as interest surveys, questionnaires, teacher observations, participation in peer-to-peer talk, informal conferences, self-assessments (e.g., reading ladders, logs, territories), conference records, portfolios, and artifacts of student work.
h. Model and make visible to students the habits of a lifelong reader and writer (e.g., think-alouds, writing and reading with students, author visits, annotations, comprehension strategies, conferring, community readers/writers, peer reading programs, participation in reading events and networks).
i. Celebrate student voices and productions by providing avenues for publishing and communicating with authentic audiences (e.g., online, public spaces, classroom guests, conferences).
j. Offer learners substantive options, choices, and input into learning activities and provide a variety of meaningful purposes for curricular units and tasks in the service of critical disciplinary inquiry.
k. Provide continual encouragement for academic and personal attainment and interests by emphasizing the utility, value, and enjoyment of literacy and literacy tasks (e.g., reading of high-interest texts).
l. Build interpersonal relationships with learners that encourage mutual trust and commitment by arranging collaborative activities that foster literacy learning through social interactions.

ELA.11. Speaking and Listening

Well-prepared beginning teachers of English language arts will be able to:

a. Facilitate a range of collaborative discussions to generate knowledge and ideas and to express ideas clearly and effectively for specific rhetorical situations.
b. Select and use evidence-based instruction to design authentic communication experiences that integrate listening, speaking, viewing, visually representing, reading and writing.
c. Teach active listening for understanding, empathy, and synthesis of ideas and information from multiple perspectives in order to support collaborative inquiry and classroom community-building.
d. Provide regular opportunities for students to critically view, listen, and respond to oral presentations and stories, including those that incorporate visual and quantitative information to make students' conclusions public (e.g., debate, reports, presentations to external audiences).
e. Provide regular opportunities for students to present information, understanding, concepts, and ideas to diverse audiences, based on their strengths, needs, and interests.
f. Understand how the structure, conventions, and evolution of language (e.g., patterns, dialects) affect the oral communication process and apply that knowledge in instruction and assessment.
g. Illuminate how language choices, including dialect and home languages, shape students' listening and speaking as part of the social, cultural, and dynamic nature of verbal and nonverbal language.
h. Guide students in analyzing oral, written, and visual texts to determine their style, voice, and language choices, and evaluate their appropriateness to context, purpose, audience, and genre.
i. Model and facilitate productive discussions by making discursive moves and constructing norms appropriate to the discipline of ELA and to civic discourse around public issues and potentially controversial topics.

ELA.12. Literature

Well-prepared beginning teachers of English language arts will demonstrate:

a. Understanding of literature as oral, written, enacted, and visual texts that reflect diverse cultures, values, traditions, and perspectives, including but not limited to books written for children and young adults (e.g., fiction, nonfiction, multimodal texts).
b. Knowledge of a wide variety of quality contemporary and classic literature relevant for secondary students in ELA classrooms and appropriate for different developmental levels and student needs, including multicultural/world literature, literature by women, and literature for young adults.
c. Awareness of the power of literature to affirm lived experience, create empathy, catalyze conversations, and respect the questions, challenges, and emotions of childhood and adolescence.
d. Commitment to teaching young adult literature in ways that honor literary quality as well as potential to spark personal and social transformation.
e. Understanding of the inherent value of young adult literature for both general reading and classroom use.
f. Awareness of resources that can provide them with information about quality new books and their potential for classroom use and reading advisory.

Well-prepared beginning teachers of English language arts will be able to:

g. Serve as a reading role model, lifelong reader, book matchmaker, and advocate for diverse children's and young adult literature.
h. Employ critical literacy practices to critique the social narratives that are embedded in classic and contemporary literature in order to read with and against the text.
i. Prepare rationales for selection and use of literature and other texts to present to students, parents, and other stakeholders and to respond to potential challenges.
j. Advocate for students' reading selections and right to read.
k. Select and use a range of literature relevant for secondary students in ELA classrooms and appropriate for different developmental levels and student needs, including multicultural/world literature, literature by women, and literature for young adults.

ELA.13. Professionalism

Well-prepared beginning teachers of English language arts will seek to:

a. Participate in and facilitate professional development opportunities provided within school buildings and districts.
b. Participate in and facilitate professional development outside of district-provided offerings, including learning opportunities provided by universities and professional organizations at the state (e.g., Michigan Council of Teachers of English), national (e.g., Michigan Council of Teachers of English), and international levels (e.g., International Literacy Association).
c. Work effectively with colleagues in English language arts professional learning communities (PLCs).
d. Foster positive working relationships with students, families, community members, administrators, and teaching colleagues.
e. Model life-long reading and writing practices in both professional and personal contexts.
f. Read scholarly journals (e.g., *English Journal, Voices from the Middle*) and research-based books focused on teaching English language arts.
g. Stay current and conversant about local and global issues relevant to the English language arts classroom.
h. Connect teaching and learning to social, political, and cultural contexts in ways that support students' growth of critical consciousness.
i. Be politically active in local, state, or national policy decisions related to the English language arts teaching.
j. Advocate for diversity, inclusion, justice, and equity in English language arts classrooms, curricula, and instruction and within the school and district at large.

Standards for the Preparation of Teachers in Mathematics in Middle Grades (5-9) and High School (7-12)

SBE PRESENTATION DRAFT

A. Pedagogical Knowledge and Practices for Teaching Mathematics

A.1. Promote Equitable Teaching

Well-prepared beginning teachers of mathematics structure learning opportunities and use teaching practices to advance the learning of every student by providing access, support, and challenge while learning rigorous mathematics. Well-prepared beginning teachers of mathematics:

a. Facilitate a range of tasks through equity-based pedagogy including consideration of students' individual needs, cultural experiences, and interests, as well as prior mathematical knowledge.
b. Develop a classroom community in which students present ideas, challenge one another's ideas respectfully, construct meaning together, value and celebrate varied mathematical strengths, and use mathematics to address problems and issues in their school, homes, and communities.
c. Ensure all student approaches, responses, representations, experiences, and voices are valued in mathematical inquiries, discourse, and problem solving.
d. Facilitate multiple opportunities for all students to formulate, represent, analyze, interpret mathematical models using a variety of tools including technology.
e. Provide all students access to the ways of doing mathematics (e.g., inquiry, technology, mathematical language including symbols and notation).
f. Engage all students in challenging mathematics content, building from their own funds of knowledge as they use multiple representations and models of their choice.
g. Use students' developing understandings as found in various student representations (e.g., visualizations, vocalizations, models, symbols, notation) to appropriately plan next steps for instruction.

A.2. Plan for Effective Instruction

Well-prepared beginning teachers of mathematics attend to a multitude of factors in planning for effective instruction (e.g., learning progressions, students' individual learning needs, options for student engagement, task selection and implementation, formative and summative assessment data). Well-prepared beginning teachers of mathematics:

a. Establish appropriate and rigorous learning goals for students, which build on student understandings and are situated within learning progressions, research about student learning, mathematics standards and practices, and the approach to learning mathematics.
b. Attend to the development of both conceptual and procedural understanding as they choose tasks and design instruction.
c. Plan and implement rich tasks, including the appropriate instructional strategies that provide opportunities and access for all students to actively engage in the mathematical learning.
d. Anticipate an array of students' responses to tasks, craft questions, and prepare follow-up replies to probe student thinking in a way that relates the mathematical concepts and procedures.

e. Select mathematics-specific tools and technology to develop student conceptual understanding of mathematics.
f. Plan ways to use evidence of student thinking to assess progress toward mathematical understanding and possible instructional adjustments.
g. Draw on current research to develop mathematics instruction and assessment.
h. Consider their students as learners, including how to motivate and engage all students in learning mathematics.

A.3. Implement Effective Instruction

Well-prepared beginning teachers implement effective mathematical pedagogical practices found in NCTM's *Principles to Actions* (2014) to develop students' meaningful learning of mathematics. Well-prepared beginning teachers of mathematics:

a. Use established learning goals to guide instructional decisions.
b. Engage students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.
c. Engage students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.
d. Facilitate discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student strategies and arguments.
e. Pose purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.
f. Use strategies that ground procedural fluency in conceptual understanding so that students, over time, become skillful in using procedures flexibly and efficiently as they solve contextual and mathematical problems.
g. Provide students with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.
h. Use evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.
i. Analyze students' thinking that leads to an incorrect answer, identify the mathematical understanding that students have and may not yet have, and reply in a way that helps students develop their own understanding.
j. Implement the use of appropriate mathematical tools (e.g., technology and manipulatives) to develop students' conceptual understanding.
k. Are committed to enacting effective mathematics instruction that supports the learning of each and every student, including appreciating and accepting student reasoning that may be atypical or different from their own.
l. Reflect upon instruction to inform planning for future teaching.

A.4. Enhance Teaching Through Collaboration With Colleagues, Families, and Community

Well-prepared beginning teachers of mathematics seek and leverage collaboration with others, which could include education professionals, parents, caregivers, and community partners, to provide effective mathematics instruction for every student. They also engage colleagues, families, and/or the community in mathematical

conversations and experiences to enhance the mathematical learning of their students. Well-prepared beginning teachers of mathematics:

a. Make their professional ideas and decisions visible and subject to shared examination by colleagues to develop a deeper shared understanding of students' learning and to support their development as a teacher.
b. Plan strategies to grow professionally and promote the mathematical success of students in collaboration with colleagues.
c. Understand, interact and build intentional relationships with families and community members to learn their perspectives, priorities, and cultures that can provide information regarding the mathematical learning needs of students.
d. Utilize mathematics knowledge and experiences related to students' culture, community, family, and history as resources for interactions with students.
e. Provide constructive feedback to students' families and caregivers focused on strengths and areas of growth concerning students' mathematical performance.
f. Develop shared strategies with families and caregivers for promoting mathematical success of the student.
g. Possess an awareness of and commitment to employing multiple strategies to get to know students' families and communities in order to better serve students.

B. Students as Learners of Mathematics

B.1. Anticipate and Attend to Students' Thinking About Mathematics Content

Well-prepared beginning teachers of mathematics understand how students' mathematical ideas develop across levels of thinking in learning a specific mathematical topic. They use knowledge of what comes before and after a given mathematics topic to plan instructional moves to extend student thinking and competency. Well-prepared beginning teachers of mathematics:

a. Understand learning progressions within the mathematical content domains they may teach which includes knowledge of the mathematics that comes before and after a given mathematics topic.
b. Elicit and analyze students' thinking to understand where students lie on the learning progression.
c. Utilize understanding of students' thinking to plan for and execute instructional moves to advance students' learning.
d. Provides frequent opportunities for students to be metacognitive about their own learning and understandings.
e. Recognize the importance of eliciting and understanding student experiences and identity in shaping their mathematical thinking.

B.2. Promote Students' Engagement in Mathematical Practices

Well-prepared beginning teachers of mathematics strategically create environments in which students engage in the mathematical practices as described in the Michigan K-12 Mathematical Standards and recognize the challenges that students may face when engaging in them. Well-prepared beginning teachers can identify teaching

moves that support or inhibit students' engagement with the mathematical practices. Well-prepared beginning teachers of mathematics:

a. Anticipate that students will present various approaches to problems and support students in analyzing, comparing, justifying, and proving their solutions.
b. Create environments in which strategies are respectfully discussed, critiqued, and compared.
c. Identify how contexts, culture, conditions, and language can be used to create meaningful and authentic tasks that relate to their students' interests, backgrounds, prior knowledge, and experience, leading to increased engagement and motivation in math.
d. Present tasks that have high cognitive demand, have multiple solution strategies, entry points and representations, require communication of thinking and reasoning, and ensure students engage in rigorous mathematics.
e. Reflect on teaching moves that support or inhibit the engagement of students with the mathematical practices.
f. Pose questions for students that help them analyze problem situations, select strategies, and reason quantitatively.

B.3. Cultivate Positive Mathematical Identities of Students

Well-prepared beginning teachers of mathematics support students in developing and maintaining positive mathematical identities. A student with a positive mathematical identity has a productive disposition towards mathematics that includes the inclination to see mathematics as sensible, useful, and worthwhile, along with a belief in one's own diligence and efficacy when doing mathematics. Well-prepared beginning teachers of mathematics:

a. Are reflective practitioners, understanding that student learning of mathematics relies upon the teacher and should view their roles as supporting the development of students' mathematical identities through their interactions with students and instructional decisions.
b. Plan and implement mathematics instruction that draws on all students' mathematical strengths and positive mathematical identities that will allow them to be successful with the mathematics they are learning which in turn continues to develop positive mathematical identities.
c. Analyze their task selection and implementation, reflecting on ways this shapes students' mathematical identities and consider how the experience of doing the task supports developing a positive mathematical identity for each student.
d. Create classroom environments and orchestrate classroom discussions that enable respectful communication about mathematical ideas that support the development of positive student identities.
e. Work to combat negative beliefs including stereotypes about who is good at math and build positive beliefs within and among students.
f. Exhibit an asset-based perspective rather than a deficit-based view in interactions with students, realizing that mathematical errors are opportunities for learning and that all students bring their own unique mathematical strengths to the learning environment.
g. Acknowledge the diversity of individual and group identities, particularly those whose learning experiences and needs are different from their own, including

both individual differences (e.g., personality, interests, learning modalities, life experiences), and group differences (e.g., race, ethnicity, ability, gender identity, gender expression, sexual orientation, nationality, language, religion, political affiliation, socio-economic background) and use these in designing instruction to validate and build productive identities.

h. Take conscious and intentional actions to build students' agency as mathematical learners, based on strong beliefs that each and every student can learn mathematics with understanding.

C. Understanding of Social Contexts of Mathematics Teaching and Learning

C.1. Provide Access and Opportunity

Well-prepared beginning teachers of mathematics work to provide access for every student to a high-quality mathematics curriculum, effective teaching and learning where high expectations are in place for every student, and the support and resources needed to maximize the learning potential of each and every student. Well-prepared beginning teachers are also knowledgeable about and prepared to advocate for equitable practices for identifying opportunities for all students to succeed and excel in mathematics. Well-prepared beginning teachers of mathematics:

a. Understand that access includes ensuring all students, particularly those that have been historically marginalized, have qualified teachers, opportunities for placement into higher level courses, high quality curriculum, and opportunities to approach problems.
b. Understand how denial of access and advancement perpetuate and produce inequities in the learning of mathematics, particularly for traditionally underrepresented and/or underserved students.
c. Are knowledgeable about and prepared to advocate for equitable practices for identifying students for advancement, which include analysis of multiple indicators ensuring advancement is open to a wide range of students.
d. Understand the negative impacts of tracking students into qualitatively different or dead-end course pathways.
e. Understand and can employ accommodations available for students with exceptionalities to promote their access and advancement in mathematics.

C.2. Understand Power and Privilege in the History of Mathematics Education

Well-prepared beginning teachers of mathematics understand the social and economic impacts of the roles of power and privilege in the history of mathematics education and are equipped to promote systems that produce equitable mathematics learning experiences and outcomes for all students. Well-prepared beginning teachers of mathematics:

a. Understand current and historical mathematical educational practices that contribute to inequitable student opportunities and outcomes such as, but not limited to: social barriers (e.g., finances, teaching philosophy, demographic trends, culture), structural barriers (e.g., classroom size, schools, teachers, resources), and system policies (e.g., those related to placement and instruction, tracking, high stakes test taking).

b. Are knowledgeable about national reform movements in mathematics education, including the strides and challenges in affording every student a quality mathematics education.
c. Recognize and are willing to advocate for changes to policies and procedures that have negatively impacted mathematics learning, particularly for those students who have not historically experienced success in mathematics.
d. Analyze mathematical curriculum and instruction to determine whether either is likely to contribute to inequitable mathematical outcomes and opportunities for students.
e. Recognize implicit and explicit biases in themselves and others, including biases in the school/district culture, which work against equitable mathematics learning opportunities and supports for all learners; works to counter these biases so that all students learn challenging mathematics deeply and well.

C.3. Enact Ethical Practice for Advocacy

Well-prepared beginning teachers of mathematics are prepared to take action in the classroom, at school meetings, in professional settings, with families and the wider community, and in other spaces to publicly champion meaningful and robust mathematical experiences for all students. Well-prepared beginning teachers hold themselves and others accountable to challenge the status quo of their students' mathematical experiences and recognize the advocacy role of teaching. Well-prepared beginning teachers of mathematics:

a. Develop and use language that is effective in advocating for all students and conveys high expectations for learning mathematics.
b. Identify personal beliefs, classroom practices, and systemic structures that produce equitable and inequitable mathematical learning experiences and outcomes for students.
c. Work with others to develop strategies and methods to ensure traditionally marginalized students experience success in mathematics.
d. Are knowledgeable about and use effective advocacy strategies that promote meaningful inclusion of all students in the learning of mathematics.
e. Recognize their responsibility to stand up to exclusion, prejudice, and injustice of students in the learning of meaningful and robust mathematics.

D. Understanding Mathematics Concepts, Practices, Dispositions, and Curriculum

NOTE: Bold Text = required for 7-12 grade band, *Italics* = required only for 5-9 grade band, standard text = required for both grade bands

D.1. Know Relevant Mathematical Content

Well-prepared beginning teachers of mathematics have deep and flexible knowledge of core mathematical concepts and procedures that they will teach, along with knowledge both beyond what they will teach and foundational to those core concepts and procedures.

D.1.1. Essential Concepts in Number

Well-prepared beginning teachers demonstrate and apply conceptual understanding, procedural fluency, factual knowledge and applications of the major mathematical concepts in number including flexibly applying computational procedures, using real and rational numbers in contexts, solving problems involving numbers and evaluating the solutions. Essential concepts in number include *integers, fractions*, number theory, operations (including exponentiation) and their meanings and properties, meanings of complex numbers**, operations with complex numbers, matrices, vectors, and graphing in a polar coordinate system.** Well-prepared beginning teachers:

a. Demonstrate "number sense"- flexible reasoning with and about whole numbers, integers and rational numbers in a variety of situations and applications through opportunities such as composing and decomposing numbers and number talks.
b. Describe the underlying structure of the *real* / **complex** number system and the learning progression for the development of number across the grades from kindergarten through high school.
c. Identify and apply a variety of strategies to compare and estimate rational and irrational numbers.
d. Understand and are fluent in using operations and appropriate notation, including exponentiation **and logarithms**, with *rational* / **complex** numbers, and can apply and justify multiple strategies for adding, subtracting, multiplying and dividing *rational* / **complex** numbers.
e. Apply and connect concepts such as factor, prime, divisible, and multiple to particular numbers and sets of numbers.
f. Reason about and prove basic theorems about real numbers (e.g., the product of two negative numbers is positive, $\sqrt{2}$ is irrational, or the product of two odd numbers will be odd).
g. Use technology to investigate certain numbers (e.g., value of pi, compare the relative size of two numerical expressions, evaluate limiting processes, or **compute with matrices**).
h. Understand how complex numbers are related to the solutions of *quadratic* / **polynomial** equations.
i. **Recognize that vectors and polar coordinates are useful mathematical tools to describe both location and direction and are able to employ these tools in contextual situations.**
j. **Recognize that matrices are a shorthand notation for organizing information and for carrying out computations on that information.**

D.1.2. Essential Concepts in Ratios and Proportional Relationships

Well-prepared beginning teachers demonstrate and apply conceptual understanding, procedural fluency, factual knowledge and applications of the major mathematical concepts related to ratios and proportional relationships including rates and percents and their applications in contexts. Essential concepts in ratios and proportional relationships include understanding ratios; that equivalent ratios connect to proportional relationships (y=kx) and to graphs of rays from the origin (0,0); and that percents are a particular form of a ratio and are invaluable tools in comparing quantities when the group sizes are different. Well-prepared beginning teachers:

a. Describe the learning progression for the development of proportional reasoning across the grades from kindergarten through high school.
b. Identify situations in which ratios can be a tool to solve problems and apply a variety of strategies such as ratio tables, double number lines, and unit rates to solve problems involving ratios.
c. Understand ratios as paired quantities that vary together in the same relationship*,* distinct from a single number, recognizing that a ratio a:b may be associated with a value *a/b* (if *b* is not 0) and can describe the differences and similarities between ratios and fractions.
d. Identify and use equivalent ratios, reason about the role of multiplication and addition in generating equivalent ratios and recognize that the sum of equivalent ratios is another equivalent ratio.
e. Associate a unit rate with a ratio, recognize that equivalent ratios have the same unit rate, and recognize this unit rate as the constant of proportionality (*k*) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
f. Connect the constant of proportionality (*k*) to the slope of a line through the origin and to the equations of such a line $a:b \rightarrow y = (b/a)x$, and describe how this perspective relates to the general concept of linearity.
g. Reason about contextual situations, identifying those that involve proportional relationships and use a variety of strategies for solving problems involving proportions, including finding a unit rate.
h. Connect ratios to scale factors, both within and between scaled figures, and relate scale factors to similar shapes, including how scaling a figure affects the area and volume of the scaled figures.
i. Describe percentage as a particular ratio of a quantity to 100, and apply this understanding to solve a variety of contextual problems.

D.1.3. Essential Concepts in Algebra

Well-prepared beginning teachers demonstrate and apply conceptual understanding, procedural fluency, factual knowledge and applications of the major concepts in algebra including how algebra can be used systematically to represent patterns and relationships among numbers and other objects, to analyze change, and to model everyday events and problems of life and society. *Well-prepared beginning middle school (5-9) teachers are expected to have a comprehensive, robust understanding of the essential concepts related to algebra content at the 5-9 level*; the **well-prepared beginning high school (7-12) will have a comprehensive, robust, understanding of algebra and a basic understanding through linear algebra**. Essential concepts in algebra include understanding the role of and generating equivalent expressions, solving equations and inequalities in both real **and complex numbers**, and graphing algebraic relationships. **Additional concepts should include algebra from a more theoretical approach such as relationships among groups, rings, and fields and concepts from linear algebra.** Well-prepared beginning teachers:

a. Explain how algebra as the language of generalization is useful for describing patterns and relationships.
b. Appreciate the value that new technologies can bring to developing algebraic understandings and strategically employ them in improving learning experiences in algebra for all students.

c. Describe how algebraic concepts build from arithmetic and are connected to other content areas, such as geometry, statistics and calculus.
d. Describe the role of and be able to apply definitions, reasoning and proof in algebra including identifying conditions under which theorems are valid, recognizing contradiction as a proof strategy, and using conjectures to investigate algebraic relationships.
e. Use different technologies to enhance the learning of mathematics such as computer algebra systems to investigate algebraic structures and to check results; spreadsheets to produce and explore regularity in repeated reasoning; graphs to explore algebraic relationships; and interactive dynamic technologies to develop conceptual understanding of key algebraic topics.
f. Interpret the structure of an algebraic expression in terms of a context and understand that structure can provide insight into a mathematical situation.
g. Connect symbolic, graphical, tabular and verbal representations of a problem or situation and explain any advantages and disadvantages of each representation for the given problem or situation.
h. Use algebra as a tool to solve contextual problems including identifying variables, formulating an algebraic model, manipulating and analyzing the model, interpreting the results and validating the conclusions.
i. Explain and justify routine procedures involved in manipulating expressions and solving equations including the use of the properties related to multiplication, addition and equality.

D.1.4 Essential Concepts in Functions

Well-prepared beginning teachers demonstrate and apply conceptual understanding, procedural fluency, factual knowledge and applications of the major concepts related to function, including models of real-world contexts where one variable determines another. The differentiation between a well-prepared middle grades and high school teacher lays in their additional level of expertise in the various types of functions noted below. Essential concepts in function include mapping from one set to another in which each element of the second set is uniquely paired with one element from the first, recognizing the characteristics of different function families (e.g., linear, exponential, polynomial, absolute value, piece-wise, **trigonometric**, **logarithmic,** defined) as well as creating and interpreting different representations of functions. Well-prepared beginning teachers:

a. Recognize the value of function as the language and organizational structure in the analysis of mathematical relationships.
b. Understand how algebra concepts are related to the ideas of function and that not all algebraic equations are functions.
c. Represent functions, with and without technology, in a variety of ways including mapping diagrams, function notation, recursive definitions, tables, and graphs.
d. Connect members of the same function family and identify distinguishing attributes (structure) common to all functions within that family.
e. Compare function families and describe their similarities and differences. (e.g. linear functions are additive, exponential functions are multiplicative).
f. Describe and reason about key features of the graphs of functions, using appropriate language, (e.g. zeros, intercepts, rate of change, increasing/decreasing and maximum/minimum values; **asymptotes**);

associate symbolic representations with these features and interpret them in both mathematical and real-world contexts.

g. Model a wide variety of real situations using functions and understand the processes of making and changing assumptions, assigning variables, and finding solutions to contextual problems.
h. Apply one or more function transformations to a representation (verbal, symbolic, graphical or tabular) of a function and explain the effects and results on other representations.

D.1.5 Essential Concepts in Statistics and Probability

Well-prepared beginning teachers demonstrate and apply conceptual understanding, procedural fluency, factual knowledge and applications of the major concepts in statistics and probability including understanding the statistical investigation process (formulate questions, collect data or select portions of given data sets, analyze data, interpret results). Essential concepts in statistics and probability include aspects of data literacy, visualizing and summarizing data recognizing the foundational role of variability, statistical inference, and basic ideas related to probability. Well-prepared beginning teachers:

a. Describe the difference between the way conclusions are made in mathematics (deductive and deterministic) and in statistics (inductive and account for uncertainty) and appreciate that statistical reasoning is always grounded in a context in the presence of variability.
b. Describe statistics as an investigative process of problem-solving and decision-making and explain how proficiency in statistical thinking matures as learners gain more knowledge and experience with variability (the developmental levels as outlined in the Guidelines for Assessment and Instruction in Statistics Education).
c. Use real data with a context and purpose, hands on activities and active learning and technology to explore concepts and to manage and analyze data in developing understanding of statistical ideas.
d. *Understand and explain measures of center and spread.*
e. Identify the role of randomization and chance in determining the probability of events and **how randomization is connected to the scope of inference**.
f. Draw inferences about a population based on a sample in light of sampling variability using simulation-based techniques that lead to *informal* / **formal** inference procedures.
g. Evaluate reports based on data, reasoning critically and asking questions about the implementation of the statistical investigation process and critique the ways in which numbers and graphical representations are used in the media, mathematical contexts, and everyday discussions.
h. **Describe the differences among types of studies (survey, experiment, and observational) and number and type of variables (quantitative and categorical) determine the scope and validity of statistical inferences.**
i. Connect the probability of an outcome to a long-run relative frequency of an outcome and investigate chance processes, developing, using, and evaluating probability models.

j. Analyze and describe the association between variables **including experience with multivariate thinking** and considering whether causation can be established.
k. Design a basic observational or **experimental** study based on the statistical investigation process.
l. Reflect upon data from implementation of classroom practices to enhance their own craft.

D.1.6 Essential Concepts in Geometry, Trigonometry, and Measurement
Well-prepared beginning mathematics teachers demonstrate and apply conceptual understanding, procedural fluency, factual knowledge and applications of the major concepts in geometry, recognizing geometry as a systematic study of size, shape, location and navigation to provide a lens to view and model the world. Essential concepts in geometry, trigonometry, and measurement include properties of one, two, and three-dimensional shapes; measurement techniques and units; transformations; geometric arguments; trigonometric relationships; **development of axiomatic proof**; and *foundational*/**robust** understanding of non-Euclidean geometries. Well-prepared beginning teachers:

a. Recognize and value geometry as a lens to reason with ideas and to solve problems from real world and mathematical domains.
b. Connect geometry and measurement to other mathematical content areas such as: to algebra when they work in the coordinate plane, to ratios and proportional relationships when they explore scaling and scale drawings, to functions when they explore transformations, to number theory when they explore Pythagorean triples, and to calculus when they find the area under a curve.
c. Recognize and describe the levels of geometric understanding (such as van Hiele) as it develops through a progression from investigations to more formal proof and reasoning.
d. Explain, apply, and reason about the Pythagorean theorem (both the statement and the contrapositive), are able to reason through proofs of the theorem based on similarity, area or transformations, and can describe the connections of the Pythagorean theorem to areas of mathematics such as coordinate geometry (distance formula, equations of circles) and trigonometry.
e. Use a variety of tools including dynamic geometry software to investigate and understand variance and invariance of geometric objects and to make and test conjectures.
f. Understand congruence and similarity in terms of transformations and solve problems involving congruence and similarity in multiple ways.
g. Apply the transformation definition of congruence and similarity in terms of rigid motions to establish congruence and similarity criteria and use these criteria to prove theorems about triangles, quadrilaterals, and other geometric figures.
h. Solve problems using transformations, coordinate geometry or Euclidean geometry.
i. Understand the role of definitions, postulates, and axioms and use them to prove theorems about angles, lines, and 2 and 3-dimensional shapes, including the parallel postulate and its connection to Euclidean and **non-Euclidean** geometries.

D.1.7. Essential Concepts in Calculus

Well-prepared beginning mathematics teachers demonstrate and apply conceptual understanding, procedural fluency, factual knowledge and applications of the major mathematical concepts in calculus, recognizing calculus as the study of change, including instantaneous rates of change and accumulation of values. *Well-prepared beginning middle school (5-9) teachers are expected to have a foundational, basic knowledge of the key concepts in calculus*; the **well-prepared beginning high school (7-12) will have a comprehensive, robust, understanding of the topics**. Essential concepts in calculus include limits; rates of change; continuity; fundamental theorem of calculus; and the meaning, techniques, and applications of differentiation and integration. Well-prepared beginning teachers:

a. Recognize and value the power of calculus to solve observed phenomenal problems involving change and **accumulation**.
b. Understand how ideas related to algebra, geometry, and functions are involved in understanding and applying calculus concepts.
c. Connect the concepts of limit, derivative, and integration.
d. Use dynamic interactive technology to develop conceptual understanding of key concepts such as derivative or mean value theorem, use graphing technology to analyze functions and their first and second derivatives; and develop notions of limit and understand how sequences and series behave.
e. Apply *foundational*/**robust** definitions, theorems, and concepts from calculus to solve mathematical and contextual problems, attending to the need to verify the hypotheses/conditions for using theorems.
f. Interpret results in the context of a given situation when using calculus to solve a problem.
g. Fluently use and interpret the notation involved in describing and working with limits, derivatives, integrals, **series**, and **sequences**.
h. Connect graphical, algebraic, tabular, and verbal representations of a problem involving rates of change, approximations, or **accumulation**, understanding the advantages and limitations of each.
i. Identify and explain *foundational*/**robust** common underlying structures in concepts involving rate of change, approximations, and **accumulation**.

D.1.8. Essential Concepts in Discrete Mathematics

Well-prepared beginning mathematics teachers demonstrate and apply conceptual understanding, procedural fluency, factual knowledge and applications of the major mathematics concepts related to discrete mathematics including the exploration of discrete rather than continuous variables. *Well-prepared beginning middle school (5-9) teachers are expected to have a foundational, basic knowledge of the key concepts in discrete mathematics*; the **well-prepared beginning high school (7-12) will have a comprehensive, robust, understanding of the topics**. Essential concepts in discrete mathematics include logic, set theory, counting, number theory, graph theory, **induction,** and recursion. Well-prepared beginning teachers:

a. Seek out opportunities to engage in solving problems leveraging strategies and tools from areas of discrete mathematics.
b. Identify ways in which discrete mathematics can connect different mathematical domains.

c. Use a variety of techniques to count and arrange sets of objects (combinatorics), including making the connection of counting to Pascal's triangle.
d. Apply mathematical induction to prove statements about sequences.
e. Understand recurrence relations and can reason recursively.
f. Model situations with networks and use graph theory to solve problems.
g. Are familiar with algorithms, their implementation and efficiencies.
h. Identify and analyze common sequences and their characteristics (e.g., Fibonacci, triangular numbers, arithmetic, and geometric progressions).
i. Apply concepts from logic and logical reasoning puzzles and related mathematical problems
j. Understand and appreciate how discrete mathematics is used in real world situations such as theoretical computer science and cyber security.

D.2. Demonstrate Mathematical Practices

Well-prepared beginning teachers of mathematics demonstrate deep and flexible knowledge of mathematical practices (see Michigan K-12 Standards for Mathematical Practice). Like their future students, they are able to use these mathematical processes and practices as tools to solve problems and communicate ideas. Well-prepared beginning teachers:

a. Engage in Mathematical Practices:
    - *SMP1: Make sense of problems and persevere in solving them*
    - *SMP2: Reason abstractly and quantitatively*
    - *SMP3: Construct viable arguments and critique the reasoning of others*
    - *SMP4: Model with mathematics*
    - *SMP5: Use appropriate tools strategically*
    - *SMP6: Attend to precision*
    - *SMP7: Look for and make use of structure*
    - *SMP8: Look for and express regularity in repeated reasoning*
b. Understand that doing mathematics is a sense-making activity that calls for perseverance, problem posing, and problem solving.
c. Explain their mathematical thinking using grade-appropriate concepts, procedures, and language, including grade-appropriate definitions and interpretations for key mathematical concepts.
d. Be metacognitive with respect to the practices in their mathematical thinking and highlight these actions and behaviors when they observe them in others.
e. Recognize the interrelationships among the practices and how they support each other, and those that are important to a mathematical investigation.

D.3. Exhibit Productive Mathematical Dispositions

Well-prepared beginning teachers of mathematics expect mathematics to be sensible, useful, and worthwhile for themselves and others, and they believe that all people are capable of thinking mathematically and are able to solve sophisticated mathematical problems with effort. Well-prepared beginning teachers:

a. Know that success in mathematics depends on a productive disposition toward the subject.
b. Are reflective practitioners, understanding that student learning of mathematics relies upon them and view their roles as supporting the development of students' robust and powerful mathematical identities.

c. Describe mathematics as a sense-making activity that calls for habits of mind such as curiosity, imagination, inventiveness, risk-taking, and persistence.
d. See sense in mathematics, perceive it as both useful and worthwhile, believe that steady effort in learning mathematics pays off, and see oneself as an effective learner and doer of mathematics.
e. Identify beliefs and classroom practices that produce equitable and inequitable mathematical learning experiences and outcomes for students and seek to create more equitable learning environments.
f. See themselves as perpetual learners of mathematics and look for new and innovative ways to solve problems and seek out new mathematical tools and techniques.

D.4. Analyze the Mathematical Content of Curriculum

Well-prepared beginning teachers of mathematics read, analyze, interpret, and enact standards documents, learning progressions, mathematics curricula, instructional materials, and assessment frameworks for the grades in which they are being prepared to teach. In addition, they should have significant understanding of mathematical standards for adjacent grade levels and a broad knowledge of mathematical standards for all of PK-12. Well-prepared beginning teachers of mathematics:

a. Understand the content within standards documents, learning progressions, mathematics curricula, instructional materials, and assessment frameworks and be able to discuss them with colleagues, administrators, and families of their students in ways that make sense in each audience.
b. Connect standards documents, learning progressions, mathematics curricula, instructional materials, and assessment frameworks and have the commitment to analyze these guides to inform their teaching.
c. Analyze provided instructional resources and formative assessment data to make decisions about the sequencing and time required to teach the content as well as how to make important connections among the mathematics taught in the grades and/or units before and after what they are teaching.
d. Apply their knowledge of content and practices to critically analyze multiple mathematical instructional resources, to determine whether resources fully address the content and practice expectations described in standards and curriculum documents and promote equitable and effective teaching.

D.5. Use Mathematical Tools and Technology

Well-prepared beginning teachers of mathematics are proficient with tools and technology designed to support mathematical reasoning and sense making, both in doing mathematics themselves and supporting student learning of mathematics. Well-prepared beginning teachers of mathematics:

a. Select and use tools and technology for solving mathematical problems, for mathematical modeling, and for supporting mathematical reasoning and sense making.
b. Select and use manipulatives (e.g., fold paper, toss coins, demonstrate polyhedra models, measure with protractors) and technology (e.g., interact with an applet displaying slope triangles for a line, find the intersection point of two functions using a graphing calculator, drag a point on a number line, or

change values in a spreadsheet to explore the meaning of variable) as a means of developing students' understanding of mathematics.

c. Employ the strategic use of virtual manipulatives and interactive electronic depictions of physical manipulatives, know how these can support sophisticated explorations of mathematical concepts, and make sound decisions about when such tools enhance teaching and learning.
d. Understand the benefits of using physical and virtual manipulatives and make strategic choices between them, recognizing their potential and limitations for students' mathematics learning.
e. Recognize the fast rate at which technologies emerge and are replaced and are committed to staying abreast of new tools.