

282—13.28 (272) Minimum content requirements for teaching endorsements.

13.28(1) Agriculture. 5-12. Completion of 24 semester credit hours in agriculture and agriculture education to include:

- a. Foundations of vocational and career education.
- b. Planning and implementing courses and curriculum.
- c. Methods and techniques of instruction to include evaluation of programs and students.
- d. Coordination of cooperative education programs.
- e. Coursework in each of the following areas and at least three semester credit hours in five of

the following areas:

- (1) Agribusiness systems.
- (2) Power, structural, and technical systems.
- (3) Plant systems.
- (4) Animal systems.
- (5) Natural resources systems.
- (6) Environmental service systems.
- (7) Food products and processing systems.

13.28(2) Art. K-8 or 5-12. Completion of 24 semester hours in art to include coursework in art history, studio art, and two- and three-dimensional art.

13.28(3) Business—all. 5-12. Completion of 30 semester hours in business to include 6 semester hours in accounting, 3 semester hours in business law to include contract law, 3 semester hours in computer and technical applications in business, 6 semester hours in marketing to include consumer studies, 3 semester hours in management, 6 semester hours in economics, and 3 semester hours in business communications to include formatting, language usage, and oral presentation. Coursework in entrepreneurship and in financial literacy may be a part of, or in addition to, the coursework listed above.

13.28(4) Driver education. 5-12. Completion of 9 semester hours in driver education to include coursework in accident prevention that includes drug and alcohol abuse; vehicle safety; and behind-the-wheel driving.

13.28(5) English/language arts.

a. K-8. Completion of 24 semester hours in English and language arts to include coursework in oral communication, written communication, language development, reading, children's literature, creative drama or oral interpretation of literature, and American literature.

b. 5-12. Completion of 24 semester hours in English to include coursework in oral communication, written communication, language development, reading, American literature, English literature and adolescent literature.

13.28(6) Language arts. 5-12. Completion of 40 semester hours in language arts to include coursework in the following areas:

a. *Written communication.*

(1) Develops a wide range of strategies and appropriately uses writing process elements (e.g., brainstorming, free-writing, first draft, group response, continued drafting, editing, and self-reflection) to communicate with different audiences for a variety of purposes.

(2) Develops knowledge of language structure (e.g., grammar), language conventions (e.g., spelling and punctuation), media techniques, figurative language and genre to create, critique, and discuss print and nonprint texts.

b. *Oral communication.*

(1) Understands oral language, listening, and nonverbal communication skills; knows how to analyze communication interactions; and applies related knowledge and skills to teach students to become competent communicators in varied contexts.

(2) Understands the communication process and related theories, knows the purpose and function of communication and understands how to apply this knowledge to teach students to make appropriate and effective choices as senders and receivers of messages in varied contexts.

c. Language development.

(1) Understands inclusive and appropriate language, patterns and dialects across cultures, ethnic groups, geographic regions and social roles.

(2) Develops strategies to improve competency in the English language arts and understanding of content across the curriculum for students whose first language is not English.

d. Young adult literature, American literature, and world literature.

(1) Reads, comprehends, and analyzes a wide range of texts to build an understanding of self as well as the cultures of the United States and the world in order to acquire new information, to respond to the needs and demands of society and the workplace, and for personal fulfillment. Among these texts are fiction and nonfiction, graphic novels, classic and contemporary works, young adult literature, and nonprint texts.

(2) Reads a wide range of literature from many periods in many genres to build an understanding of the many dimensions (e.g., philosophical, ethical, aesthetic) of human experience.

(3) Applies a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. Draws on prior experience, interactions with other readers and writers, knowledge of word meaning and of other texts, word identification strategies, and an understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics).

(4) Participates as a knowledgeable, reflective, creative, and critical member of a variety of literacy communities.

e. Creative voice.

(1) Understands the art of oral interpretation and how to provide opportunities for students to develop and apply oral interpretation skills in individual and group performances for a variety of audiences, purposes and occasions.

(2) Understands the basic skills of theatre production including acting, stage movement, and basic stage design.

f. Argumentation/debate.

(1) Understands concepts and principles of classical and contemporary rhetoric and is able to plan, prepare, organize, deliver and evaluate speeches and presentations.

(2) Understands argumentation and debate and how to provide students with opportunities to apply skills and strategies for argumentation and debate in a variety of formats and contexts.

g. Journalism.

(1) Understands ethical standards and major legal issues including First Amendment rights and responsibilities relevant to varied communication content. Utilizes strategies to teach students about the importance of freedom of speech in a democratic society and the rights and responsibilities of communicators.

(2) Understands the writing process as it relates to journalism (e.g., brainstorming, questioning, reporting, gathering and synthesizing information, writing, editing, and evaluating the final media product).

(3) Understands a variety of forms of journalistic writing (e.g., news, sports, features, opinion, Web-based) and the appropriate styles (e.g., Associated Press, multiple sources with attribution,

punctuation) and additional forms unique to journalism (e.g., headlines, cutlines, and/or visual presentations).

h. Mass media production.

- (1) Understands the role of the media in a democracy and the importance of preserving that role.
- (2) Understands how to interpret and analyze various types of mass media messages in order for students to become critical consumers.
- (3) Develops the technological skills needed to package media products effectively using various forms of journalistic design with a range of visual and auditory methods.

i. Reading strategies (if not completed as part of the professional education core requirements).

- (1) Uses a variety of skills and strategies to comprehend and interpret complex fiction, nonfiction and informational text.
- (2) Reads for a variety of purposes and across content areas.

13.28(7) Foreign language. K-8 and 5-12. Completion of 24 semester hours in each foreign language for which endorsement is sought.

13.28(8) Health. K-8 and 5-12. Completion of 24 semester hours in health to include coursework in public or community health, personal wellness, substance abuse, family life education, mental/emotional health, and human nutrition. A current certificate of CPR training is required in addition to the coursework requirements.

For holders of physical education or family and consumer science endorsements, completion of 18 credit hours in health to include coursework in public or community health, personal wellness, substance abuse, family life education, mental/emotional health, and human nutrition. A current certificate of CPR training is required in addition to the coursework requirements.

13.28(9) Family and consumer sciences—general. 5-12. Completion of 24 semester hours in family and consumer sciences to include coursework in lifespan development, parenting and child development education, family studies, consumer resource management, textiles or apparel design and merchandising, housing, foods and nutrition, and foundations of career and technical education as related to family and consumer sciences.

13.28(10) Industrial technology. 5-12. Completion of 24 semester hours in industrial technology to include coursework in manufacturing, construction, energy and power, graphic communications and transportation. The coursework is to include at least 6 semester hours in three different areas.

13.28(11) Journalism. 5-12. Completion of 15 semester hours in journalism to include coursework in writing, editing, production and visual communications.

13.28(12) Mathematics.

a. K-8. Completion of 24 semester hours in mathematics to include coursework in algebra, geometry, number theory, measurement, computer programming, and probability and statistics.

b. 5-12.

(1) Completion of 24 semester hours in mathematics to include a linear algebra or an abstract (modern) algebra course, a geometry course, a two-course sequence in calculus, a computer programming course, a probability and statistics course, and coursework in discrete mathematics.

(2) For holders of the physics 5-12 endorsement, completion of 17 semester hours in mathematics to include a geometry course, a two-course sequence in calculus, a probability and statistics course, and coursework in discrete mathematics.

(3) For holders of the all science 9-12 endorsement, completion of 17 semester hours in mathematics to include a geometry course, a two-course sequence in calculus, a probability and statistics course, and coursework in discrete mathematics.

c. 5-8 algebra for high school credit. For a 5-8 algebra for high school credit endorsement, hold either the K-8 mathematics or middle school mathematics endorsement and complete a college algebra or linear algebra class. This endorsement allows the holder to teach algebra to grades 5-8 for high school credit.

13.28(13) Music.

a. K-8. Completion of 24 semester hours in music to include coursework in music theory (at least two courses), music history, and applied music, and a methods course in each of the following: general, choral, and instrumental music.

b. 5-12. Completion of 24 semester hours in music to include coursework in music theory (at least two courses), music history (at least two courses), applied music, and conducting, and a methods course in each of the following: general, choral, and instrumental music.

13.28(14) Physical education.

a. K-8. Completion of 24 semester hours in physical education to include coursework in human anatomy, human physiology, movement education, adaptive physical education, personal wellness, human growth and development of children related to physical education, and first aid and emergency care. A current certificate of CPR training is required in addition to the coursework requirements.

b. 5-12. Completion of 24 semester hours in physical education to include coursework in human anatomy, kinesiology, human physiology, human growth and development related to maturational and motor learning, adaptive physical education, curriculum and administration of physical education, personal wellness, and first aid and emergency care. A current certificate of CPR training is required in addition to the coursework requirements.

13.28(15) Reading. K-8 and 5-12. Completion of 24 semester hours in reading to include all of the following requirements:

a. Foundations of reading. This requirement includes the following competencies:

(1) The practitioner demonstrates knowledge of the psychological, sociocultural, motivational, and linguistic foundations of reading and writing processes and instruction.

(2) The practitioner demonstrates knowledge of a range of research pertaining to reading, writing, and learning, including the analysis of scientifically based reading research, and knowledge of histories of reading. The range of research encompasses research traditions from the fields of the social sciences and other paradigms appropriate for informing practice and also definitions of reading difficulties including but not limited to dyslexia.

(3) The practitioner demonstrates knowledge of the major components of reading, such as comprehension, vocabulary, word identification, fluency, phonics, and phonemic awareness, and effectively integrates curricular standards with student interests, motivation, and background knowledge.

b. Reading curriculum and instruction. This requirement includes the following competencies:

(1) The practitioner demonstrates knowledge of designing and implementing an integrated, comprehensive, and balanced curriculum that addresses the major components of reading and contains a wide range of texts, including but not limited to narrative, expository, and poetry, and including traditional print, digital, and online resources.

(2) The practitioner uses knowledge of a range of research-based strategies and instructional technology for designing and delivering effective instruction, including appropriate interventions, remediation, assistive technology, and classroom accommodations for students with dyslexia and other difficulties.

(3) The practitioner demonstrates knowledge of grouping students, selecting materials appropriate for learners with diverse abilities at various stages of reading and writing development, differentiating instruction to meet the unique needs of all learners, including students with dyslexia, offering sufficient

opportunities for students to practice reading skills, and providing frequent and specific instructional feedback to guide students' learning.

(4) The practitioner demonstrates knowledge of designing instruction to meet the needs of diverse populations, including populations in urban, suburban, and rural settings, as well as for students from various cultural and linguistic backgrounds.

(5) The practitioner demonstrates knowledge of creating a literate physical environment which is low risk, supports students as agents of their own learning, and supports a positive socio-emotional impact for students to identify as readers.

c. Reading assessment, diagnosis and evaluation. This requirement includes the following competencies:

(1) The practitioner understands types of reading and writing assessments and their purposes, strengths, and limitations.

(2) The practitioner demonstrates knowledge of selecting and developing appropriate assessment instruments, procedures, and practices that range from individual to group and from formal to informal to alternative for the identification, screening, and diagnosis of all students' reading proficiencies and needs including knowledge of the signs and symptoms of dyslexia and other reading difficulties.

(3) The practitioner demonstrates knowledge of assessment data analysis to inform, plan, measure, progress monitor, and revise instruction for all students and to communicate the outcomes of ongoing assessments to all stakeholders.

(4) The practitioner demonstrates awareness of policies and procedures related to special programs, including Title I.

d. Reading in the content areas. This requirement includes the following competencies:

(1) The practitioner demonstrates knowledge of morphology and the etymology of words, along with text structure and the dimensions of content area vocabulary and comprehension, including literal, interpretive, critical, and evaluative.

(2) The practitioner demonstrates an understanding of reading theory, reading knowledge, and a variety of research-based strategies and approaches to provide effective literacy instruction into content areas.

(3) The practitioner demonstrates knowledge of integrating literacy instruction into content areas for all students, including but not limited to students with disabilities, students who are at risk of academic failure, students who have been identified as gifted and talented, students who have limited English language proficiency, and students with dyslexia, whether or not such students have been identified as children requiring special education under Iowa Code chapter 256B.

e. Language development. This requirement includes the following competency: The practitioner uses knowledge of oral language development, linguistics including phonology and phonological awareness, sound-symbol association, syllable types, morphology, syntax and semantics and the relationship of these components to typical and atypical reading development and reading instruction, cognitive academic language development, oral and written language proficiency (including second language development), acquisition of reading skills, and the variations related to cultural and linguistic diversity to provide effective instruction in reading and writing.

f. Oral communication instruction. This requirement includes the following competencies:

(1) The practitioner has knowledge of the unique needs and backgrounds of students with language differences and delays.

(2) The practitioner uses effective strategies for facilitating the learning of language for academic purposes by all learners.

g. Written communication instruction. This requirement includes the following competency: The practitioner uses knowledge of reading-writing-speaking connections; the writing process to include structures of language and grammar; the stages of spelling development; the different types of writing,

such as narrative, expressive, persuasive, informational, and descriptive; and the connections between oral and written language development to effectively teach writing as communication.

h. Children's fiction and nonfiction (K-8 only) or adolescent or young adult fiction and nonfiction (5-12 only). This requirement includes the following competency: The practitioner uses knowledge of children's literature (K-8) or adolescent or young adult literature (5-12) for:

- (1) Modeling the reading and writing of varied genres, including fiction and nonfiction; technology- and media-based information; and nonprint materials;
- (2) Motivating through the use of texts at multiple levels, representing broad interests, and reflecting varied cultures, linguistic backgrounds, and perspectives; and
- (3) Matching text complexities to the proficiencies and needs of readers.

i. Practicum. This requirement includes the following competencies:

- (1) The practitioner works with appropriately licensed professionals who observe, evaluate, and provide feedback on the practitioner's knowledge, dispositions, and performance of the teaching of reading and writing.
- (2) The practitioner effectively uses reading and writing strategies, materials, and assessments based upon appropriate reading and writing research and works with colleagues and families in the support of children's reading and writing development.

13.28(16) Reading specialist. K-12. The applicant must have met the requirements for the standard license and a K-8 or 5-12 reading endorsement and must present evidence of at least three years of experience which included the teaching of reading as a significant part of the responsibility.

a. Authorization. The holder of this endorsement is authorized to serve as a reading specialist in kindergarten and grades one through twelve.

b. Program requirements. Degree—master's.

c. Content. Completion of a sequence of courses and experiences which may have been a part of, or in addition to, the degree requirements. This sequence is to be at least 24 semester hours to include the following:

(1) Foundations of reading. The reading specialist will understand the historical, theoretical, and evidence-based foundations of reading and writing processes and instruction and will be able to interpret these findings to model exemplary instructional methods for students with typical and atypical literacy development and effectively develop and lead professional development.

(2) Curriculum and instruction. The reading specialist will use instructional approaches, materials, and an integrated, comprehensive, balanced curriculum to support student learning in reading and writing including the following:

1. Work collaboratively with teachers to develop a literacy curriculum that has vertical and horizontal alignment K-12 and that uses instructional approaches supported by literature and research for the following areas: print, phonemic awareness, phonics, fluency, comprehension, vocabulary, writing, critical thinking, and motivation.

2. Support classroom teachers to implement and adapt in-depth instructional approaches, including but not limited to approaches to improve decoding, comprehension, and information retention, to meet the language-proficiency needs of English language learners and the needs of students with reading difficulties or reading disabilities, including appropriate interventions, remediation, assistive technology, and classroom accommodations for students with dyslexia and other difficulties within or outside the regular classroom.

3. Demonstrate a knowledge of a wide variety of quality traditional print, digital, and online resources and support classroom teachers in building and using a quality, accessible classroom library and materials collection that meets the specific needs and abilities of all learners.

4. Provide support for curriculum and instruction through modeling, coteaching, observing, planning, reviewing literacy data, and providing resources.

(3) Assessment, diagnosis, and evaluation. The reading specialist will use a variety of assessment tools and practices to plan and evaluate effective reading and writing instruction including the following:

1. Demonstrate an understanding of the literature and research related to assessments and their purposes, including the strengths and limitations of assessments, and assessment tools for screening, diagnosis, progress monitoring, and measuring outcomes; demonstrate an understanding of the signs and symptoms of reading difficulties including but not limited to dyslexia; and also demonstrate an understanding of district and state assessments, proficiency standards and student benchmarks.

2. Select, administer, and interpret assessments for specific purposes, including collaboration with teachers in the analysis of data, and leading schoolwide or districtwide scale analyses to select assessment tools that provide a systemic framework for assessing reading, writing, and language growth of all students, including those with reading difficulties and reading disabilities including but not limited to students with dyslexia and English language learners.

3. Use assessment information to plan and evaluate instruction, including multiple data sources for analysis and instructional planning, for examining the effectiveness of specific intervention practices and students' responses to interventions including appropriate interventions, remediation, assistive technology, and classroom accommodations for students with dyslexia and other difficulties, and to plan professional development initiatives.

4. Communicate assessment results and implications to a variety of audiences.

(4) Administration and supervision of reading programs. The reading specialist will:

1. Demonstrate foundational knowledge of adult learning theories and related research about organizational change, professional development, and school culture.

2. Demonstrate the practical application of literacy leadership including planning, developing, supervising, and evaluating literacy programs at all levels.

3. Demonstrate knowledge of supervising an overall reading program, including but not limited to staffing; budgetary practices; planning, preparing, and selecting materials; subsystems; special provisions; and evaluating teacher performance.

4. Participate in, design, facilitate, lead, and evaluate effective and differentiated professional development programs to effectively implement literacy instruction.

5. Demonstrate an understanding of local, state, and national policies that affect reading and writing instruction.

6. Promote effective communication and collaboration among stakeholders, including parents and guardians, teachers, administrators, policymakers, and community members, and advocate for change when necessary to promote effective literacy instruction.

(5) Educational research, measurement and evaluation. The reading specialist will effectively utilize existing research and learn to conduct new research to continuously improve the design and implementation of a comprehensive reading system.

(6) Psychology of language and reading. The reading specialist will understand the highly complex processes by which children learn to speak, read, and write, including language acquisition, linguistics including phonology and phonological awareness, sound-symbol association, syllable types, morphology, syntax and semantics and the relationship of these components to typical and atypical reading development and reading instruction, ranges of individual differences, reading difficulties and reading disabilities, including but not limited to dyslexia, and the importance of the role of diversity in learning to read and write.

(7) Practicum in reading leadership. The reading specialist will participate in elementary and secondary practicum experiences with licensed teachers who are serving in leadership roles in the area of reading.

13.28(17) Science.

a. Science—basic. K-8.

(1) Required coursework. Completion of at least 24 semester hours in science to include 12 hours in physical sciences, 6 hours in biology, and 6 hours in earth/space sciences.

(2) Pedagogy competencies.

1. Understand the nature of scientific inquiry, its central role in science, and how to use the skills and processes of scientific inquiry.

2. Understand the fundamental facts and concepts in major science disciplines.

3. Be able to make conceptual connections within and across science disciplines, as well as to mathematics, technology, and other school subjects.

4. Be able to use scientific understanding when dealing with personal and societal issues.

b. Biological science. 5-12. Completion of 24 semester hours in biological science or 30 semester hours in the broad area of science to include 15 semester hours in biological science.

c. Chemistry. 5-12. Completion of 24 semester hours in chemistry or 30 semester hours in the broad area of science to include 15 semester hours in chemistry.

d. Earth science. 5-12. Completion of 24 semester hours in earth science or 30 semester hours in the broad area of science to include 15 semester hours in earth science.

e. Basic science. 5-12. Completion of 24 semester hours of credit in science to include the following:

(1) Six semester hours of credit in earth and space science to include the following essential concepts and skills:

1. Understand and apply knowledge of energy in the earth system.

2. Understand and apply knowledge of geochemical cycles.

(2) Six semester hours of credit in life science/biological science to include the following essential concepts and skills:

1. Understand and apply knowledge of the cell.

2. Understand and apply knowledge of the molecular basis of heredity.

3. Understand and apply knowledge of the interdependence of organisms.

4. Understand and apply knowledge of matter, energy, and organization in living systems.

5. Understand and apply knowledge of the behavior of organisms.

(3) Six semester hours of credit in physics/physical science to include the following essential concepts and skills:

1. Understand and apply knowledge of the structure of atoms.

2. Understand and apply knowledge of the structure and properties of matter.

3. Understand and apply knowledge of motions and forces.

4. Understand and apply knowledge of interactions of energy and matter.

- (4) Six semester hours of credit in chemistry to include the following essential concepts and skills:
1. Understand and apply knowledge of chemical reactions.
 2. Be able to design and conduct scientific investigations.
- f. Physical science.* Rescinded IAB 11/14/12, effective 12/19/12.
- g. Physics.*
- (1) 5-12. Completion of 24 semester hours in physics or 30 semester hours in the broad area of science to include 15 semester hours in physics.
- (2) For holders of the mathematics 5-12 endorsement, completion of:
1. 12 credits of physics to include coursework in mechanics, electricity, and magnetism; and
 2. A methods class that includes inquiry-based instruction, resource management, and laboratory safety.
- (3) For holders of the chemistry 5-12 endorsement, completion of 12 credits of physics to include coursework in mechanics, electricity, and magnetism.
- h. All science I.* Rescinded IAB 11/14/12, effective 12/19/12.
- i. All science.* 5-12.
- (1) Completion of 36 semester hours of credit in science to include the following:
1. Nine semester hours of credit in earth and space science to include the following essential concepts and skills:
 - Understand and apply knowledge of energy in the earth system.
 - Understand and apply knowledge of geochemical cycles.
 - Understand and apply knowledge of the origin and evolution of the earth system.
 - Understand and apply knowledge of the origin and evolution of the universe.
 2. Nine semester hours of credit in life science/biological science to include the following essential concepts and skills:
 - Understand and apply knowledge of the cell.
 - Understand and apply knowledge of the molecular basis of heredity.
 - Understand and apply knowledge of the interdependence of organisms.
 - Understand and apply knowledge of matter, energy, and organization in living systems.
 - Understand and apply knowledge of the behavior of organisms.
 - Understand and apply knowledge of biological evolution.
 3. Nine semester hours of credit in physics/physical science to include the following essential concepts and skills:
 - Understand and apply knowledge of the structure of atoms.
 - Understand and apply knowledge of the structure and properties of matter.

- Understand and apply knowledge of motions and forces.
 - Understand and apply knowledge of interactions of energy and matter.
 - Understand and apply knowledge of conservation of energy and increase in disorder.
4. Nine semester hours of credit in chemistry to include the following essential concepts and skills:
- Understand and apply knowledge of chemical reactions.
 - Be able to design and conduct scientific investigations.

(2) Pedagogy competencies.

1. Understand the nature of scientific inquiry, its central role in science, and how to use the skills and processes of scientific inquiry.
2. Understand the fundamental facts and concepts in major science disciplines.
3. Be able to make conceptual connections within and across science disciplines, as well as to mathematics, technology, and other school subjects.
4. Be able to use scientific understanding when dealing with personal and societal issues.

13.28(18) *Social sciences.*

- a. American government.* 5-12. Completion of 24 semester hours in American government or 30 semester hours in the broad area of social sciences to include 15 semester hours in American government.
- b. American history.* 5-12. Completion of 24 semester hours in American history or 30 semester hours in the broad area of social sciences to include 15 semester hours in American history.
- c. Anthropology.* 5-12. Completion of 24 semester hours in anthropology or 30 semester hours in the broad area of social sciences to include 15 semester hours in anthropology.
- d. Economics.* 5-12. Completion of 24 semester hours in economics or 30 semester hours in the broad area of social sciences to include 15 semester hours in economics, or 30 semester hours in the broad area of business to include 15 semester hours in economics.
- e. Geography.* 5-12. Completion of 24 semester hours in geography or 30 semester hours in the broad area of social sciences to include 15 semester hours in geography.
- f. History.* K-8. Completion of 24 semester hours in history to include at least 9 semester hours in American history and 9 semester hours in world history.
- g. Psychology.* 5-12. Completion of 24 semester hours in psychology or 30 semester hours in the broad area of social sciences to include 15 semester hours in psychology.
- h. Social studies.* K-8. Completion of 24 semester hours in social studies, to include coursework from at least three of these areas: history, sociology, economics, American government, psychology and geography.
- i. Sociology.* 5-12. Completion of 24 semester hours in sociology or 30 semester hours in the broad area of social sciences to include 15 semester hours in sociology.
- j. World history.* 5-12. Completion of 24 semester hours in world history or 30 semester hours in the broad area of social sciences to include 15 semester hours in world history.
- k. All social sciences.* 5-12. Completion of 51 semester hours in the social sciences to include 9 semester hours in each of American and world history, 9 semester hours in government, 6 semester

hours in sociology, 6 semester hours in psychology other than educational psychology, 6 semester hours in geography, and 6 semester hours in economics.

13.28(19) *Speech communication/theatre.*

a. K-8. Completion of 20 semester hours in speech communication/theatre to include coursework in speech communication, creative drama or theatre, and oral interpretation.

b. 5-12. Completion of 24 semester hours in speech communication/theatre to include coursework in speech communication, oral interpretation, creative drama or theatre, argumentation and debate, and mass media communication.

13.28(20) *English as a second language (ESL). K-12.*

a. Authorization. The holder of this endorsement is authorized to teach English as a second language in kindergarten and grades one through twelve.

b. Content. Completion of 18 semester hours of coursework in English as a second language to include the following:

(1) Knowledge of pedagogy to include the following:

1. Methods and curriculum to include the following:

- Bilingual and ESL methods.
- Literacy in native and second language.
- Methods for subject matter content.
- Adaptation and modification of curriculum.

2. Assessment to include language proficiency and academic content.

(2) Knowledge of linguistics to include the following:

1. Psycholinguistics and sociolinguistics.

2. Language acquisition and proficiency to include the following:

- Knowledge of first and second language proficiency.
- Knowledge of first and second language acquisition.
- Language to include structure and grammar of English.

(3) Knowledge of cultural and linguistic diversity to include the following:

1. History.

2. Theory, models, and research.

3. Policy and legislation.

(4) Current issues with transient populations.

13.28(21) *Elementary school teacher librarian.*

a. Authorization. The holder of this endorsement is authorized to serve as a teacher librarian in prekindergarten through grade eight.

b. Content. Completion of 24 semester hours in school library coursework to include the following:

(1) Literacy and reading. This requirement includes the following competencies:

1. Practitioners collaborate with other teachers to integrate developmentally appropriate literature in multiple formats to support literacy in children.

2. Practitioners demonstrate knowledge of resources and strategies to foster leisure reading and model personal enjoyment of reading among children, based on familiarity with selection tools and current trends in literature for children.

(2) Information and knowledge. This requirement includes the following competencies:

1. Practitioners teach multiple strategies to locate, analyze, evaluate, and ethically use information in the context of inquiry-based learning.

2. Practitioners advocate for flexible and open access to library resources, both physical and virtual.

3. Practitioners uphold and promote the legal and ethical codes of their profession, including privacy, confidentiality, freedom and equity of access to information.

4. Practitioners use skills and knowledge to assess reference sources, services, and tools in order to mediate between information needs and resources to assist learners in determining what they need.

5. Practitioners model and facilitate authentic learning with current and emerging digital tools for locating, analyzing, evaluating and ethically using information resources to support research, learning, creating, and communicating in a digital society.

6. Practitioners demonstrate knowledge of creative and innovative uses of technologies to engage students and facilitate higher-level thinking.

7. Practitioners develop an articulated information literacy curriculum grounded in research related to the information search process.

(3) Program administration and leadership. This requirement includes the following competencies:

1. Practitioners evaluate and select print, nonprint, and digital resources using professional selection tools and evaluation criteria to develop and manage a quality collection designed to meet the diverse curricular, personal, and professional needs of the educational community.

2. Practitioners demonstrate knowledge necessary to organize the library collections according to current standard library cataloging and classification principles.

3. Practitioners develop policies and procedures to support ethical use of information, intellectual freedom, selection and reconsideration of library materials, and the privacy of users.

4. Practitioners develop strategies for working with regular classroom teachers, support services personnel, paraprofessionals, and other individuals involved in the educational program.

(4) Practicum. This requirement includes the following competencies:

1. Practitioners apply knowledge of learning styles, stages of human growth and development, and cultural influences of learning at the elementary level.

2. Practitioners implement the principles of effective teaching and learning that contribute to an active, inquiry-based approach to learning in a digital environment at the elementary level.

3. Practitioners understand the teacher librarian role in curriculum development and the school improvement process at the elementary level.
4. Practitioners collaborate to integrate information literacy and emerging technologies into content area curricula at the elementary level.

13.28(22) *Secondary school teacher librarian.*

a. Authorization. The holder of this endorsement is authorized to serve as a teacher librarian in grades five through twelve.

b. Content. Completion of 24 semester hours in school library coursework to include the following:

(1) Literacy and reading. This requirement includes the following competencies:

1. Practitioners collaborate with other teachers to integrate developmentally appropriate literature in multiple formats to support literacy in young adults.
2. Practitioners demonstrate knowledge of resources and strategies to foster leisure reading and model personal enjoyment of reading among young adults, based on familiarity with selection tools and current trends in literature for young adults.

(2) Information and knowledge. This requirement includes the following competencies:

1. Practitioners teach multiple strategies to locate, analyze, evaluate, and ethically use information in the context of inquiry-based learning.
2. Practitioners advocate for flexible and open access to library resources, both physical and virtual.
3. Practitioners uphold and promote the legal and ethical codes of their profession, including privacy, confidentiality, freedom and equity of access to information.
4. Practitioners use skills and knowledge to assess reference sources, services, and tools in order to mediate between information needs and resources to assist learners in determining what they need.
5. Practitioners model and facilitate authentic learning with current and emerging digital tools for locating, analyzing, evaluating and ethically using information resources to support research, learning, creating, and communicating in a digital society.
6. Practitioners demonstrate knowledge of creative and innovative uses of technologies to engage students and facilitate higher-level thinking.
7. Practitioners develop an articulated information literacy curriculum grounded in research related to the information search process.

(3) Program administration and leadership. This requirement includes the following competencies:

1. Practitioners evaluate and select print, nonprint, and digital resources using professional selection tools and evaluation criteria to develop and manage a quality collection designed to meet the diverse curricular, personal, and professional needs of the educational community.
2. Practitioners demonstrate knowledge necessary to organize the library collections according to current standard library cataloging and classification principles.
3. Practitioners develop policies and procedures to support ethical use of information, intellectual freedom, selection and reconsideration of library materials, and the privacy of users.

4. Practitioners develop strategies for working with regular classroom teachers, support services personnel, paraprofessionals, and other individuals involved in the educational program.

(4) Practicum. This requirement includes the following competencies:

1. Practitioners apply knowledge of learning styles, stages of human growth and development, and cultural influences of learning at the secondary level.
2. Practitioners implement the principles of effective teaching and learning that contribute to an active, inquiry-based approach to learning in a digital environment at the secondary level.
3. Practitioners understand the teacher librarian role in curriculum development and the school improvement process at the secondary level.
4. Practitioners collaborate to integrate information literacy and emerging technologies into content area curricula at the secondary level.

13.28(23) School teacher librarian. PK-12.

a. Authorization. The holder of this endorsement is authorized to serve as a teacher librarian in prekindergarten through grade twelve. The applicant must be the holder of or eligible for the initial license.

b. Program requirements. Degree—master’s.

c. Content. Completion of a sequence of courses and experiences which may have been part of, or in addition to, the degree requirements. This sequence is to be at least 30 semester hours in school library coursework, to include the following:

(1) Literacy and reading. This requirement includes the following competencies:

1. Practitioners collaborate with other teachers to integrate developmentally appropriate literature in multiple formats to support literacy for youth of all ages.
2. Practitioners demonstrate knowledge of resources and strategies to foster leisure reading and model personal enjoyment of reading, based on familiarity with selection tools and current trends in literature for youth of all ages.
3. Practitioners understand how to develop a collection of reading and informational materials in print and digital formats that supports the diverse developmental, cultural, social and linguistic needs of all learners and their communities.
4. Practitioners model and teach reading comprehension strategies to create meaning from text for youth of all ages.

(2) Information and knowledge. This requirement includes the following competencies:

1. Practitioners teach multiple strategies to locate, analyze, evaluate, and ethically use information in the context of inquiry-based learning.
2. Practitioners advocate for flexible and open access to library resources, both physical and virtual.
3. Practitioners uphold and promote the legal and ethical codes of their profession, including privacy, confidentiality, freedom and equity of access to information.
4. Practitioners use skills and knowledge to assess reference sources, services, and tools in order to mediate between information needs and resources to assist learners in determining what they need.

5. Practitioners model and facilitate authentic learning with current and emerging digital tools for locating, analyzing, evaluating and ethically using information resources to support research, learning, creating, and communicating in a digital society.

6. Practitioners demonstrate knowledge of creative and innovative uses of technologies to engage students and facilitate higher-level thinking.

7. Practitioners develop an articulated information literacy curriculum grounded in research related to the information search process.

8. Practitioners understand the process of collecting, interpreting, and using data to develop new knowledge to improve the school library program.

9. Practitioners employ the methods of research in library and information science.

(3) Program administration and leadership. This requirement includes the following competencies:

1. Practitioners evaluate and select print, nonprint, and digital resources using professional selection tools and evaluation criteria to develop and manage a quality collection designed to meet the diverse curricular, personal, and professional needs of the educational community.

2. Practitioners demonstrate knowledge necessary to organize the library collections according to current standard library cataloging and classification principles.

3. Practitioners develop policies and procedures to support ethical use of information, intellectual freedom, selection and reconsideration of library materials, and the privacy of users of all ages.

4. Practitioners develop strategies for working with regular classroom teachers, support services personnel, paraprofessionals, and other individuals involved in the educational program.

5. Practitioners demonstrate knowledge of best practices related to planning, budgeting (including alternative funding), organizing, and evaluating human and information resources and facilities to ensure equitable access.

6. Practitioners understand strategic planning to ensure that the school library program addresses the needs of diverse communities.

7. Practitioners advocate for school library and information programs, resources, and services among stakeholders.

8. Practitioners promote initiatives and partnerships to further the mission and goals of the school library program.

(4) Practicum. This requirement includes the following competencies:

1. Practitioners apply knowledge of learning styles, stages of human growth and development, and cultural influences of learning at the elementary and secondary levels.

2. Practitioners implement the principles of effective teaching and learning that contribute to an active, inquiry-based approach to learning in a digital environment at the elementary and secondary levels.

3. Practitioners understand the teacher librarian role in curriculum development and the school improvement process at the elementary and secondary levels.

4. Practitioners collaborate to integrate information literacy and emerging technologies into content area curricula.

a. Authorization. The holder of this endorsement is authorized to serve as a teacher or a coordinator of programs for the talented and gifted from the prekindergarten level through grade twelve. This authorization does not permit general classroom teaching at any level except that level or area for which the holder is eligible or holds the specific endorsement.

b. Program requirements—content. Completion of 12 undergraduate or graduate semester hours of coursework in the area of the talented and gifted to include the following:

- (1) Psychology of the gifted.
 1. Social needs.
 2. Emotional needs.

- (2) Programming for the gifted.
 1. Prekindergarten-12 identification.
 2. Differentiation strategies.
 3. Collaborative teaching skills.
 4. Program goals and performance measures.
 5. Program evaluation.

(3) Practicum experience in gifted programs.

NOTE: Teachers in specific subject areas will not be required to hold this endorsement if they teach gifted students in their respective endorsement areas.

13.28(25) *American Sign Language endorsement.*

a. Authorization. The holder of this endorsement is authorized to teach American Sign Language in kindergarten and grades one through twelve.

b. Content. Completion of 18 semester hours of coursework in American Sign Language to include the following:

- (1) Second language acquisition.
- (2) Sociology of the deaf community.
- (3) Linguistic structure of American Sign Language.
- (4) Language teaching methodology specific to American Sign Language.
- (5) Teaching the culture of deaf people.
- (6) Assessment of students in an American Sign Language program.

c. Other. Be the holder of or be eligible for one other teaching endorsement.

13.28(26) *Elementary professional school counselor.*

a. Authorization. The holder of this endorsement is authorized to serve as a professional school counselor in kindergarten and grades one through eight.

b. Program requirements. Master's degree from an accredited institution of higher education.

c. Content. Completion of a sequence of courses and experiences which may have been a part of, or in addition to, the degree requirements to include the following:

- (1) Nature and needs of individuals at all developmental levels.
 1. Develop strategies for facilitating development through the transition from childhood to adolescence and from adolescence to young adulthood.
 2. Apply knowledge of learning and personality development to assist students in developing their full potential.

(2) Social and cultural foundations.

1. Demonstrate awareness of and sensitivity to the unique social, cultural, and economic circumstances of students and their racial/ethnic, gender, age, physical, and learning differences.
2. Demonstrate sensitivity to the nature and the functioning of the student within the family, school and community contexts.
3. Demonstrate the counseling and consultation skills needed to facilitate informed and appropriate action in response to the needs of students.

(3) Fostering of relationships.

1. Employ effective counseling and consultation skills with students, parents, colleagues, administrators, and others.
2. Communicate effectively with parents, colleagues, students and administrators.
3. Counsel students in the areas of personal, social, academic, and career development.
4. Assist families in helping their children address the personal, social, and emotional concerns and problems that may impede educational progress.
5. Implement developmentally appropriate counseling interventions with children and adolescents.
6. Demonstrate the ability to negotiate and move individuals and groups toward consensus or conflict resolution or both.
7. Refer students for specialized help when appropriate.
8. Value the well-being of the students as paramount in the counseling relationship.

(4) Group work.

1. Implement developmentally appropriate interventions involving group dynamics, counseling theories, group counseling methods and skills, and other group work approaches.
2. Apply knowledge of group counseling in implementing appropriate group processes for elementary, middle school, and secondary students.

(5) Career development, education, and postsecondary planning.

1. Assist students in the assessment of their individual strengths, weaknesses, and differences, including those that relate to academic achievement and future plans.
2. Apply knowledge of career assessment and career choice programs.
3. Implement occupational and educational placement, follow-up and evaluation.
4. Develop a counseling network and provide resources for use by students in personalizing the exploration of postsecondary educational opportunities.

(6) Assessment and evaluation.

1. Demonstrate individual and group approaches to assessment and evaluation.
2. Demonstrate an understanding of the proper administration and uses of standardized tests.
3. Apply knowledge of test administration, scoring, and measurement concerns.
4. Apply evaluation procedures for monitoring student achievement.

5. Apply assessment information in program design and program modifications to address students' needs.
6. Apply knowledge of legal and ethical issues related to assessment and student records.

(7) Professional orientation.

1. Apply knowledge of history, roles, organizational structures, ethics, standards, and credentialing.
2. Maintain a high level of professional knowledge and skills.
3. Apply knowledge of professional and ethical standards to the practice of school counseling.
4. Articulate the professional school counselor role to school personnel, parents, community, and students.

(8) School counseling skills.

1. Design, implement, and evaluate a comprehensive, developmental school counseling program.
2. Implement and evaluate specific strategies designed to meet program goals and objectives.
3. Consult and coordinate efforts with resource persons, specialists, businesses, and agencies outside the school to promote program objectives.
4. Provide information appropriate to the particular educational transition and assist students in understanding the relationship that their curricular experiences and academic achievements will have on subsequent educational opportunities.
5. Assist parents and families in order to provide a supportive environment in which students can become effective learners and achieve success in pursuit of appropriate educational goals.
6. Provide training, orientation, and consultation assistance to faculty, administrators, staff, and school officials to assist them in responding to the social, emotional, and educational development of all students.
7. Collaborate with teachers, administrators, and other educators in ensuring that appropriate educational experiences are provided that allow all students to achieve success.
8. Assist in the process of identifying and addressing the needs of the exceptional student.
9. Apply knowledge of legal and ethical issues related to child abuse and mandatory reporting.
10. Advocate for the educational needs of students and work to ensure that these needs are addressed at every level of the school experience.
11. Promote use of school counseling and educational and career planning activities and programs involving the total school community to provide a positive school climate.

(9) Classroom management.

1. Apply effective classroom management strategies as demonstrated in delivery of classroom and large group school counseling curriculum.
2. Consult with teachers and parents about effective classroom management and behavior management strategies.

(10) Curriculum.

1. Write classroom lessons including objectives, learning activities, and discussion questions.
2. Utilize various methods of evaluating what students have learned in classroom lessons.

3. Demonstrate competency in conducting classroom and other large group activities, utilizing an effective lesson plan design, engaging students in the learning process, and employing age-appropriate classroom management strategies.

4. Design a classroom unit of developmentally appropriate learning experiences.

5. Demonstrate knowledge in writing standards and benchmarks for curriculum.

(11) Learning theory.

1. Identify and consult with teachers about how to create a positive learning environment utilizing such factors as effective classroom management strategies, building a sense of community in the classroom, and cooperative learning experiences.

2. Identify and consult with teachers regarding teaching strategies designed to motivate students using small group learning activities, experiential learning activities, student mentoring programs, and shared decision-making opportunities.

3. Demonstrate knowledge of child and adolescent development and identify developmentally appropriate teaching and learning strategies.

(12) Teaching and counseling practicum. The candidate will complete a preservice supervised practicum of a minimum of 100 hours, and at least 40 of these hours must be direct service. Candidates will complete a supervised internship for a minimum of 600 hours, and at least 240 of these hours must be direct service. For candidates seeking both the K-8 and 5-12 professional school counselor endorsements, a minimum of 100 hours of the practicum or internship experiences listed above must be completed at each of the desired endorsement levels.

13.28(27) *Secondary professional school counselor.*

a. Authorization. The holder of this endorsement is authorized to serve as a professional school counselor in grades five through twelve.

b. Program requirements. Master's degree from an accredited institution of higher education.

c. Content. Completion of a sequence of courses and experiences which may have been a part of, or in addition to, the degree requirements to include:

(1) The competencies listed in subparagraphs 13.28(26) "c"(1) to (11).

(2) The teaching and counseling practicum. The candidate will complete a preservice supervised practicum and an internship that meet the requirements set forth in 13.28(26) "c"(12).

13.28(28) *School nurse endorsement.* The school nurse endorsement does not authorize general classroom teaching, although it does authorize the holder to teach health at all grade levels. Alternatively, a nurse may obtain a statement of professional recognition (SPR) from the board of educational examiners, in accordance with the provisions set out in 282—Chapter 16, Statements of Professional Recognition (SPR).

a. Authorization. The holder of this endorsement is authorized to provide service as a school nurse at the prekindergarten and kindergarten levels and in grades one through twelve.

b. Content.

(1) Organization and administration of school nurse services including the appraisal of the health needs of children and youth.

(2) School-community relationships and resources/coordination of school and community resources to serve the health needs of children and youth.

(3) Knowledge and understanding of the health needs of exceptional children.

(4) Health education.

c. *Other.* Hold a license as a registered nurse issued by the Iowa board of nursing.

13.28(29) Athletic coach. K-12. An applicant for the coaching endorsement must hold a teacher's license with one of the teaching endorsements.

a. *Authorization.* The holder of this endorsement may serve as a head coach or an assistant coach in kindergarten and grades one through twelve.

b. *Program requirements.*

(1) One semester hour college or university course in the structure and function of the human body in relation to physical activity, and

(2) One semester hour college or university course in human growth and development of children and youth as related to physical activity, and

(3) Two semester hour college or university course in athletic conditioning, care and prevention of injuries and first aid as related to physical activity, and

(4) One semester hour college or university course in the theory of coaching interscholastic athletics, and

(5) Successful completion of the concussion training approved by the Iowa High School Athletic Association or Iowa Girls High School Athletic Union.

13.28(30) Content specialist endorsement. The applicant must have met the requirements for the standard license and a teaching endorsement.

a. *Authorization.* The holder of this endorsement is authorized to serve as a content specialist in kindergarten and grades one through twelve in the specific content listed on the authorization.

b. *Requirements.*

(1) Hold a master's degree in the content area or complete 30 semester hours of college course work in the content area.

(2) Complete 15 semester hours of credit in professional development in three or more of the following areas:

1. Using research-based content teaching strategies;
2. Integrating appropriate technology into the learning experiences for the specific content;
3. Engaging the learner in the content through knowledge of learner needs and interests;
4. Using reflective thinking to solve problems in the content area;
5. Making data-driven decisions in the content area;
6. Utilizing project-based learning in the content area;
7. Developing critical thinking skills in the content area;
8. Forming partnerships to collaborate with content experts within the community;
9. Relating content with other content areas;
10. Facilitating content learning in large and small teams;
11. Implementing response to intervention (RTI) to close achievement gaps in the content area.

(3) Complete an internship, externship, or professional experience for a minimum of 90 contact hours in the content area.

13.28(31) Engineering. 5-12.

a. Completion of 24 semester hours in engineering coursework.

b. Methods and strategies of STEM instruction or methods of teaching science or mathematics.

13.28(32) STEM.

a. K-8.

(1) Authorization. The holder of this endorsement is authorized to teach science, mathematics, and integrated STEM courses in kindergarten through grade eight.

(2) Program requirements. Be the holder of the teacher—elementary classroom endorsement.

(3) Content.

1. Completion of a minimum of 12 semester hours of college-level science.

2. Completion of a minimum of 12 semester hours of college-level math (or the completion of Calculus I) to include coursework in computer programming.

3. Completion of a minimum of 3 semester hours of coursework in content or pedagogy of engineering and technological design that includes engineering design processes or programming logic and problem-solving models and that may be met through either of the following:

- Engineering and technological design courses for education majors;
- Technology or engineering content coursework.

4. Completion of a minimum of 6 semester hours of required coursework in STEM curriculum and methods to include the following essential concepts and skills:

- Comparing and contrasting the nature and goals of each of the STEM disciplines;
- Promoting learning through purposeful, authentic, real-world connections;
- Integration of content and context of each of the STEM disciplines;
- Interdisciplinary/transdisciplinary approaches to teaching (including but not limited to problem-based learning and project-based learning);
- Curriculum and standards mapping;
- Engaging subject-matter experts (including but not limited to colleagues, parents, higher education faculty/students, business partners, and informal education agencies) in STEM experiences in and out of the classroom;
- Assessment of integrative learning approaches;
- Information literacy skills in STEM;
- Processes of science and scientific inquiry;
- Mathematical problem-solving models;
- Communicating to a variety of audiences;
- Classroom management in project-based classrooms;
- Instructional strategies for the inclusive classroom;
- Computational thinking;
- Mathematical and technological modeling.

5. Completion of a STEM field experience of a minimum of 30 contact hours that may be met through the following:

- Completing a STEM research experience;
- Participating in a STEM internship at a STEM business or informal education organization; or
- Leading a STEM extracurricular activity.

b. 5-8.

(1) Authorization. The holder of this endorsement is authorized to teach science, mathematics, and integrated STEM courses in grades five through eight.

(2) Program requirements. Be the holder of a 5-12 science, mathematics, or industrial technology endorsement or 5-8 middle school mathematics or science endorsement.

(3) Content.

1. Completion of a minimum of 12 semester hours of college-level science.

2. Completion of a minimum of 12 semester hours of college-level math (or the completion of Calculus I) to include coursework in computer programming.

3. Completion of a minimum of 3 semester hours of coursework in content or pedagogy of engineering and technological design that includes engineering design processes or programming logic and problem-solving models and that may be met through either of the following:

- Engineering and technological design courses for education majors;
- Technology or engineering content coursework.

4. Completion of a minimum of 6 semester hours of required coursework in STEM curriculum and methods to include the following essential concepts and skills:

- Comparing and contrasting the nature and goals of each of the STEM disciplines;
- Promoting learning through purposeful, authentic, real-world connections;
- Integration of content and context of each of the STEM disciplines;
- Interdisciplinary/transdisciplinary approaches to teaching (including but not limited to problem-based learning and project-based learning);
- Curriculum and standards mapping;
- Engaging subject-matter experts (including but not limited to colleagues, parents, higher education faculty/students, business partners, and informal education agencies) in STEM experiences in and out of the classroom;
- Assessment of integrative learning approaches;
- Information literacy skills in STEM;
- Processes of science and scientific inquiry;
- Mathematical problem-solving models;
- Communicating to a variety of audiences;
- Classroom management in project-based classrooms;
- Instructional strategies for the inclusive classroom;
- Computational thinking;
- Mathematical and technological modeling.

5. Completion of a STEM field experience of a minimum of 30 contact hours that may be met through the following:

- Completing a STEM research experience;
- Participating in a STEM internship at a STEM business or informal education organization; or
- Leading a STEM extracurricular activity.

c. *Specialist K-12.*

(1) Authorization. The holder of this endorsement is authorized to serve as a STEM specialist in kindergarten and grades one through twelve.

(2) Program requirements.

1. The applicant must have met the requirements for a standard Iowa teaching license and a teaching endorsement in mathematics, science, engineering, industrial technology, or agriculture.

2. The applicant must hold a master's degree from a regionally accredited institution. The master's degree must be in math, science, engineering or technology or another area with at least 12 hours of college-level science and at least 12 hours of college-level math (or completion of Calculus I) to include coursework in computer programming.

(3) Content.

1. Completion of a minimum of 3 semester hours of coursework in content or pedagogy of engineering and technological design that includes engineering design processes or programming logic and problem-solving models and that may be met through either of the following:

- Engineering and technological design courses for education majors;
- Technology or engineering content coursework.

2. Completion of 9 semester hours in professional development to include the following essential concepts and skills:

- STEM curriculum and methods:
 - Comparing and contrasting the nature and goals of each of the STEM disciplines;
 - Promoting learning through purposeful, authentic, real-world connections;
 - Integration of content and context of each of the STEM disciplines;
 - Interdisciplinary/transdisciplinary approaches to teaching (including but not limited to problem-based learning and project-based learning);
 - Curriculum/standards mapping;
 - Assessment of integrative learning approaches;
 - Information literacy skills in STEM;
 - Processes of science/scientific inquiry;
 - Mathematical problem-solving models;
 - Classroom management in project-based classrooms;
 - Instructional strategies for the inclusive classroom;
 - Computational thinking;
 - Mathematical and technological modeling.
- STEM experiential learning:
 - Engaging subject-matter experts (including but not limited to colleagues, parents, higher education faculty/students, business partners, and informal education agencies) in STEM experiences in and out of the classroom;
 - STEM research experiences;
 - STEM internship at a STEM business or informal education organization;
 - STEM extracurricular activity;
 - Communicating to a variety of audiences.
- Leadership in STEM:
 - STEM curriculum development and assessment;

- Curriculum mapping;
- Assessment of student engagement;
- STEM across the curriculum;
- Research on best practices in STEM;
- STEM curriculum accessibility for all students.

3. Completion of an internship/externship professional experience or prior professional experience in STEM for a minimum of 90 contact hours.

13.28(33) *Multioccupations.* Completion of any 5-12 endorsement and, in addition thereto, coursework in foundations of career and technical education, coordination of cooperative programs, and competency-based curriculum development. Four thousand hours of career and technical experience in two or more occupations. The multioccupations endorsement also authorizes the holder to supervise students in cooperative programs, school-to-work programs, and similar programs in which the student is placed in school-sponsored, on-the-job situations.

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