
Middle Grades STEM Teacher Licensure

The Background:

Over the past two years Tennessee has undergone systemic revisions to almost all aspects of the public education system. To help support these changes it is necessary to examine not only the current force of teachers, but teachers coming through the training pipeline as well. Student curriculum standards have been raised so it follows that teacher content knowledge and pedagogical strategies much keep pace.

Middle school is a critical place for students and teachers alike. At present, middle grades teachers are licensed as “generalists.” In other words, these teachers are licensed to teach English Language Arts, Mathematics, Science, and Social Studies. The nature of the license gives flexibility to school leadership and allows them to move teachers across and among subject areas depending on the teacher’s strengths, coupled with the needs of the school. However, given the interdisciplinary nature of the teacher’s training it is a challenge for pre-service teachers to gain enough content knowledge to become an expert on the depth and breadth of the curriculum.

A STEM license for middle grades teachers addresses both of these concerns. These teachers will be licensed to teach in math, science, and technology in grades 5-9. They will be licensed to teach Physical Science and Algebra I along with Exploring Technology (5-6), Inventions and Innovations (7), Technological Systems (8), and Foundations of Technology (9).

The undergraduate training program will focus squarely on math and science thereby giving the candidates the increased content knowledge necessary to meet the demands of an upgraded curriculum. School administrators will still have flexibility within the math and science disciplines. Those teachers currently employed with a generalist license will maintain that status, and this program will not change their employability. Likewise, university teachers training programs are not required to shift away from the programs in operation. The STEM license (5-9) serves as another option universities and teacher candidates have.

The formation of a middle grades STEM license holds the promise of helping create new teachers with the capacity to move more students to the ACT benchmarks in math and science; create new teachers who have a rich content understanding and are able to pass that understanding along to students; and create a curricular system that honors all areas of STEM, not just math and science. The work of Mary Martin, Ph.D., and Dovie Kimmins, Ed.D. (TMSTEC) points to several desired outcomes including improves student learning and engagement, better adaptation to new curriculum standards, improves test scores, improves teacher effectiveness and morale, and an increase in Tennessee’s stature as compared other states.

The work to build this licensure area has been going on over the course of the past two years. Members of the SBE's Advisory Council on Teacher Education and Certification (ACTEC) expressed an interest in creating more subject-specific licensure options for middle grades teachers and after SBE staff consultation with the Tennessee Math, Science, and Technology Education Center (TMSTEC) at MTSU it was decided that they would become the lead organization in the formulation of program recommendations to the SBE. What followed was a series of meetings and conferences including stakeholders statewide. The list of included partners includes TMSTEC, the State Board of Education, the State Department of Education, TBR universities and the associated STEM centers, The University of Tennessee, the SDE's Principal Study Council, TOSS, ETS, and many others.

In addition to the creation of the STEM 5-9 endorsement the ACTEC voted to explore the formation of a Humanities endorsement to parallel the STEM 5-9 endorsement and to also explore the possibility of using a pre-service teacher licensing exam with consequential subtest scores for those seeking the middle grades generalist endorsement.

The Master Plan Connection:

This item supports the Board's *Master Plan* by providing for effective teachers.

First to the Top Connection:

This item supports assurances within First to the Top by providing for the development of both effective teachers.

The Recommendation:

The State Board of Education staff recommends adoption of a STEM 5-9 endorsement on final reading.

“A Work in Progress”
Recommendations For a
New Teacher License and Endorsements for
Middle Grades STEM Teachers

Presented to the
Advisory Council on Teacher Education and Certification of the Tennessee State Board of Education,
October 7, 2010

Submitted by:

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Mathematics Director, STEM Teachers Now Project

This preliminary document is a work in progress, and is not for citation or dissemination.

Rationale:

This presentation is based on the work of 60 experts in education, the STEM disciplines, policy-makers, classroom teachers, and administrators. It has been summarized and supplemented by Drs. Martin and Vanosdall based on extant documentation and resources on the topic from the National Middle Schools Association, the National Science Teachers Association, the National Council of Teachers of Mathematics, and other key stakeholder organizations. This represents a series of recommendations for consideration by policymakers; in particular, the recommendations address professional development for existing teachers and support the development of a new teacher license for middle grades STEM teachers that provides depth of knowledge, pedagogical practices, and interdisciplinary relevance and rigor. Recommendations for the design of professional development support the systematic and systemic delivery of professional development to practicing teachers and the development of policies that support and reward participation of teachers and school districts. The middle school STEM license would be available and provide deep conceptual understanding, increased pedagogical practices, that are based on the developmental and cognitive sciences. With this solid foundation, novice teachers and dedicated experienced teachers, become empowered life-long learners who support universal access to excellent STEM education for all students in Tennessee. As a result, every student will experience success in learning and mastering STEM concepts, and thereby have the power of choice regarding their desire to enter the STEM workforce.

STEM Teachers Now is a project funded by the U.S. Department of Education (Award # P116Z10064) conducted at TMSTEC, the STEM Education Center at Middle Tennessee State University. This “Work in Progress” was produced in coordination and cooperation of the Tennessee State Board of Education and their Advisory Council on Teacher Education and Certification. The positions and information in this paper reflect those of the authors/editors, and do not represent approval or endorsement from the funding agency, any cooperating governmental organizations, nor any individual member of the working groups.

Supplemental Information:

The presentation summarizes the discussion and recommendations for a new middle grades teacher license with STEM education endorsements.

The main points of the recommendations are reflected in Table 2: Side-by-Side Comparisons of Current with Options 1 & 2 from the STEM Teachers Now Working Groups, attached.

Eight working groups were convened for a two-day immersion working session with small group and large group presentations and discussion. The working groups were composed of experts from across Tennessee with particular attention to representation from each of the three grand divisions as well as tapping the expertise from the following domains:

- a) Business/Industry/Foundations-2 representatives from two grand divisions;
- b) Government-6 representatives from stakeholder departments in the Dept. of Education, and 1 representative from the State Board of Education;
- c) Public/Private P-12 Education-10 representatives including the President of the TEA, 5 Central Office Administrators, 1 Principal, 3 Classroom Teachers;
- d) Higher Education (2 and 4 year institutions)-22 representatives including 1 from Oak Ridge Associated Universities, 10 from Colleges of Education (APSU, ETSU, MTSU, TTU, UM, UTK), and 11 from Colleges of Science (APSU, ETSU, Motlow State CC, MTSU, TTU)—these 22 IHE representatives were distributed by discipline as follows:
 - i. 5 scientists
 - ii. 2 mathematicians
 - iii. 1 engineer
 - iv. 4 science educators
 - v. 6 mathematics educators
 - vi. 4 professional educators

The large group was distributed into eight working groups through purposeful intention to maximize experience and expertise of the working group to focus upon the individual focus on the working group (Table 1).

Table 1: STEM Teachers Now Working Groups and Assignments

Working Group 1	Vision of STEM Education— Middle Grades	Develop a mission statement/concise vision for Middle Grades STEM teaching and learning.
Working Group 2	STEM Education Standards (Core Ideas)	Identify the core principles of STEM learning—as distinct from the principles of any individual discipline across STEM
Working Group 3	STEM Middle Grades Competencies	Describe the specific competencies for the training of new middle grades teachers who will teacher from a STEM methodology or perspective.
Working Group 4	Competencies for Middle Grades Math Teachers	Describe the specific competencies for the training of new middle grades math teachers.
Working Group 5	Competencies for Middle Grades Science Teachers	Describe the specific competencies for the training of new middle grades science teachers.
Working Group 6	Middle Grades STEM Professional Development	Describe the nature of professional development that current middle grades teachers in STEM disciplines need to improve student learning across the STEM disciplines.
Working Group 7	STEM Teacher Self Assessment and Reflection	Describe the habits of mind that distinguish math and/or science teaching with a STEM philosophy.
Working Group 8	Middle Grades Licensure Structure	Review the current Middle Grades Licensure documents and make recommendations regarding appropriate amendments for the structure of the license.

**Side-by-Side Comparisons of Current and Advisory Council Recommendation
for a Middle School STEM Teaching License**

	Current 4-8 Middle School Licensure	Additional 5-9 Middle School STEM Licensure
Grade Band	4-8	5-9*
Specialties	Prepare to teach all areas: ELA, Math, Social Studies, and Science	Choose One Combined Content Area: Math & Science with STEM Elements or ELA and Social Studies
Content Knowledge	<30%	>35% in Combined Content Area >2 course & semester sequence at least 3000 level in one content area
Professional Education	30%	30%
Other Coursework & Gen. Ed.	Approx. 50%	35%

STEM TEACHERS NOW: SUPPORTING MIDDLE SCHOOL STEM TEACHER DEVELOPMENT

Science

Principal Investigator/Project
Director:

Technology

Rick Vanosdall, Ed.D.
Director of STEM Education
Professor of Education
Middle Tenn. State Univ.

Engineering

Mathematical Sciences Faculty:

Mathematics

Mary Martin, Ph.D.
Professor of Mathematics
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Project funding by the
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Award #: P116Z10064

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S cience	Principal Investigator/Project Director: Rick Vanosdall, Ed.D. Director of STEM Education Professor of Education Middle Tenn. State Univ.
T echnology	
E ngineering	
M athematics	

Mathematical Sciences Faculty:
Mary Martin, Ph.D.
Professor of Mathematics
Middle Tenn. State Univ.

Project funding by the
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STEM TEACHERS NOW: SUPPORTING MIDDLE SCHOOL STEM TEACHER DEVELOPMENT

PART I:
MIDDLE GRADES STEM LICENSURE OVERVIEW

PART II:
MIDDLE GRADES STEM LICENSURE RECOMMENDATIONS

PART III:
PRELIMINARY RECOMMENDATIONS FOR MIDDLE GRADES
TEACHER PROFESSIONAL DEVELOPMENT

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PART I: MIDDLE GRADES LICENSURE OVERVIEW

Based on Working Groups
documentation and discussion

Mary Martin and Rick Vanosdall
Middle Tennessee State University

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A Work in Progress

- ▣ Working Conference was held in mid-August - 40 STEM Educators participated from across the state
- ▣ Eight working groups addressed issues critical to STEM Education in Tennessee
- ▣ Recommendations in eight areas are in progress, with all 40 individuals working in all eight areas

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Focal Topics

- ▣ Vision of STEM Education – mission and characteristics
- ▣ Defining elements of STEM Education
- ▣ Competencies in STEM Education
- ▣ Competencies in Math Education
- ▣ Competencies in Science Education
- ▣ STEM Professional Development
- ▣ STEM Teaching –Self-reflection and Best Practices
- ▣ Middle School Licensure

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Representation in Working Group

Individuals who worked on documents had experience vital to the task:

- ▣ Public Schools – 10
 - TEA President, 6 administrators, 3 teachers
- ▣ Higher Education – 22
 - 11 College of Sciences, 10 College of Education, 1 ORAU/ORISE
- ▣ State Policy -6
- ▣ Industry/Foundation- 2

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The “Oil in the Gulf” Analogy

There are two populations of teachers to address:

- Provide training to active teachers who are licensed as generalists and need additional opportunities to obtain the depth of knowledge needed in light of new standards and demands
- Training new teachers who need to be appropriately prepared and proficient in specific middle school content/pedagogy area(s)

Critical idea: These populations must have different implementation policies -- but the minimal educational thresholds (content and pedagogy expertise) are ultimately the same.

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Empowering Change

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**STEM Education-
A New Concept and a New Vision**

**Strategic Integration of
Science, Mathematics,
Engineering and Technology**

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**Building student readiness and
enthusiasm.**

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**STEM Education-
A New Concept and a New Vision**

- ▣ The strategic integration of technology with the application of engineering thinking and using an inquiry-based approach in the learning of mathematics and sciences while developing an appreciation of real-world applications and career readiness.
- ▣ Seamlessly weaves together technology and engineering with mathematics and the sciences with the intention of enthusing students for the upcoming high school program of study.

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Core Defining Principles

Flexible STEM Instruction

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Best Practices to encourage communication and inquiry

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Relevant Applications

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Way of thinking, planning, and applying knowledge

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Core Defining Principles

- ▣ Integrated STEM instruction and/or instruction that moves flexibly between and uses all four areas of STEM
- ▣ Uses teaching best practices, especially communication, vocabulary, and inquiry, to further depth of understanding
- ▣ Focus on relevant applications to deepen appreciation of STEM topics and understanding of career choices for the 21st century
- ▣ Way of thinking, planning and applying knowledge that is critical across all disciplines.

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Comments on Competencies

Competencies written in three areas (Math, Science, and STEM teaching)

--

Integration of Instruction

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Process Skills and Applications

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User's Guide for each area

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Comments on Competencies

- ☐ Reorganize and add competencies in the three areas of Math, Science, and integrated STEM perspective.
- ☐ The conscious integration of instruction is a method of improving teacher competency and student learning.
- ☐ Process skills and applications are common to STEM disciplines and uniquely different when compared to other disciplines; valuable opportunities for reasoning with concrete elements.
- ☐ Math, Science and STEM competencies have been listed for future use.
- ☐ Provide User's Guide to standards and additional support for teachers.

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Professional Development Recommendations

Connections between short and long term PD opportunities

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Standards-based project learning for teachers

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Curriculum specialist at each school

--

Increase focused planning time

--

Lesson Study and similar opportunities

--

Technology training

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Professional Development Recommendations

Various recommendations were suggested, including:

- ☐ Short term weekend opportunities connected to week-long summer institutes
- ☐ Access to standards-based projects for teacher learning
- ☐ Curriculum specialist at each school to provide support at a local level
- ☐ Increase focused planning time
- ☐ Add Lesson Study and similar opportunities
- ☐ Technology training in variety of areas

Additional information after completion of our primary discussion.

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Teacher Self-Assessment and Reflection

Develop Best Practices and objective self-analysis

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All PD should be content – driven

--

Encourage Habits of Thinking that support analytical self-evaluation of teaching.

--

Align all policies to attain PD validity

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Teacher Self-Assessment and Reflection

- ▣ Develop Best Practices and objective self-analysis
- ▣ All PD should be content – driven and consciously designed.
- ▣ Encourage the Habits of Thinking that support integrated STEM teaching and that encourage repeated analytical self-evaluation of teaching.
- ▣ Align structures for PD validity: School structures, licensure structures, leadership structures, and reward structures must support professionals continuing to develop improved content knowledge, pedagogical understanding, and teaching practices.

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Reviewing the data regarding certifications of teachers in 2009-2010 grades 6-8 classrooms...

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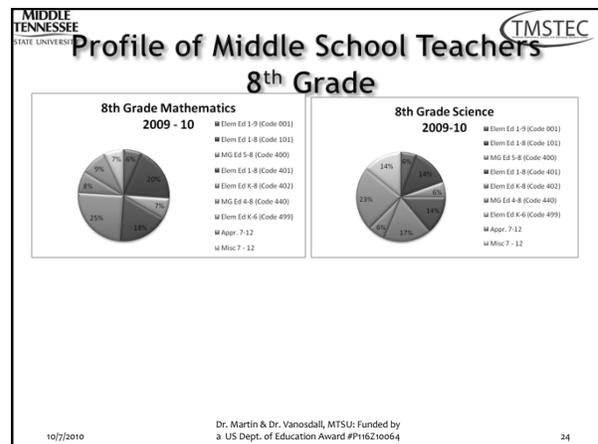
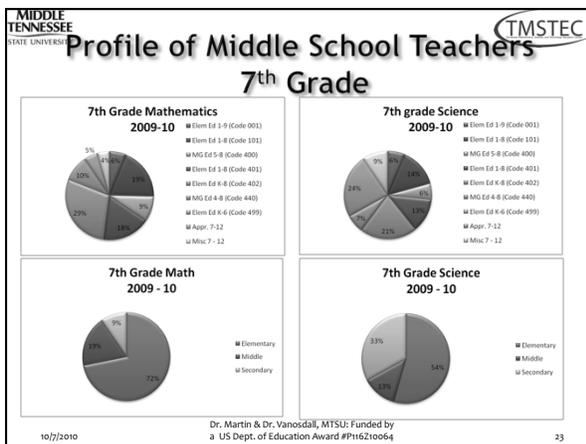
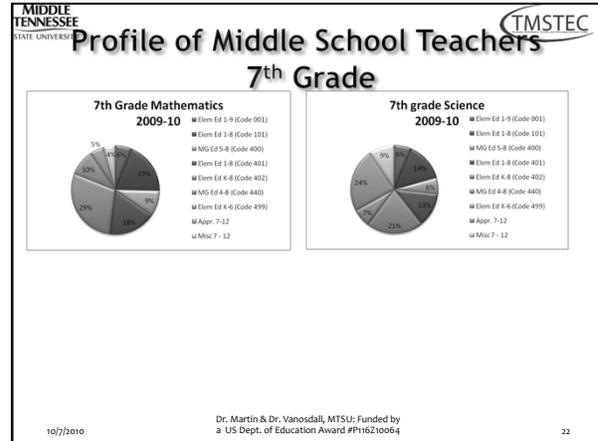
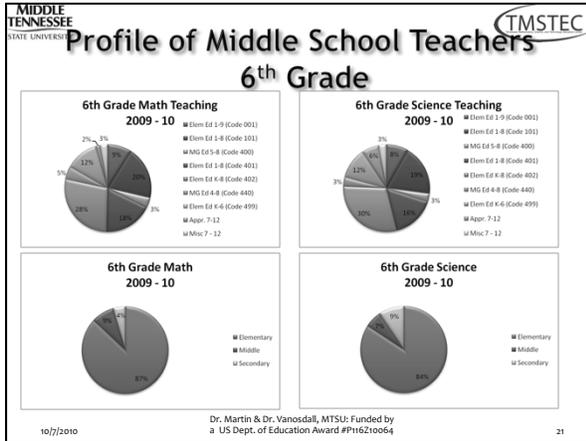
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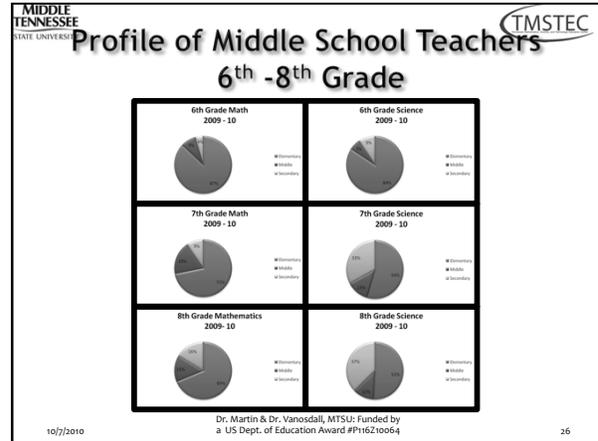
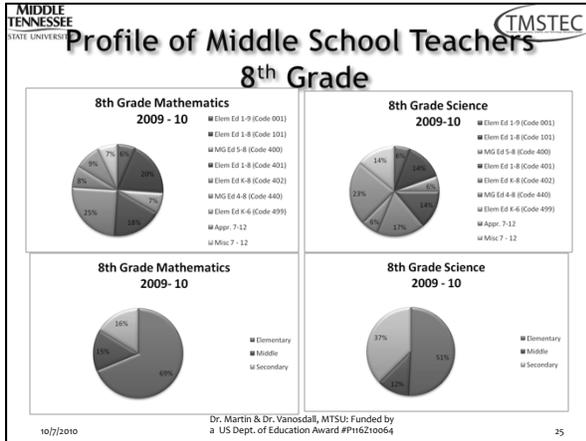
Profile of Middle School Teachers 6th Grade

6th Grade Math Teaching 2009 - 10

6th Grade Science Teaching 2009 - 10

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Middle School Licensure Recommendations

- ▣ The major charge for this meeting .
- ▣ Developed and supported with comments from all of the eight working groups.
- ▣ Provides the definition of a minimum threshold for effective middle school teaching.

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PART II: MIDDLE GRADES LICENSURE RECOMMENDATIONS

Based on Working Groups documentation and discussion

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Recommendations for the Development of a Middle Level STEM Teacher License

Table of Contents

1. Content (General, Two, Four, etc.)
2. Grade Band
3. Professional Education & the Middle Level Learner
4. Content-based Competencies
5. Teacher Proficiency Exams
6. Add-On Licensure Options

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Content

Current Program Implementation Guidelines:
(copied from the Tennessee Licensure Standards and Induction Guidelines, p.7-16 & 17)

1. The program of study in middle grades education enables teacher candidates to meet the performance standards for the middle grades education endorsement. Institutions of higher education develop a comprehensive program of study that integrates the standards in the general education core, professional education, and the major. The program of study assists candidates in teaching the subjects taught in middle grades, particularly English language arts, mathematics, social studies, and science, and the ability to apply developmentally appropriate practices to the various content areas.

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Content

Current Program Implementation Guidelines:
(copied from the Tennessee Licensure Standards and Induction Guidelines, p.7-17)

2. Candidates in middle grades education complete a major, consisting of courses offered primarily by faculty from arts and sciences disciplines. The major includes in-depth study of one or more fields, provides candidates the opportunity to demonstrate the integration of knowledge across the disciplines, and promotes an understanding of the processes of inquiry and research. The major may be combined with study in other fields related to how children learn in the context of their environment. Enrollment in such a major is open to students who are preparing for licensure in middle grades education and to students who are not. Examples include the following:
 - A. An interdisciplinary major, which includes study in English, mathematics, science and social studies.
 - B. An interdisciplinary major in two disciplines from the arts and sciences. The major may include any combination of subjects taught in elementary grades.
 - C. A major in a single discipline from the arts and sciences with an area of emphasis (approximately 10% of the undergraduate curriculum) in at least one additional discipline outside the major.

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Recommendation 1: Content

- A. **Content Distribution:**
 - Two Content Domains
 - Math/Science Combo with STEM Elements
 - Humanities?
 - or...
 - Four Content Domains
 - Mathematics only
 - Science only
 - Language Arts only?
 - Social Sciences/Studies only?

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Recommendation 1: Content

B. Expectations for the future...

- Two Content Domains supports the opportunity for the future development of fully integrated STEM courses in the middle level grades (part of the vision for STEM education in the future)

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Recommendation 1: Content

c. End the Grades 4-8 Generalist License

- Seal the leak in the pipeline
Stop producing teachers who lack the foundational depth of understanding required to facilitate the learning of all students
- K-6 License continue as is
- 7-12 License continue as is

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Recommendation 2: Grade Band

A. Grades 5-8+
(option to earn employment standards exceptions for Algebra I and/or Physical Science upon completion of relevant Tennessee State Employment Standards Training)

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Recommendation 2: Grade Band

B. The working groups also discussed:

1. Grades 5-8 or 6-8: with inclusion of the qualifications to meet competencies to teach Algebra I and Physical Science (increasingly offered in 8th grade classrooms)
2. Grades 5-9 was considered for the flexibility for teachers to be utilized in 9th grade classrooms for the new math and science graduation standards

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Recommendation 2: Grade Band

c. The grade band 4-8 was not seen as a viable option due to:

- the common expectation that 4th grade classrooms are self-contained, and
- the need for the depth of knowledge/understanding to adequately prepare middle level teachers for the standards and students in grades 6-8.

Note: This was a unanimous position of the working groups.

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Recommendation 3: Professional Education for the Middle Level Learner

A. 30% of undergraduate program

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Recommendation 3: Professional Education for the Middle Level Learner

A. 30% of undergraduate program

1. STEM Pedagogical practices
2. Pedagogical foundations for middle level students
3. Foundations in:
 - a) middle level philosophy and organization
 - b) young adolescent development
 - c) middle level curriculum
 - d) middle level special needs considerations

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Recommendation 4: Content-based Competencies

A. >35% of undergraduate program

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Recommendation 4: Content-based Competencies

A. >35% of undergraduate program

1. **Science:**
 - Increase depth of conceptual understanding, fewer topics, deeper understanding (authentic rigor)
 - Increase the Nature of Science, and Inquiry/Constructivist Practices across all topics in science
2. **Technology:**
 - Inclusion of Project-based Instruction and Learning across science and mathematics
3. **Engineering:**
 - Inclusion of engineering design principles with PBI across science and mathematics
4. **Mathematics:**
 - Increase depth of conceptual understanding, and the integration of concepts for a more accurate and comprehensive foundation in mathematics

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Recommendation 4: Content-based Competencies

B. Future consideration:

The implementation of a fully integrated STEM curriculum that represents a synergistic approach to conceptual understanding, and the ACT benchmarks in Math and Science

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Recommendation 5: Teacher Proficiency Exams

A. New exams specifically targeted for

1. Middle level Professional Education Standards—see recommendations for Professional Education Competencies
2. Mathematics (with Science, Technology, and Engineering applications)
3. Science (with Mathematics, Technology, and Engineering applications)
4. Parallel exam sets as need for other disciplines/endorsements

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Recommendation 5: Teacher Proficiency Exams

B. Licensure and Endorsements:

Middle level License with endorsements in:

1. Math & Science (with STEM elements)
2. Parallel endorsements for other disciplines/domains

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Recommendation 5: Teacher Proficiency Exams

C. Content focused on critical thinking, and core math and science conceptual understanding needed for current and foreseeable future standards revision with elements of technology and engineering

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Recommendation 6: Adding an Endorsement

A. Current 4-8, K-6, and 7-12 teachers will continue to hold their license and teach as they have been assigned (no change for current license holders)

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Recommendation 6: Adding an Endorsement

B. All new teachers will hold the 5-8 license with:

1. Math & Science in STEM endorsement
- OR...
2. Other parallel endorsements

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Recommendation 6: Adding an Endorsement

C. Teachers may add endorsements by passing all relevant Teacher Proficiency Exams

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Recommendations for the Development of a Middle Level STEM Teacher License

Table of Contents

<ol style="list-style-type: none"> 1. Content 2. Grade Band 3. Professional Education & the Middle Level Learner 4. Content-based Competencies 5. Teacher Proficiency Exams 6. Add-On Licensure Options 	<ol style="list-style-type: none"> 1. Single or Double Discipline 2. Grades 5-8+ 3. 30% of undergrad degree 4. >35% of undergrad degree 5. Prof. Ed., Math/STEM, Science/STEM 6. Pass relevant Teacher Proficiency Exams
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STEM TEACHERS NOW: SUPPORTING MIDDLE SCHOOL STEM TEACHER DEVELOPMENT

Science Technology Engineering Mathematics

Based on STEM Teachers Now Working Groups

	Current	Option 1	Option 2
Grade Band	4-8	5-8+	5-8+
Specialties	Prepare to teach all areas: ELA, Math, Social Studies, and Science	Choose One Content Area: ELA Math Social Studies Science	Choose One Combined Content Area: Math & Science with STEM Elements ELA and Social Studies
Content Knowledge	No recommendation given	>35% in Single Content Area >2 course & semester sequence at least 3000 level in one content area	>35% in Combined Content Area >2 course & semester sequence at least 3000 level in one content area
Professional Education	No recommendation given	30%	30%
Other Coursework & Gen. Ed.	Approx. 50%	35%	35%

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PART III: PRELIMINARY RECOMMENDATIONS FOR MIDDLE GRADES STEM PROFESSIONAL DEVELOPMENT

Based on Working Groups documentation and discussion with supplemental information from Drs. Martin & Vanosdall

Mary Martin and Rick Vanosdall
Middle Tennessee State University

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Professional Development Features

- Focused, targeted, and intentionally designed
- State-wide planning and scheduling
- School System option to align their PD with state PD
- Appropriately funded
- Appropriately tied to reward structure for teachers
- Coordinated with proficiency examinations and exceeds those thresholds
- Evaluated and regularly reviewed

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State-wide PD Design

- ❑ Include 3 year rotation of content topics
- ❑ Focus on providing knowledge targeted to model best practices that are content related
- ❑ Reverse design/intentional design to coordinate with content knowledge expectations that exceed actual classroom instruction levels
- ❑ Include content-specific pedagogy and best practices
- ❑ Instruction delivery should be at least 50% IHE and at most 50% peer and/or distance learning
- ❑ Should coordinate with NSDC standards for Staff Development

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State Scheduling and Participation

- ❑ All PD state-wide encouraged to coordinate with State schedule – “The Year of...”
- ❑ Provide three year rotation of topics
- ❑ Laser focus of PD instead of current shotgun, ad hoc approach
- ❑ Decrease in PD opportunities that are unrelated to state schedule

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Alignment with Resources and Reward Structure

- ❑ Local school entities are encouraged to coordinate with state schedule
- ❑ Teachers' leadership aligns with state PD structure
- ❑ Teachers' reward structure aligns with state PD structure
- ❑ Direct rewards to teachers for participation included in plan
- ❑ Direct rewards to IHE faculty for participation included in plan
- ❑ Mandatory value towards tenure included for P-20 teachers

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PD Management

- ❑ Permanent budget funding and staff to support design, materials, year-long systematic planning, and instructional cost
- ❑ Coordinated in order to provide material that surpasses teacher proficiency exams
- ❑ Evaluated for ties to school curriculum, teacher participation outcomes, and impact on students of participants

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NSTA PD Web Features

Evaluation to determine topics of interest/need
 ↓
 Generates appropriate Pre-test(s)
 ↓
 Generates list of resources and exercises
 ↓
 Generates post-test(s)

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STEM TEACHERS NOW: SUPPORTING MIDDLE SCHOOL STEM TEACHER DEVELOPMENT

PART I:
MIDDLE GRADES STEM LICENSURE OVERVIEW

PART II:
MIDDLE GRADES STEM LICENSURE RECOMMENDATIONS

PART III:
PRELIMINARY RECOMMENDATIONS FOR MIDDLE GRADES
TEACHER PROFESSIONAL DEVELOPMENT

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STEM TEACHERS NOW: SUPPORTING MIDDLE SCHOOL STEM TEACHER DEVELOPMENT

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T echnology	
E ngineering	Mathematical Sciences Faculty: Mary Martin, Ph.D. Professor of Mathematics Middle Tenn. State Univ.
M athematics	

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