Memorandum

To: SBOE members
Commissioner Edelblut

Fm: Members Cindy Chagnon and Bill Duncan

Re: Standards for Standards Review

Date: May 8, 2017

At the March meeting, we proposed guidelines for a potential review of ELA and math standards. It's been six years since initial adoption and it's logical to consider a review.

However, a question surfaced at the April meeting about department capacity for a standards review. So we reviewed the approaches other states have taken and, based on that, make several observations as background for consideration of future plans the department may present.

Back when the common core debate was active, at least 16 states, including Maine, undertook standards reviews. Like Maine, most made minor changes and reaffirmed their commitment to the standards. We would recommend that the department review other states' experience but in our own overview, other states' reviews had several key elements in common:

- Detailed plan - The process usually started with the presentation to the board of a detailed plan (such as the New Jersey plan in Att. 1) that included public reviews at the beginning and the end of the process, full specifications for multiple committees, and a comprehensive timeline, sometimes down to the committee meeting schedule.
- Substantial budgets - Budgets ranged from $125,000 on up. The Tennessee budget (Attachment 4), is $150,000 per subject, including educator stipends similar to those required in our recent assessment RFP.
- Grade-by-grade, standard-by-standard feedback - All reviews were based primary on the detailed feedback provided by parents, educators and the business community at the beginning of the process, through a web site set up to receive standard-by-standard feedback as well as in public forums, listening tours, and focus groups. (The video describing the Colorado standards feedback web site is pretty representative, and here is an example of questions from town hall meetings from West Virginia.)
- Start with the current standards - All the ELA and math standards reviews we looked at improved what was in place based on responses from the public and the business community. They found very little that needed changing. Only Oklahoma did a rewrite. It took two years and a large budget but still got poor

reviews from advocates on all sides of the issue (Attachment 6). New Hampshire, with even less standards writing capacity, was part of the first-of-its-kind NECAP multi-state consortium and an active participant in the 40 state consortium that wrote our current standards.

- Efficient timelines - Rewrites take a long time but a revision can be more efficient. New Jersey posted updated standards for public comment just four months and the board considered the revised standards six months after the start date. South Carolina completed its review in 8 months; Tennessee's board adopted the revised standards 9 months after the start date.
- Educator commitment - The educators and school leaders the process depends upon were committed to standards review process.
- Psychometric expertise - Strong psychometric expertise always drove the process. The result was that, after modification, the standards still provided a legitimate basis for assessment.
- Timing - All of these states changed their annual assessments as needed after the standards were developed, not before.

The fact that, after a substantial investment, other states found little to change in the standards may reduce the urgency here in New Hampshire. In addition, New Hampshire districts can and do make their own changes, without the state board's oversight, and can let the board know when there are standards the do not work, making it a real New Hampshire local control process rather than the top-down process other states have employed. That's what happened with our science standards. Science teachers and their districts moved to NGSS on their own, found them effective, and asked the board to catch up by adopting the NGSS.

We recommend that the New Hampshire standards review process at least match the clarity and rigor demonstrated by other states. A process less organized and transparent would leave room for suspicion and lack of finality about the project.

Attachment 1: Standards review proposal from the New Jersey Department of Education to its Board of Education.
Attachment 2: A CCSSO case study of the South Carolina standards review process and the Achieve review of the new draft standards.
Attachment 3: The Louisiana standards review process
Attachment 4: The Tennessee standards review process
Attachment 5: The North Carolina standards review results
Attachment 6: The Colorado standards review process
Attachment 7: The Oklahoma's standards rewrite process

Attachment 1: Standards review proposal from the New Jersey Department of Education to its Board of Education

New Jersey's Standards Review Process

2015

Proposal Outline

1. **Background**

2. Committee Membership

3. Review Process and Meeting Procedures

In May, Governor Christie called on the New Jersey Department of Education to review New Jersey's Core Curriculum Content Standards in English language arts and mathematics to develop higher standards that reflect the educational needs and goals of our communities.

New Jersey Standards

The New Jersey Department of Education proposes a standards review process led by professional New Jersey educators that results in the best New Jersey standards for students. New Jersey has a strong history of standards and our review process will build upon the rigor and academic success of our standards in the past.

The following principles will guide this local review:

1. **Consistency:** The standards review will be consistent with the regulatory process of the State Board.
2. **Focus on the standards:** The review process will focus on the New Jersey Core Curriculum Content Standards.
3. **Improve what exists today rather than start from scratch:** The review process will improve the New Jersey Core Curriculum Content Standards in English language arts and mathematics based on NJ expert review and revisions.
4. **Public input:** The review process will include opportunities for public comment on each standard.

Proposal Outline

1. Background

2. **Committee Membership**

3. Review Process and Meeting Procedures

Standards Review Committee

23 members

Guide process and updates

Make final recommendation to NJSB

Standards Committee

Subcommittees

K-2: 22 members

3-12 (ELA & Math): 28 members each

K-2 Content Subcommittee

3-12 ELA Content Subcommittee

3-12 Math Content Subcommittee

New Jersey academic content standards should be a living set of expectations designed to meet the ever-changing needs of New Jersey's students to ensure their success in postsecondary education, the workplace, and readiness to compete in a global society. New Jersey State Board of Education regulations provide for a regular review of academic standards to ensure they meet these goals.

- A Standards Review Committee will review the New Jersey Core Curriculum Content Standards in English language arts and mathematics to raise our standards and ensure they are New Jersey based. This committee will
  - monitor progress
  - ensure alignment across grade levels and subjects
  - make final recommendations to the NJSBOE.
- At least half of this committee will be current New Jersey, district and school-based educators. Given their expertise, representatives of these members will also serve on one of three content subcommittees.

Participants	Nominating Body	Qualifications (all must be NJ educators and experts)	Total
Member of K-2 content subcommittee	School Districts	❑Current, K-2 district/school-based educator	1
Member of 3-12 ELA content subcommittee	School Districts	❑Current, 3-12 district/school-based educator	1
Member of 3-12 math content subcommittee	School Districts	❑Current, 3-12 district/school-based educator	1
Teacher representative	NJEA, AFT, School Districts	❑Current, school-based educator	3
Math content experts	University & County College Deans	❑Current university/county college faculty ❑Recognized as mathematics content expert by peers	2
ELA content experts	University & County College Deans	❑Current university/county college faculty ❑Recognized as mathematics content expert by peers	2
Early Elementary content expert	University Dean	❑Current university/county college faculty ❑Recognized as mathematics content expert by peers	1
Post-secondary education representative	University & County College Deans	❑Individual familiar with academic expectations for freshman entering NJ public post-secondary colleges and universities	2
Parents	NJ PTA (1), PTO (1), SPAN (1)	❑Parent of a current NJ public school student ❑Represent different regions of NJ ** at least 1 of 3 parents has a student with special needs	3
Principal	NJPSA	❑Current NJ principal	1
Superintendent	NJASA (comprehensive (1) Technical School (1))	❑Current NJ superintendent	2
School board member	NJSBA	❑Current NJ school board member	1
Charter school representative	NJ Charter Schools Association	❑Current NJ charter school principal or CEO	1
Business and Industry	Chamber (1) & BIA (1)	❑NJ business and industry owner or association representative	2
TOTAL			**23**

Content Subcommittees

- For the current review process (2015), three content subcommittees will review each set of standards in depth.
  - K-2 Content Subcommittee
  - 3-12 ELA Content Subcommittee
  - 3-12 Math Content Subcommittee

- Each content subcommittee will propose a set of revised standards to the Standards Committee for consideration.

- Seventy five percent of each content subcommittee will be current, district and school-based educators.

K-2 Content Subcommittee

Participant	Qualifications	Total
Kindergarten educators	❑Current, K school-based teacher	4
First grade educators	❑Current, 1st grade school-based teacher	4
Second grade educators	❑Current, 2nd grade school-based teacher	4
District K-2 content experts	❑Current district, K-2 staff member	5
Early elementary content expert	❑Faculty content expert ❑Previous educator in NJ ❑Recognized early elementary content expert by peers ❑At least one has a background in childhood psychology	2
Elementary school education expert	❑Faculty content expert	1
Special education expert	❑Faculty content expert ❑Current district staff	1
ELL education expert	❑Faculty content expert ❑Current district staff	**1**
TOTAL		**22**

3-12 ELA Content Subcommittee

Participant	Qualifications	Total
3-5 ELA educators	❑Current, 3-5, school-based teacher	6
6-8 ELA educators	❑Current, 6-8, school-based teacher	6
High school ELA educators	❑Current, high school, school-based teacher	6
District ELA content experts	❑Current district, ELA staff member	5
ELA content expert	❑Previous NJ educator ❑Recognized ELA content expert by peers	2
Special education expert	❑Faculty content expert	1
ELL education expert	❑Faculty content expert	1
CTE education expert	❑Faculty content expert	1
TOTALS		**28**

3-12 Math Content Subcommittee

Participant	Qualifications	Total
3-5 math educators	❑Current, 3-5, school-based teacher	6
6-8 math educators	❑Current, 6-8, school-based teacher	6
High school math educators	❑Current, high school, school-based teacher	6
District math content experts	❑Current district, ELA staff member	5
Math content expert	❑Previous NJ educator ❑Recognized ELA content expert by peers	2
Special education expert	❑Faculty content expert	1
ELL education expert	❑Faculty content expert	1
CTE education expert	❑Faculty content expert	1
TOTALS		**28**

Community Involvement

- **Standards Survey**
  - Online survey available for all stakeholders to comment standard by standard, grade by grade, and content area by content area
- **Listening Tours – 3 regional**
  - These tours will allow for an open forum for community members, including parents and members of the business community, to address their concerns about specific standards to inform the work of the committees.
- **Community Focus Groups – 3 regional**
  - These focus groups, made up of parents, business community members, and higher education leaders, will meet prior to each regional Listening Tour. It is imperative that we collect local, community feedback early in the review of the standards to ensure specific concerns are addressed throughout the review process.

Proposal Outline

1. Background

2. Committee Membership

3. **Review Process and Meeting Procedures**

New Jersey DEPARTMENT OF EDUCATION

Nomination/Application Process

Step and Timeline	Details
Step 1: Districts and Organizations Nominate •July 15: Nomination forms (Standards Review Committee) and Applications (Subcommittees and Focus Groups) released •July 24: Nomination forms and applications due	**•Each district may nominate a maximum of the following:** ❑2 school-based educators ❑2 district content staff members ❑1 special education, ELL, or CTE expert (school or district-based) ❑Can meet all time commitments(up to 10 in person days over 5 months and work time) **•Each organization nominates 4 candidates per allotted position** **•Nominees must meet the following criteria:** ❑NJ educator or expert ❑Can meet **ALL** time commitments (up to 10 in person days over 5 months and work time) ❑Recognized as a content and pedagogical expert
Step 2: Committee Proposals •July 31: Committee make up finalized	**•Representatives for each committee will be chosen to meet the following criteria:** ❑Each grade level K-12 in math and ELA represented ❑Experts include early childhood, reading, mathematics, psychology, special education, English language learners, Career and Technical education, science, and social studies ❑Representatives are diverse in gender, ethnicity, and regional representation **•A total of 98 committee members will be chosen** ❑22 K-2 subcommittee members and 28 (each) 3-12 ELA and math subcommittee members ❑3 of the representatives on the Standards Review Committee serve on the content subcommittees

Review Process – Phase 1

Step	Details	Date
Public Comment	❑Standards posted on the website for public comment ❑Parents, community members, committee members, and educators share their feedback on each individual standard, K-12, ELA and mathematics ❑Consultants from an independent third party will review public comments and share a report with the committees ❑Listening Tours – Regionally (N,C, S) ❑Parent Focus Groups – Regionally (N,C,S)	•July – Mid-August, 2015 (survey) •September, 2015 (listening tours)
Standards Committee **INITIAL REVIEW**	❑Review public comments ❑Send process recommendations to each content subcommittee ❑NJDOE staff capture comments and prepare materials	•Mid-August, 2015 – 1 full day meeting •End August, 2015 – 1 full day joint meeting with each content subcommittee
Content subcommittees **REVIEW AND UPDATES**	❑Review public comments ❑Work in grade band groups to review standards ❑NJDOE staff capture recommendations for the Standards Review Committee ❑Each subcommittee will provide input on proposed updates	•End August, 2015 – 1 full day joint meeting with Standards Review Committee •Early September, 2015– 1 full day •End September, 2015 – 1 full day •Mid-October, 2015 – 1 full day •End October, 2015 – 1 full day

Review Process – Phase 2

Step	Details	Date
Public Comment	❑Update standards and post for public comment	•End October, 2015
Standards Committee **FINAL REVIEW**	❑Review public comments , student assessment results, and proposed updates from content subcommittees ❑Check for alignment from K-2 and 3-12 subcommittees ❑Full review of each individual standard and update ❑Direct subcommittees to review small revisions where required	•Early November, 2015 – 1 full day meeting
Content subcommittees **REVIEW AND UPDATES**	❑Review recommendations based on Standards Committee requests ❑Update proposals	•Mid-November, 2015- 1 full day •End November, 2015 - 1 full day
Standards Committee **FINAL VOTE**	❑The NJDOE prepares final updates based on recommendations from subcommittees ❑Standards Review Committee reviews final recommendation updates	•Mid-December, 2015 – 1 full day
NJSBE PROPOSAL	❑NJSBOE considers recommended updates to standards	•January 6, 2016

Standards Review Process FAQs
July 2015

Frequently Asked Questions (FAQs) about the standards review process include answers related to committee makeup, form completion, and committee expectations. This document also provides review process information for all who are interested in applying for the **Standards Review Committee** or **Content Subcommittees**, as well as for others interested in engaging in the standards review process.

This FAQ currently contains questions that have been asked by potential applicants to date, and it will be updated with new questions and answers, as needed. Some questions will refer back to the July 2015 State Board presentation listed on the NJDOE website.

What will the two committees do and who is eligible to serve on each?

Which form do I use for which committee, and are other application materials required?

Which organizations may nominate for the Standards Review Committee?

What is the expected availability or commitment for members of the committees and subcommittees?

When will I know if I have been selected for a committee?

What should I do if I want to be on the Standards Review Committee and I don't believe I can secure a nomination?

Who can I contact if I have a question about filling out the forms?

When are applications due? Is there a specific time that they must be in on the due date?

Where do I send application materials?

If I am not interested in applying for the Content Subcommittees or Standards Review Committee, but want to be involved, how can I engage in the standards review process?

What do the two committees do and who is eligible to serve on each?

The 23-member **Standards Review Committee** will review the New Jersey Core Curriculum Content Standards in English language arts and mathematics to develop higher standards that reflect the educational needs and goals of our New Jersey communities. This committee will monitor the progress of subcommittees, ensure alignment of content across grade levels and subjects, and make final recommendations to the State Board of Education (NJSBOE). Membership on the Standards Review Committee is by nomination only, and the nomination form can be found at http://www.state.nj.us/education/standards/. This nomination form is applicable to the Standards Review Committee only. The nomination form must be completed by the nominating party, and each person nominated will also need to provide a resume and "Statement of Interest."

Educators, parents, education organization members, and business representatives may serve on the committee. *At least half of the committee will be current New Jersey district- and school-based educators. Representatives from the* ***Standards Review Committee*** *will also serve on each of the* ***Content Subcommittees****.*

The three **Content Subcommittees** will review each set of standards in depth -- (K-2 - 22 members); (3 -12 English language arts - 28 members), and (3 -12 mathematics – 28 members). Each subcommittee will propose a set of revised standards to the **Standards Review Committee** for consideration. Educators can apply for the content subcommittees, no nomination is required. *Seventy-five percent of each content subcommittee will be current district- and school-based educators.*

Which form do I use for which committee, and are other application materials required?

Candidates for the **Standards Review Committee** must be nominated. Nomination forms are available online at: http://www.state.nj.us/education/standards

Content Subcommittees do not require a nomination. Educators and content specialists can choose to submit a **Content Subcommittee** application, along with a "Statement of Interest" and their resumes to apply for participation.

A candidate can be nominated for the **Standards Review Committee** by an organization, and also submit an application for a **Content Subcommittee**. Or, the candidate can apply for one of the **Content Subcommittees** where no nomination is required.

Which organizations may nominate candidates for the Standards Review Committee?

The following organizations may nominate candidates for the Standards Review Committee:

- American Federation of Teachers (AFT)
- New Jersey Business and Industry Association (NJBIA)
- Chamber of Commerce
- County College Deans
- Local Parent Teacher Organizations (PTO)
- New Jersey Association for Supervision and Curriculum Development (NJASCD)
- New Jersey Association of School Administrators (NJASA)
- New Jersey Charter Schools Association
- New Jersey Education Association (NJEA)
- New Jersey Parent Teacher Association (NJPTA)
- New Jersey Principals and Supervisors Association (NJPSA)
- School Districts

- Special Education Parent Advisory Council (SEPAC)
- Statewide Parent Advocacy Network (SPAN)
- University Deans

NOTE: Be sure to review the presentation from the July Board of Education meeting for details on qualifications, as well as the total number of nominations allowable from the nominating body.

What is the expected availability or commitment for members of the committees?

From August to December, the Department is estimating a 10-day commitment during typical work hours for the **Standards Review Committee** and **Content Subcommittees**. There will also be some personal work time requested in addition to the 10-day commitment. This will be determined throughout the review process but will fall within the August to December timeline. We recommend that all candidates communicate the level of this commitment to the committee work to their districts before they apply. Committee members are expected to attend all meetings that may be scheduled during the review process.

When will I know if I have been selected for a committee?

Applicants will be made aware of their selection in early August.

What should I do if I want to be on the Standards Review Committee and I don't believe I can secure a nomination?

Potential nominees should speak directly with their organization regarding a nomination for the **Standards Review Committee**. Educators who are interested in **Content Subcommittees** do not need a nomination and are welcome to apply using the **Content Subcommittee** application form. See slide 8 of the July 2015 State Board presentation .

Who can I contact if I have a question about filling out the forms?

Please email njstandardsreview@doe.state.nj.us with any questions or concerns.

When are applications due? Is there a specific time that they must be in on the due date?

Applications are due on July 31 by 4 p.m.

Where do I send application materials?

Please send all application materials to njstandardsreview@doe.state.nj.us

If I am not interested in applying for the Content Subcommittees or Standards Review Committee, but want to be involved, how can I engage in the standards review process?

There are three additional ways to participate. They are listed below.

Standards Survey

An online survey is available for all stakeholders to comment standard-by-standard, grade-by-grade, and content area-by-content area

Listening Tours – three regional
These tours will provide open forums for community members, including parents and members of the business community, to address their concerns about specific standards to inform the work of the committees.

Community Focus Groups – three regional
Focus groups made up of parents, business community members, and higher education leaders will meet prior to each regional listening tour. It is imperative that the group leaders collect local, community feedback early in the review of the standards to ensure that specific concerns are addressed throughout the review process.

Revised July 28, 2015

Attachment 2: A CCSSO case study of the South Carolina standards review process and the Achieve review of the new draft standards

Communicating South Carolina's Standards Review Process

How Transparency and Stakeholder Engagement Helped to Calm Contentious Waters

"First new non-Common Core standards up for review

S.C. teachers soon will have new guidelines — replacing the controversial Common Core standards — for teaching reading and writing in classrooms from kindergarten through high school."

\- *The State,* November 2014

Summary

- From summer 2014 to February 2015, South Carolina educators and community leaders worked together to draft new Mathematics and English language arts standards to replace the Common Core State Standards.
- The South Carolina Department of Education (SCDE) prioritized transparency and maintaining the public's trust in the process itself. To help foster both, SCDE created an online home for their standards review process, through which all information and communications materials were disseminated.
- SCDE established a rigorous, multi-step drafting and review process, working with educators, parents, business leaders, and community leaders to develop new standards and earn endorsements from South Carolina higher education institutions prior to adopting the new standards.
- Consistent and clear messaging, transparency, and community involvement helped ensure that when South Carolina's new academic standards were adopted in March 2015, there was enough buy-in and involvement from key stakeholders that any accusations that the new standards were just "rebranded Common Core" did not stick.

Situation

On May 30, 2014, South Carolina Governor Nikki R. Haley signed a bill into law that required replacement of the Common Core State Standards with new, locally-driven standards in time to be implemented for the 2015-16 school year. The standards review and development process spanned nine months, with the new standards being officially approved and adopted by the state's Education Oversight Committee (EOC) and State Board of Education (SBE) in March 2015. Because of the manner in which the process was managed, key validators for the new standards – South Carolina teachers, business leaders, and higher education officials – were already engaged in the process and helped to amplify positive messages. The strength and thoroughness of the process remains SCDE's bulwark against criticism that the new standards are just "Common Core by another name."

May 2014 – Gov. Haley signs law requiring new standards
June 2014 – Establish standards writing teams and review task forces
July 2014 – Begin reviewing existing standards & drafting new standards
October 2014 – Finalize 1st draft of new standards
November 2014 – Online public comment period; review panels share feedback
December 2014 – Standards writing teams reconvene, revise standards
January 2015 – Joint SCDE, SBE, EOC, higher education, and community teams revise standards; reach consensus; SBE approves ELA Standards
February 2015 – SBE Approves Math Standards
March 2015 – New standards formally adopted by EOC and SBE
Spring & Summer 2015 – Professional development for new standards
August 2015 – SC schools implement new standards

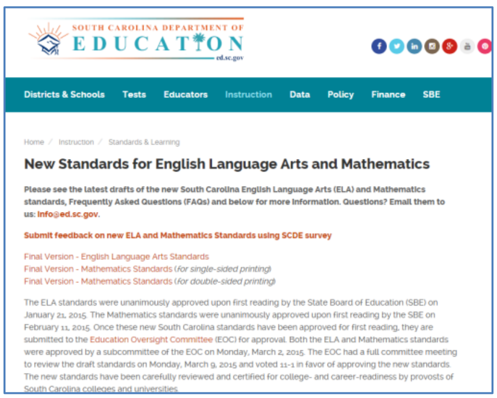
Approach

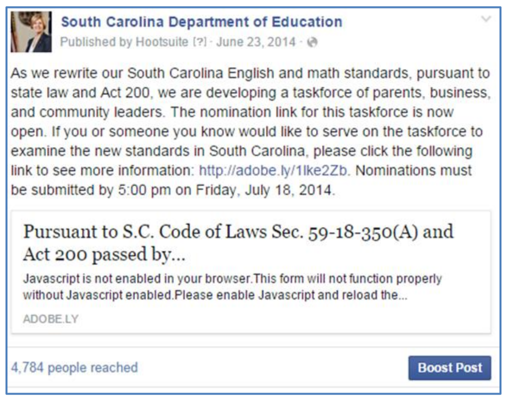
In order to comply with the new law, SCDE officials started with the overall deadline – new standards for 2015-16 – and established a timeline working backwards from that point.

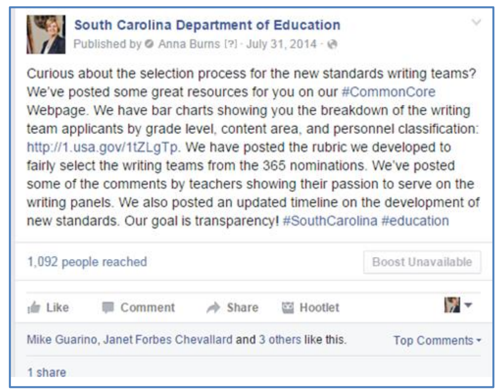
Because much of the pushback over the Common Core in South Carolina had been driven by confusion over who wrote the standards and how they were created, SCDE prioritized maintaining transparency and inclusiveness throughout the process.

Create an Easy Way for Individuals to Access Information

SCDE created a web page that served as the communications hub throughout the review process as a way of enabling a communications effort that was streamlined and transparent. This page was updated throughout the process to answer frequently asked questions about the timeline, individuals involved, and overall status of the review process. SCDE directed anyone with questions to this webpage, distributed press releases directing reporters to the website, and also promoted the website through Twitter, Facebook, Google+, and LinkedIn posts to ensure they were reaching their audience with updates and that the messaging around the review process was consistent.







Create Opportunities for Stakeholder Engagement

SCDE's review process provided opportunities for educators, community stakeholders, and the public at large to participate. During the summer and fall of 2014, SCDE invited South Carolina educators from across the state to participate in the drafting of the new standards. The ELA and Math standards writing teams were made up of 20 teachers each, and were chosen from the record 340 applicants, with SCDE taking special care to ensure that the teams represented a cross-section of urban, suburban, and rural communities. In addition to the educators charged with writing the standards, SCDE and EOC also invited approximately 100 community leaders into the process through the establishment of two task forces that reviewed and helped revise drafts of the standards. As a part of this community outreach, SCDE secured certification of the new standards as college- and career-ready from all South Carolina four-year colleges and universities as well as the state technical college system, which was an effective proof point in making the case for the new standards.

To further reiterate the inclusiveness of the review process, SCDE held a one month public comment period in November 2014 that was open to anyone, and posted all revisions for additional comment. While not administered by SCDE, the EOC also hosted a public comment period during the drafting process.

The public was asked to review and comment on the new draft standards. Importantly, the feedback was structured to allow for comments on specific standards. Through the efforts of both SCDE and EOC, the process yielded more than 18,000 comments which were used to validate and improve upon the drafts being reviewed by the writing teams and task forces.

During that revision process, SCDE sought to emphasize that the standards were still in a draft form and were not going to be perfect, and thus constructive criticism was not just expected, but welcomed.

Best Practices

- Transparency is key.
- Provide periodic updates to legislators, the governor's office, media, and the public, among others, on how the process is proceeding.
- Make the process in revising the standards transparent to the public.
- Partner with education, business, civil rights, and advocacy organizations to get the word out about the opportunity to comment on the standards and the standards revision process as a whole.
- Include representatives from the final decision makers in the process. SCDE's last round of reviews included not only educators and general community members, but EOC, SBE, higher education, and legislative representatives.
- Document and communicate the standards-setting process in your state:
    - Explain your state's vision for providing students with academic standards.
    - Share your state law/provision for creating, revising, and reviewing state academic standards (including who sets the standards, who approves the standards, and how the public plays a part in that process).
    - Create a timeline of your review process, with opportunities for input.
    - Include in all press releases and resulting media related to this process:
        - How input was received, synthesized, and how decisions were ultimately made
        - How standards are approved/confirmed/voted on.
    - Define the Standards Committee by releasing:
        - All communications soliciting participation or appointment for the standards setting committee.
        - Description of committee's charge/scope of work.
        - Names, content area, geographic location, and qualifications of each committee member.
    - For additional examples, see West Virginia's standards revision site and Colorado's description of the history and development of its academic content standards.

- Make it easy for the public to find information about the revision process on the state website and via social media outlets.

- Prepare for results of the review/revision process:
    - Provide a clear list of changes between the new standards and the previous standards.
    - Create talking points for all state education agency (SEA) staff regarding the changes between previous standards and new standards.
    - Equip teachers and other individuals involved in the standards revision process to be spokespeople about the process and the quality of the standards.
    - Have a standards implementation plan in place so the hard work of teaching the standards can begin quickly.

A Review of the South Carolina College- and Career-Ready Standards in English Language Arts and Mathematics

Submitted to the South Carolina Department of Education August 2015

Table of Contents

Introduction

This report provides a review of the South Carolina College- and Career-Ready Standards (SCCCRS) for English language arts and mathematics, adopted by the South Carolina Board of Education on March 11, 2015, to replace the Common Core State Standards (CCSS). These new standards stem from state legislation signed by Governor Nikki Haley in 2014 requiring the state to review the CCSS and develop new standards for the 2015–16 academic year. The SCCCRS were developed by South Carolina teachers and others and released in the fall of 2014 for public review and comment. From December 2014 through January 2015, teams of reviewers convened by the state's Education Oversight Committee (EOC) and the state Department of Education worked through multiple drafts of the standards. The EOC approved a draft in March 2015, which was then sent to the South Carolina Board of Education for final approval and adoption.

Achieve's review compares the SCCCRS with the CCSS and with the Indiana Academic Standards, which were adopted by the Indiana State Board of Education in April 2014. The rationale for including the Indiana Academic Standards in this comparison is simple: Indiana is the only other state to have adopted the CCSS and subsequently adopted its own college and career readiness standards after its state legislation reversed the state adoption of the CCSS. Similar to the SCCCRS, the Indiana Academic Standards define what students should know and be able to do. They were validated as measuring college and career readiness by the Indiana Education Roundtable, the Indiana Commission for Higher Education, the Indiana Center for Education and Career Innovation, and the Indiana State Board of Education.

This review of the SCCCRS uses the criteria and procedures that Achieve has developed and refined to evaluate academic standards for more than 25 states over the past 15 years. Achieve has used similar methods for comparing standards in 15 countries. These six criteria are rigor, coherence, focus, specificity, clarity/accessibility, and measurability.

Executive Summary

English Language Arts

Much like Indiana's standards, South Carolina's new standards for English language arts (ELA) trace their lineage back to the Common Core State Standards (CCSS) and the research underpinning those standards regarding what skills students must graduate with to be college and career ready. While there are some notable gaps in South Carolina's standards, they retain many of the key strengths of the CCSS.

South Carolina's standards include a couple of important additions over and above what the CCSS or the Indiana Academic Standards demand. Occasionally, South Carolina standards diverge from the CCSS expectations, which affects the rigor of what students are expected to do. But the majority of the new standards South Carolina has advanced draw verbatim — or with only minor or inconsequential wording changes — from the CCSS and also are closely aligned with the Indiana Academic Standards, which themselves are nearly identical to the CCSS. In short, though South Carolina's standards might be framed using slightly different wording from the CCSS or Indiana's standards, most of the standards reflect no substantive changes in overall expectations.

Key Findings

1. **The South Carolina standards have highlighted a couple of important skills that prepare students for college and careers that are not singled out in the CCSS.**

Fluency is the ability to read a text accurately, at an appropriate rate, and with expression. Readers who lack fluency must read slowly, word by word, which leaves them little ability to understand the meaning of sentences, paragraphs, and the connections between them. Fluent readers do not have to concentrate on decoding words; they can focus their attention on what the text means.

While the CCSS and Indiana Academic Standards include requirements for fluency, those requirements end in grade 5. Yet as students are asked to read and comprehend more complex texts, it is important for them to continue to work on their fluency. South Carolina's standards include a fluency strand up through grade 12.

Independent reading is another important aspect of learning to read. Students develop stamina, efficacy, and persistence through reading on their own a volume of texts that engage them. Independent reading also rapidly expands vocabularies and knowledge bases through contextualized exposure to lots of words and allows students to learn the sheer pleasure of becoming lost in the printed world of ideas.

While the CCSS and Indiana Academic Standards point to the importance of independent reading, embedding that skill in the context of text complexity expectations, South Carolina includes a stand-alone standard that explicitly calls for sustained independent reading:

South Carolina	Common Core State Standards
Read independently for sustained periods of time to build stamina.	By the end of the year, read and comprehend literature, including stories, dramas, and poetry, at the high end of the grades 4–5 text complexity band independently and proficiently.

2. **The South Carolina standards note the issue of developing literacy across different content areas but only through a short, broadly stated list of disciplinary literacy practices.**

In their present form, the South Carolina standards do not address the need for all content areas to address the issue of literacy skills in instruction. This is crucial because disciplines such as science and history depend on reading and writing, too; literacy skills are not unique to ELA classes. South Carolina's Disciplinary Literacy practices offer only three broad-based recommendations toward reading and responding to texts in particular disciplines:

- Read, write, and communicate using knowledge of a particular discipline.
- Integrate the Reading, Writing, and Communication Standards and the Inquiry-Based Literacy Standards to communicate and create understanding within content areas.
- Extend and deepen understanding of content through purposeful, authentic, real-world tasks to show understanding and integration of content within and across disciplines.

South Carolina explicitly states that these disciplinary practices "*are not standards*" (their emphasis) and goes on to add that they therefore should not be assessed. Practices that are not assessed likely will be perceived as less important and take a back seat in instruction to content and skills that will be assessed.

The CCSS (and Indiana's standards) offer an entirely separate set of disciplinary-specific standards — "Literacy in History/Social Studies, Science, and Technical Subjects" — for grades 6–12. Reading and writing are addressed differently in the various content areas, responding to the unique needs of the disciplines and the texts associated with them. In order to help students become truly competent readers, writers, and thinkers, standards should include clear expectations for reading (and writing) that extend beyond the ELA classroom to fully prepare students for the rigors of college and careers. The South Carolina standards include a note that reads, "Additional information and elaboration for Disciplinary Literacy will be included in a support document," so perhaps more detail will be forthcoming to fill this perceived gap.

3. **The South Carolina standards require that students read grade-level texts but do not offer clear guidance as to what is considered appropriate in terms of grade-level complexity.**

The research in ACT's 2006 report, *Reading Between the Lines: What the ACT Reveals About College Readiness in Reading*, showed that "the clearest differentiator in reading between students who are college ready and students who are not is the ability to comprehend *complex* texts." This is a crucial feature of college- and career-ready standards, and any standards that do not explicitly target this need lack a critical element.

The South Carolina ELA standards include the same standard repeated at all grade levels that stipulates the level of reading expected: “Read and respond to grade level text to become self-directed, critical readers, and thinkers.”[1] Yet South Carolina’s standards do not offer any additional guidance to educators and students regarding selecting works of appropriate complexity levels to help students become college- and career-ready readers. This could easily result in educators retaining the same texts they are teaching now at their grade levels without actually knowing whether they are grade appropriate in terms of complexity. (Research in *Appendix A* of the CCSS illustrates that students are not regularly reading appropriately complex texts for their grade band.)

Reading standards have grappled with the issue of defining grade-level texts in a variety of ways. One way to do this is by offering a reading list; another is through judicious use of examples within the standards themselves. The CCSS describe a variety of quantitative levels and qualitative factors that define text complexity and include *Appendix A: Research Supporting Key Elements of the Standards,* in which text complexity is defined by grade band. In addition, the CCSS offer *Appendix B,* which includes text complexity exemplars for all grades and most genres.

Within the standards themselves, the CCSS include specific requirements regarding the kinds of grade level-appropriate texts that students should read and have access to, including plays by Shakespeare and an American dramatist as well as seminal U.S. documents of historical and literary significance (e.g., The Declaration of Independence and early 19th-century foundational works of American literature) — exemplars that South Carolina does not include. Being able to handle texts of this range is a strong predictor of college and career readiness and prepares students for a wide variety of reading challenges. Reading seminal U.S. documents in particular helps ensure that students are ready to participate in public discourse and the civic life of the country.

4. **Despite the departures noted above, South Carolina’s standards are otherwise closely aligned with the expectations spelled out in the CCSS and Indiana Academic Standards.**

Despite the concerns voiced above, South Carolina's standards compare favorably to the CCSS (and Indiana Academic Standards) across a range of categories. The state’s standards oftentimes are identical to the CCSS, and most differences are merely a matter of phrasing. The South Carolina standards for the most part retain the high expectations set by the CCSS and Indiana, exemplified by a broad selection of standards across the grades offered below.

[1] In earlier grades, the standard reads, “Read grade-level texts with purpose and understanding.”

Common Core State Standards	South Carolina College- and Career-Ready Standards[2]	Indiana College and Career-Ready Standards
RL.1.7 Use illustrations and details in a story to describe its characters, setting, or events.	RL.1.6.1 Describe the relationship between the illustrations and the characters, setting or events.	1.RL.4.1: Use illustrations and details in a story to describe its characters, setting, or events.
RF.1.4 Read with sufficient accuracy and fluency to support comprehension. a. Read grade-level text with purpose and understanding. b. Read grade-level text orally with accuracy, appropriate rate, and expression on successive readings. c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary.	RL.1.4.2 Read grade-level texts orally with accuracy, appropriate rate, and expression on successive readings. RI.1.4.1 Read grade-level texts with purpose and understanding. RI.1.4.2 Read grade-level texts orally with accuracy, appropriate rate, and expression on successive readings. RI.1.4.3 Use context to confirm or self-correct word recognition and understanding rereading as necessary.	1.RF.5: Orally read grade-level appropriate or higher texts smoothly and accurately, with expression that connotes comprehension at the independent level.
RI.4.8 Explain how an author uses reasons and evidence to support particular points in a text.	RI.4.11.2 Explain how an author uses reasons and evidence to support particular points.	4.RN.4.1: Distinguish between fact and opinion; explain how an author uses reasons and evidence to support a statement or position (claim) in a text.
SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.	C.4.3.2 Create presentations using videos, photos, and other multimedia elements to support communication and clarify ideas, thoughts, and feelings.	4.SL.4.2: Create oral presentations that maintain a clear focus, using multimedia to enhance the development of main ideas and themes that engage the audience.
W.7.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	W.7.6.1 Write routinely and persevere in writing tasks over short and extended time frames, for a range of domain specific tasks, and for a variety of purposes and audiences.	7.W.1: Write routinely over a variety of time frames for a range of tasks, purposes, and audiences; apply reading standards to support analysis, reflection, and research by drawing evidence from literature and nonfiction texts.
SL.7.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.	C.7.3.2 Utilize multimedia to clarify information and strengthen claims or evidence.	7.SL.4.2: Create engaging presentations that include multimedia components and visual displays to clarify claims and findings and emphasize salient points.
RL.11-12.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.	RL.E3.5.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text including determining where the text leaves matters uncertain; investigate	11-12.RL.2.1: Cite strong and thorough textual evidence to support analysis of what a text says explicitly as well as inferences and interpretations drawn from the text, including

[2] In referring to South Carolina's standards, we have adopted the following numbering nomenclature: Standard Area (e.g., "W" for writing, "C" for communications), grade, and then South Carolina's numbering system. Please note that grades 9–12 in South Carolina's standards are indicated as E1–E4.

	multiple supported academic interpretations.	determining where the text leaves matters uncertain.
SL.11-12.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.	C.E3.4.1 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.	11-12.SL.3.2: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

Mathematics

South Carolina's new standards clearly reflect the CCSS in many ways, particularly at grades K–8, much as Indiana's standards do. While there are some differences, the South Carolina standards nonetheless retain many of the key elements of the CCSS. Differences between the three sets of standards are more pronounced at the high school level, particularly regarding the indicated knowledge and skills students need if they are to be college and career ready when they graduate from high school.

Key Findings:

1. **While South Carolina's expectations for college and career readiness closely parallel the CCSS, the standards have frequently been reworded.**

   South Carolina's mathematics standards for grades K–8 closely parallel the CCSS with respect to the content and performance expectations they set for students, oftentimes using the same wording, minus the cluster headings used in the CCSS to group and further explicate related standards. As such, the South Carolina standards lose a level of clarity in comparison to the CCSS. Sometimes the wording of the two sets of standards is fairly comparable, but the clarity and the mathematical precision of the CCSS are missing. For example:

South Carolina	Common Core State Standards
K.NS.5 Count a given number of objects from 1–20 and connect this sequence in a one-to-one manner.	CC.K.CC.4a When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.

   Other times, a South Carolina standard may be reworded to set a different expectation. For example, as seen below, the CCSS expect students to *establish* the Angle-Angle criterion for two triangles, while South Carolina expects students to use the criterion to show that two triangles are similar.

South Carolina	Common Core State Standards
GSRT.3 Prove that two triangles are similar using the Angle-Angle criterion and apply the proportionality of corresponding sides to solve problems and justify results.	G-SRT.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

   A difference in the level of specificity of wording comes when comparing South Carolina's Mathematical Process Standards with the CCSS Standards for Mathematical Practice (and also Indiana's Process Standards for Mathematics). It appears that South Carolina has reworded, collapsed, and synthesized the narrative descriptors that define the CCSS Practices and, in the process, has lost some of the detail that would have been important as teachers work to implement the South Carolina standards.

2. **South Carolina has added some expectations, deleted some expectations, and moved some expectations from one grade level to another. For grades K–8, these modifications are minimal and generally do not detract from the rigor, coherence, and focus of the standards.**

   The SCCCRS, particularly for grades K–8, are generally rigorous, coherent, focused, specific, clear and accessible, and measurable. They draw on strengths from the CCSS but use the expertise of South Carolina educators to help tailor the standards to meet the needs of the state's educators and students. They provide the coherence and focus that are characteristic of the CCSS in mathematics and are generally specific enough to convey the level of performance expected of students. With some caveats, particularly at the high school level, they are generally appropriately rigorous, including content and performance expectations at a level of cognitive demand that will put students on a trajectory for college and career readiness. The standards appear to provide an appropriate balance between conceptual understanding; procedural skills and fluency; and application to problem solving.

   South Carolina has, in some instances, added expectations that are not in the CCSS, deleted standards that are in the CCSS, and on a few occasions, changed the grade level at which a student expectation is set. However, these modifications are minimal and do not generally affect the quality of South Carolina's K–8 standards. One addition — the inclusion of matrices and matrix operations at grade 8 — appears with questionable coherence, however, since matrices do not appear again until Pre-Calculus, which many students may never take in high school.

   Close alignment between the CCSS and the SCCCRS at grades K–8 means that South Carolina educators should be able to identify and adapt instructional materials that are being published as aligned to the CCSS or Indiana's Academic Standards — making accommodations in those instances where South Carolina has changed the grade-level placement of selected standards.

3. **There are a variety of course sequences that students can take to meet graduation requirements. Regardless of which combination of four courses high school students in South Carolina take, they will miss content that students in other states see in the three years of high school mathematics courses aligned to the CCSS.**

   While South Carolina requires four units of mathematics as part of its graduation requirements, there are no specific course requirements. Based on the South Carolina High School Mathematics Course Pathways document[3], students might, for example, take and pass Algebra 1; Geometry; Algebra 2; and then either Probability and Statistics or Pre-Calculus in order to graduate. Other students might opt to take and pass Foundations in Algebra; Intermediate Algebra; Geometry; and a fourth course such as Algebra II, Probability and Statistics, or Discrete Mathematics. However, with the new SCCCRS, students would also have to take both Probability

[3] https://ed.sc.gov/agency/ie/School-Transformation/State-Priority-School/documents/SCHSMathematicsCoursePathways2015.pdf

and Statistics and Pre-Calculus to see all of the mathematics that would be included in three mathematics courses aligned to the CCSS or Indiana's Academic Standards. For example, in South Carolina, logarithms and inverse functions first appear in Pre-Calculus while conditional probability and standard deviation appear in Probability and Statistics. As such, students who either take Algebra I, Geometry, Algebra II, and Pre-Calculus or take Algebra I, Geometry, Algebra II, and Probability and Statistics, will not see all of the mathematics targeted in the non-(+) standards in the CCSS. Students who complete the Algebra I, Geometry, and Algebra II course sequence will not experience the same expectations for readiness as students who take those same set of courses aligned to the CCSS or to Indiana's Academic Standards. With the new SCCCRS, students would also have to take both Probability and Statistics and Pre-Calculus, in addition to Algebra I, Geometry and Algebra II, in order to see all of the mathematics that would be included in three mathematics courses aligned to the CCSS.

Although the state does not specify course requirements for graduation, it has identified a subset of the high school standards as Graduation Standards to "specify the mathematics high school students should know and be able to do in order to be both college- and career-ready." The Graduation Standards represents a lower bar for college and career readiness than is envisioned by the CCSS and Indiana's Academic Standards.

Review of South Carolina's College- and Career-Ready English Language Arts Standards Using Achieve's Criteria for Evaluating College- and Career-Ready Standards

The purpose of Achieve's standards review is to assist states in developing high-quality college- and career-ready standards in English language arts (ELA) and literacy that prepare students for success in credit-bearing college courses and quality, high-growth jobs. When evaluating standards, Achieve has historically used a set of six criteria: rigor, coherence, focus, specificity, clarity/accessibility, and measurability. For purposes of this analysis, the South Carolina College- and Career-Ready ELA Standards were analyzed with respect to these criteria and additionally compared with the Common Core State Standards (CCSS) as well as to the 2014 Indiana Academic Standards for ELA.

Rigor

Rigor is the quintessential hallmark of exemplary standards. It is the measure of how closely a set of standards represents the content and cognitive demand necessary for students to succeed in credit-bearing college courses without remediation and in entry-level, quality, high-growth jobs. To reflect the research that identifies what students need to be well prepared for college and careers, standards need to focus on (a) text complexity and academic vocabulary, (b) drawing evidence from texts to support claims and conclusions, and (c) content-rich non-fiction.

The South Carolina standards spotlight the importance of students learning academic vocabulary but lack specificity with regard to the complexity levels (despite requiring students to read grade-level texts).

Research makes clear that the complexity levels of the texts students are presently required to read are significantly below what is required to achieve college and career readiness.[4] Rather than focus solely on the skills of reading and writing, standards need to build a staircase of text complexity so that all students are ready for the demands of college- and career-level reading by the end of high school.

In South Carolina's standards, what qualifies as grade-level text remains undefined. Whereas states have used a variety of approaches to indicate the appropriate level of complexity — by including one or more of the following: a reading list, example texts, or a rubric of some kind to guide educators and students in selecting works of appropriate complexity to meet the standards — South Carolina did not. Nor do the South Carolina standards require students to read particular texts or classes of text (e.g., foundational works of American literature or key texts from the Founding Fathers or President Lincoln) and compare them on the basis of theme or topic as the CCSS call for.

Closely related to text complexity — and inextricably connected to reading comprehension by nearly a century of research — is the need for standards to focus on building students' academic vocabulary — words that appear in a variety of content areas. The South Carolina standards do a good job of addressing general academic and domain-specific vocabulary.

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[4] ACT, Inc. (2006). "Reading Between the Lines: What the ACT Reveals About College Readiness in Reading." Iowa City, IA: Author.

The South Carolina standards provide grounding in drawing evidence from texts.

Surveys of employers and college faculty cite the ability to extract details from texts and draw accurate conclusions in writing using evidence as key to success in college and the workplace.[5] As the ability to find and use evidence to support claims is a hallmark of strong readers and writers, college- and career-ready standards call on students to answer text-dependent questions that demonstrate their ability to closely read a text. This measure places a premium on students not only explicitly finding what is stated, but also making valid claims that square with the evidence when writing to sources.

The South Carolina writing standards call for writing to sources. There are a couple of lapses wherein the South Carolina standards ask students to go outside the four corners of the text to draw inferences or make claims; curiously, in grades 4 and 5 only, the following standards appear:

- Grade 4: 5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions.
- Grade 5: 5.1 Quote accurately to analyze the meaning of and beyond the text to support inferences and conclusions.

The South Carolina standards place an emphasis on reading content-rich informational text, yet the requirements around conducting research using such text are less clear.

Most of the required reading in college and workforce training programs is informational in structure and challenging in content. Part of the motivation behind supporting the interdisciplinary approach to literacy is the extensive research establishing the need for students to be proficient in reading and learning from complex informational text independently in a variety of content areas. Fulfilling this mandate requires that ELA classes also place greater attention on a specific category of informational text — literary non-fiction — than has been traditional in many classrooms.

The South Carolina reading standards are separated into two sections: Reading Literary Text and Reading Informational Text. This clearly communicates the expectation that, in addition to students reading and studying literature, they will read and study informational texts. The closest South Carolina standards come to providing a research process is their set of Inquiry-Based Literacy Standards. They include formulating questions; gathering information from a variety of sources; organizing, categorizing, and synthesizing important information; and a range of other reading, communication, and metacognitive skills. While the Inquiry-Based Literacy Standards are listed by grade, the language of these standards changes occasionally and slightly moving up the grades — which leads to standards that are sometimes too rigorous for the early grades and don't always reflect the increasing rigor demanded

[5] 2009 ACT National Curriculum Survey; Intersegmental Committee of the Academic Senates of the California Community Colleges, the California State University, and the University of California, 2002; and Ready or Not: Creating a High School Diploma That Counts. American Diploma Project, 2004.

at the higher grades. In addition, the South Carolina standards include Standard 7 — the CCSS equivalent of an anchor standard — under Reading Informational Text:

Standard 7: Research events, topics, ideas, or concepts through multiple media, formats, and in visual, auditory, and kinesthetic modalities.

This standard lacks the specific focus of the CCSS (and the Indiana Academic Standards) on short as well as sustained research projects and the approach toward conducting them. Requiring several short research projects enables students to repeat the research process many times in a year so they are able to develop the expertise needed to conduct research independently. A progression of shorter research projects also encourages students to develop expertise in one area by confronting and analyzing different aspects of the same topic.

Overall, the South Carolina standards for research are diffuse, with some elements of research embedded in the Inquiry-Based Literacy Standards (e.g., formulating questions, etc.), others (e.g., avoiding plagiarism) embedded in the Argumentative and Explanatory Writing Standards, and still others (e.g., the presentation of findings) in their Communication Standards.

Focus

High-quality standards establish priorities about the concepts and skills that students should acquire by graduation from high school. Choices should be based on the knowledge and skills essential for students to succeed in postsecondary education and the world of work. A sharpened focus also helps ensure that the cumulative knowledge and skills students are expected to learn — and teachers are expected to teach — is manageable.

South Carolina has made real attempts to retain most of the important foci of the CCSS.

South Carolina's standards reflect an appropriate balance between literature and other important areas such as informational text, evidence, crafting arguments, vocabulary study, and oral and written communication.

South Carolina inexplicably repeats numerous standards from the primary grades all the way through high school.

South Carolina presents many skills in the context of continuing standards from earlier grades (noted by the italics in the grade charts). Sometimes these are standards from as early as kindergarten and grade 1. For example, South Carolina lists the following kindergarten expectations as high school standards: "Recognize and name all upper- and lowercase letters of the alphabet" and "Understand that words are separated by spaces in print." Continuing to draw attention to these kinds of basic expectations through high school seems unnecessary. It is hard to imagine a high school student who would need instruction in these expectations.

In addition, some of the upper-grade standards supersede the earlier-grade level standards, making the latters' inclusion redundant. For example, the "unfamiliar multisyllabic words" of RI.E3.3.1 would seem to amply cover the skill of understanding "irregularly spelled two-syllable words" and "how syllables work to read multisyllabic words" — both expectations stemming from standards originating in grade 2.

Finally, including all of these standards twice in both the Reading Literary Text strand and again under the Reading Informational Text strand adds unnecessary bulk to the standards; the CCSS and Indiana solve this by creating a reading foundations section of the standards that applies only through grade 5.

South Carolina includes requirements that pertain to handwriting that are not included in the CCSS.

South Carolina's standards include handwriting from grades 1 through 3, requiring students to print letters in grade 1 and expecting cursive in grades 2 and 3. The CCSS includes only a printing standard at kindergarten and grade 1 — print all upper- and lowercase letters — and does not address cursive at any grade. Including a standard focusing on cursive writing acknowledges a recent debate concerning the teaching of handwriting. It may be the case that some young students are unable to read and write cursive writing, a potential handicap to achieving access to a major form of communication.

Specificity

Quality standards are precise and provide sufficient detail to convey the level of performance expected without being overly prescriptive. Those that are overly broad leave too much open to interpretation, while those that are too atomistic encourage a checklist approach to teaching. Both approaches undermine students' overall understanding of the discipline, whereas standards that maintain a relatively consistent level of precision ("grain size") are easier to understand and use.

Although South Carolina's standards parallel closely the expectations of the CCSS, in some cases the standards are more general and less precise.

As noted previously, there is much parallelism in the language of the South Carolina standards and the CCSS. It's quite clear that South Carolina used the CCSS as a starting point and the default wording of its standards. Where there are departures, it is equally telling that sometimes the new wording raises issues of clarity and precision avoided by the CCSS and Indiana Academic Standards. Below are some examples.

South Carolina Standards	Common Core State Standards	Indiana Academic Standards
RL.E3.6.1 Analyze the development of related themes across multiple texts citing evidence to support analysis; provide an objective summary.	**RL.11-12.2** Determine two or more themes or central ideas of a text and <u>analyze their development over the course of the text, including how they interact and build on one another to produce a complex account</u>; provide an objective summary of the text.	**11-12.RL.2.2:** Compare and contrast the development of similar themes or central ideas across two or more works of literature and <u>analyze how they emerge and are shaped and refined by specific details</u>.

RL.E3.11.1 Analyze how point of view and author's perspective and purpose shape content, meaning, and style, supports rhetorical or aesthetic purposes, and conveys cultural experience.	**RL.11-12.6** Analyze a case in which grasping point of view requires distinguishing what is directly stated in a text from what is really meant (e.g., satire, sarcasm, irony, or understatement).	**11-12.RL.3.2:** Analyze a work of literature in which the reader must distinguish between what is directly stated and what is intended (e.g., *satire, sarcasm, irony, or understatement*) in order to understand the point of view.
RL.E3.7.1 Analyze the development of theme across diverse media, modality, and format. **RL.E3.7.2** Analyze how literary texts and related media allude to themes and archetypes from historical and cultural traditions.	**RL.11-12.7** Analyze multiple interpretations of a story, drama, or poem (e.g., recorded or live production of a play or recorded novel or poetry), evaluating how each version interprets the source text. (Include at least one play by Shakespeare and one play by an American dramatist.)	**11-12.RL.4.1:** Analyze multiple interpretations of a story, play, or poem, evaluating how each version interprets the source text and the impact of the interpretations on the audience.
RI.E3.11.2 Analyze and critique the reasoning in historical, scientific, technical, cultural, and influential argument writing.	**RI.11-12.8** Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in works of public advocacy (e.g., *The Federalist*, presidential addresses).	**11-12.RN.4.1:** Delineate and evaluate the arguments and specific claims in seminal U.S. and world texts, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.
W.E3.6.4 Demonstrate effective keyboarding skills.	**W.11-12.6** Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	**11-12.W.4:** Apply the writing process to – • Use technology to generate, produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
RI.7.11.1 Determine the impact of text features and structures on an author's ideas or claims.	**RI.7.5** Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to the development of the ideas.	**7.RN.3.2:** Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to the development of the ideas.
RL.4.7.1 Explore similarities and differences among textual, dramatic, visual, or oral presentations.	**RL.4.6** Compare and contrast the point of view from which different stories are narrated, including the difference between first- and third-person narrations.	**4.RL.3.2:** Compare and contrast the point of view from which different stories are narrated, including the difference between first- and third-person narrations.

Coherence

The way in which a state's college- and career-ready standards are categorized and broken out into supporting strands should reflect a coherent structure of the discipline. The structure of the standards ought to reveal significant relationships among the strands and how the study of one complements the *study of another. In addition, the progression of standards should be meaningful and appropriate across the grades.*

The South Carolina standards include areas that have been traditionally underrepresented in the ELA curriculum.

The South Carolina standards present a broad vision of ELA that includes important knowledge and skills, not only in such traditional areas of language, writing, and literature, but also in the areas of reading and writing with informational texts and digital media. These areas are critical for preparing students for postsecondary success and have been traditionally underrepresented in the ELA curriculum.

The strands within South Carolina's standards connect to one another to create an integrated network of study.

The South Carolina standards arrange the ELA strands into five domains: Inquiry Based Literacy, Reading Literary Text Standards, Reading Informational Text Standards, Writing Standards, and Communication Standards. The organization of South Carolina's standards often attempts to reveal significant relationships among the strands, suggesting how the study of one complements the study of another. Examples include:

- Foundations of reading standards — learning how to read — are included within the reading comprehension strands.
- Language conventions are tied to their application in writing.
- Vocabulary is a significant area of study within the reading comprehension strands.

The South Carolina standards have several layers of demand that could prove complicated for teachers to digest, integrate, and implement.

The South Carolina standards include practices related to the Fundamentals of Reading, Writing and Communication that "delineate the underlying assumptions of the processes students must use and integrate to become successful and proficient readers, writers, and communicators, regardless of their grade level or course placement." The document states that the Fundamentals "are an integral part of the South Carolina college- and career-ready English Language Arts Standards 2015," yet the connection between the Fundamentals of Reading and Fundamentals of Writing and the grade-specific standards is not fully clarified. Additionally, the South Carolina standards state that these practices will not be assessed. The connection might be especially confusing to teachers as some of the practices in the Fundamentals also are included as grade-level standards. For example, expectations for writing and communication appear both as Fundamentals and as a grade-specific standard.

Fundamentals of Writing and Communication	Grade-Specific Standards
Employ a recursive writing process that includes planning, drafting, revising, editing, rewriting, publishing, and reflecting.	W.E3.1.1 Write arguments that: h. develop and strengthen writing as needed by planning, revising, editing, rewriting;"
Use active and attentive communication skills by building on other's ideas to explore, learn, argue, and exchange information.	C.E3.1.2 Initiate and participate effectively in a range of collaborative discussions with diverse partners; build on the ideas of others and express own ideas clearly and persuasively.
Adjusting speech in a variety of contexts and tasks for presenting and participating in the social exchange of ideas in person or electronically.	C.E3.2.4 Adapt speech to a variety of contexts and tasks, using standard English when indicated or appropriate.

The South Carolina standards are uneven with respect to containing meaningful progressions of expectations throughout the grade levels.

Progression is always a fundamental challenge in ELA standards. Students use many of the same reading and writing skills and strategies across all grade levels (such as identifying main idea and supporting details, identifying theme, analyzing point of view or text structure, writing to inform and explain, etc.), but educators expect increasing sophistication and flexibility in the use and application of these skills and strategies, including reading increasingly challenging texts.

Clear patterns of progression are found in the CCSS (and Indiana's standards). The CCSS show progression in a strand of standards through the use of specific verbs that indicate an increasingly sophisticated performance. Students may progress from identifying and analyzing characters, ultimately evaluating how authors use techniques to develop them. An example of this type of progression is plain to see in the South Carolina standards in grades 4 and 5 in the Reading Literature strand.

Grade 4	Grade 5
9.2 Explain how the author's choice of words, illustrations, and conventions combine to create mood, contribute to meaning, and emphasize aspects of a character or setting.	9.2 Analyze and cite examples of how the author's choice of words and conventions combine to create mood, shape meaning, and emphasize aspects of a character or setting.

Yet in later grades, that same sort of clear progression is not evident:

Grade 6	Grade 7
9.2 Analyze the author's word and convention choices and draw conclusions about how they impact meaning and tone.	9.2 Analyze the impact of the author's choice of words, word phrases, and conventions on meaning and tone.

Another way the CCSS show progression in a strand of standards is through increasing the complexity of the material involved in performing the standard. An example of this type of visible progression also is evident in the following South Carolina standard:

Grade 4	Grade 5
11.2 Explain how an author uses reasons and evidence to support particular points.	11.2 Explain how an author uses reasons and evidence to support particular points, identifying which reasons and evidence support which points.

But in other grades it is not clear that there is a progression of complexity in the standards:

Grade 10	Grade 11
11.2 Analyze and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.	11.2 Analyze and critique the reasoning in historical, scientific, technical, cultural, and influential argument writing.

A further concern, as discussed in the Focus section of this document (as well as in the Clarity/Accessibility section that follows) is that, on occasion, the standards repeat from grade level to grade level in no discernable pattern.

The South Carolina standards do not maintain parallel structure between like standards.

The inability to maintain parallel structure between like standards within the South Carolina standards could prove confusing to those who use them, with changes implying rather significant differences between standards that ought to have highly similar expectations. For example, here are two grade 11 standards that deal with drawing evidence from texts — one from Reading Literary (RL) Text and the other from Reading Informational (RI) Text:

> RL.E3.5.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text including determining where the text leaves matters uncertain; investigate multiple supported academic interpretations.
>
> RI.E3.5.1 Cite significant textual evidence to support synthesis of explicit and inferred meaning and/or in areas the text leaves indeterminate; investigate multiple supported interpretations.

These kinds of differences without a clear rationale will pose challenges in practice. For example, those charged with teaching these two similar standards will want to know what, if anything, the difference is between "strong and thorough textual evidence" and "significant textual evidence." And they will want to know why the call is for one standard of evidence when reading literature and another when reading informational texts. Lastly, they will want to know what the intended difference is between "analysis" and "synthesis" in the two standards and why "or" is included with respect to informational text but not literature.

Additionally, the South Carolina informational text standards do not include the expectation — that is part of the CCSS (and Indiana's standards) — of analyzing ideas or sequences of events and how they interact and develop over the course of the text. This is particularly perplexing given the fact that South Carolina did include a parallel literature standard (RL.E3.8.1) that precisely makes this very same expectation in a literary context.

The South Carolina number system also jumps around considerably, making it more difficult to track coverage. For example, in the CCSS, standard 5 in both reading literature and reading informational text refers to grasping the role of text structure in every grade. In South Carolina, the parallel text structure standards are found in standard 12 in literature, but split between standards 8 and 11 in informational text.

Clarity/Accessibility

In order to be effective, standards must be largely written in clear, familiar language, thereby communicating expectations in prose that can gain widespread acceptance not only by postsecondary faculty but also by educators, parents, school administrators, school boards, legislators, and others who have a stake in schooling.

The format of the South Carolina standards generally makes it easy to recognize the progression of skills from grade to grade as well as the parallel expectations set for each skill; however, formatting on occasion creates confusion rather than clarity with respect to this expectation.

The format of the new South Carolina standards is similar to the CCSS in that it presents the standards in columns by grade so that the progression of demand and complexity ought to be clearly evident moving from left to right across columns. This format allows teachers to see at a glance what their students should have learned in previous years and what students need to be prepared in future years.

However, expectations sometimes are repeated grade to grade in the South Carolina standards, and it is not always clear why that is the case. For example, sometimes standards from grade 3 are repeated verbatim in grade 4. In other standards, it is the grades 4 to 5 standards that repeat one another. This variability is true in other grades, too. Many times expectations for grades 9 and 10 repeat one another as do those for grades 11 and 12; however, there are times when the expectations are different. Here are a couple of examples:

English 1	English 2
11.1 Explain how the author's ideas or claims are supported through the use of text features and structures.	11.1 <u>Analyze in detail</u> how the author's ideas or claims are supported through the use of text features and structures.
11.2 Analyze and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.	11.2 Analyze and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.

English 3	English 4
11.1 Evaluate the effectiveness of the author's use of text features and structures to support a claim.	11.1 Compare and contrast the effectiveness of authors' uses of text features and structures to support similar claims.
11.2 Analyze and critique the reasoning in historical, scientific, technical, cultural, and influential argument writing.	11.2 Analyze and critique the reasoning in historical, scientific, technical, cultural, and influential argument writing.

As noted previously in the Coherence section, certain standards stop evolving, yet they continue to be referenced in all future grades with the note that "students are expected to build upon and continue applying previous learning" and then a mention of the expectation and the earlier grade that the standard originated in. Sometimes, however, after several grades where the earlier standard is referred to in this fashion, the exact same wording of the earlier standard is listed as if it were a new grade level standard (without the disclaimer). For example, starting in grade 4, standard RL.3.4.2 is repeated: "Read grade-level prose and poetry orally with accuracy, appropriate rate, expression, intonation, and phrasing on successive readings." Then it shows up again in high school (South Carolina's standards E1–4) as a stand-alone standard, as if it had not been introduced earlier. This is true of other standards as well, and could prove to be confusing if teachers think the re-introduction of the standard without the disclaimer indicates something different or significant.

Measurability

A critical component of any college- and career-ready set of standards is the ability to measure students' progress toward meeting the standards.

The South Carolina standards are generally measurable, although they do include a host of expectations that are not.

South Carolina's standards generally focus on the results of learning and make use of performance verbs that call for students to demonstrate knowledge and skills, rather than those expectations that refer to learning activities or the process of teaching and learning. However, the South Carolina standards also include a series of requirements, such as making predictions, confirming, cross-checking, re-reading, and self-correcting when reading, as well as a host of other strategies and metacognitive skills. Most of these expectations are included under the Fundamentals of Reading. They are techniques and habits that a reader employs in making sense of text — quite often unconsciously — and they are integrated into a reader's approach to a text, making these techniques not easily observed or measured. The CCSS do not include them (and, with the exception of making predictions, the new Indiana Academic Standards do not include such internal strategy expectations either). Instead, the CCSS (and Indiana's standards) focus solely on the requirement for students to back up and justify their claims and conclusions by referring "to details and examples from text(s)."

Summary

While there are some notable gaps in South Carolina's standards, these standards retain many of the key strengths of the CCSS. South Carolina’s standards include a couple of important additions over and above what the CCSS or the Indiana Academic Standards demand. Occasionally there are South Carolina standards that diverge from the CCSS expectations and affect the rigor of what students are expected to do. But the majority of the new standards South Carolina has advanced draw verbatim — or with only minor or inconsequential wording changes — from the CCSS (and also are closely aligned with the Indiana Academic Standards, which themselves are nearly identical to the CCSS).

Review of the South Carolina College- and Career-Ready Mathematics Standards Using Achieve's Criteria for Evaluating College- and Career-Ready Standards

The purpose of this standards review is to examine the South Carolina College- and Career-Ready Standards (SCCCRS) for mathematics to determine whether they are high-quality standards in mathematics that prepare students over their K–12 education careers for success in credit-bearing college courses and quality, high-growth jobs.

When evaluating standards, Achieve has historically used a set of six criteria: rigor, coherence, focus, specificity, clarity/accessibility, and measurability. For purposes of this analysis, the newly adopted 2015 SCCCRS were analyzed with respect to these criteria and compared with the Common Core State Standards (CCSS) and the 2014 Indiana Academic Standards for Mathematics. With some caveats and exceptions that are summarized in this report, the SCCCRS generally received favorable evaluations.

Rigor

Rigor refers to the intellectual demand of the standards. It is the measure of how closely a set of standards represents the content and cognitive demand necessary for students to succeed in credit-bearing college courses without remediation and in entry-level, quality, high-growth jobs. Rigorous standards should reflect, with appropriate balance, conceptual understanding, procedural skill and fluency, and applications. For Achieve's purposes, the CCSS represent the appropriate threshold of rigor.

The SCCCRS are generally appropriately rigorous, including content and performance expectations at a level of cognitive demand, from kindergarten through high school, which will culminate in college and career readiness. There is minor variation as to exactly when content is presented among the SCCCRS, the CCSS, and the Indiana Academic Standards, but the SCCCRS collectively appear to be appropriately rigorous and address with suitable intensity the three components of rigor. There is concern that, in using a subset of the high school SCCCRS to define college and career readiness, South Carolina will set a less intellectually demanding level of expectation than is set in either the CCSS or in Indiana's Academic Standards.

Grades K–5

For grades K–5, there is generally strong alignment between the expectations in the SCCCRS and the CCSS. The South Carolina writing team typically used their own wording to define student expectations, but strong alignment with the CCSS confirms that the content and performance expectations are comparable. There are only a few instances across these six grades where the SCCCRS address a concept at a different grade level than the CCSS — of these, there are examples where South Carolina introduces concepts both at an earlier and a later grade than the CCSS.

For example, the SCCCRS call for students to use a right angle as a benchmark to identify and sketch acute and obtuse angles in grade 3 (3.G.3), while the CCSS do not introduce concepts of angle measure (including right, acute, and obtuse angles) until grade 4 (CC.4.G.1). Notably, even though the SCCCRS introduce angle measure one grade earlier than the CCSS, they nonetheless have a 4th grade standard (4.G.1) that mirrors the 4th grade CCSS standard.

There are also occasions where the CCSS set an expectation earlier than South Carolina. For example, the CCSS expect 1st grade students to be able to partition circles and rectangles into two and four equal shares and to describe the shares using the words "half," "fourth," and "quarter" and the phrases "half of," "fourth of," and "quarter of." The CCSS also expect students to understand that decomposing into more equal shares creates smaller shares (CC.1.G.3). While South Carolina introduces the concept of partitioning into equal shares in grade 1 (1.G.3), it defers the comparable SCCCRS to 2nd grade (2.G.3).

There are very few cases where South Carolina has added or deleted K–5 standards when compared with the CCSS. One of the few notable added topics is repeating patterns, which South Carolina includes in kindergarten and 1st grade. The Indiana Academic Standards similarly have added patterning in the early grades. While the CCSS require memorization of sums of two one-digit numbers (2.OA.2) and memorization of all products of two one-digit numbers (3.OA.7), the South Carolina standards set no specific memorization requirements.

The SCCCRS, the Indiana Academic Standards and the CCSS have similar expectations with respect to fluency at grades K–5, although the Indiana Academic Standards call for students to be able to demonstrate fluency with addition facts and the corresponding subtraction facts within 20 in 1st grade — one grade earlier than the SCCCRS and the CCSS. All three sets of standards refer to using a standard algorithm, or standard algorithmic approach, when performing mathematical procedures.

Grades 6–8

For grades 6–8, there is similarly strong alignment between the expectations in the SCCCRS and the CCSS. As was the case in grades K–5, South Carolina uses its own wording in its standards but expectations in the CCSS and the SCCCRS are frequently comparable. There are only a few instances across these three grade levels where the SCCCRS include expectations at a different grade level than the CCSS, and all of these involve South Carolina placing standards at both the 6th and 7th grade levels to address concepts that the CCSS addresses only in grade 6. The concepts involved include ordering rational numbers, writing and evaluating expressions containing whole number exponents, and using concepts of equality and inequality to describe situations.

South Carolina has only a few standards that do not clearly align with a CCSS standard for grades 6–8, and there are few instances in which South Carolina has eliminated CCSS content expectations from its standards in grades 6–8. For example, South Carolina expects students to have an understanding of conversion of rational numbers to decimals (7.NS.2e), but the new standards no longer explicitly call for students to be able to convert a rational number to a decimal using long division, as is required in the CCSS (CC.7.NS.2d).

The SCCCRS, the Indiana Academic Standards, and the CCSS all set fluency benchmarks for students in grades 6–8, with the SCCCRS and the CCSS being quite comparable. In addition to the fluency standards in the CCSS, the Indiana Academic Standards require fluency in solving linear equations with rational coefficients and fluency with computation of rational numbers.

Grades 9–12

For grades 9–12, the comparison across the three standards documents becomes more complex — and frankly confusing. The SCCCRS at the high school level are organized into two formats. First, like the CCSS, the high school standards are organized by conceptual categories that appear in one or more high school courses. The conceptual categories and the key concepts within them are comparable across the two sets of standards, but often the key concepts are slightly reworded and/or sequenced differently.

There are important differences between South Carolina and Indiana in how the high school standards are applied. Graduation requirements for South Carolina, as defined in SBE Regulation 43-234 (Defined Program Grades 9–12 South Carolina Graduation Requirements), state that students are required to have four units of mathematics to graduate. There are no stipulations as to which courses are required. Indiana, on the other hand, specifies that students pursuing a Core 40 diploma — the state's default college- and career-ready diploma — need to successfully complete Algebra I, Algebra II, and Geometry (or their equivalents). Both states offer a range of courses that extends from Algebra I through Calculus, providing an array of opportunities for all students to be college and career ready. The CCSS also specify the mathematics that *all* students should study to be both college and career ready, and they identify additional mathematics that students should learn in order to take advanced courses such as Calculus, Advanced Statistics, and/or Discrete Mathematics. (Note: The Calculus Standards for South Carolina were not included in this review.)

The SCCCRS high school standards also are organized into courses: Algebra 1, Foundations in Algebra, Intermediate Algebra, Algebra 2, Geometry, Probability and Statistics, Pre-Calculus, and Calculus, and when South Carolina's high school courses through Probability and Statistics and Pre-Calculus are taken into consideration, the SCCCRS for high school are very similar to the CCSS. However, it would take more than four years of mathematics for a student in South Carolina to be exposed to the full range of the standards expected for all students in the CCSS. Defining which standards get addressed in the various high school courses is generally a helpful tool for districts, schools, and teachers. However, in this case, it may be challenging for educators and guidance counselors to have a clear vision for the course sequences that cover the full range of the state's standards. It will be incumbent upon both K–12 and postsecondary leaders in South Carolina to clearly communicate to students and parents to understand which pathways will open which doors.

The SCCCRS also denote a subset of the standards as Graduation Standards to "specify the mathematics high school students should know and be able to do in order to be both college- and career-ready." This designation caused additional confusion during the review in determining which standards *all* students in South Carolina will actually be expected to learn in order to earn a high school diploma. It is unclear, for example, if *all* possible pathways for all students are expected to cover all of the Graduation Standards. Taken together, the combination of the state's unspecified graduation requirements and the allocation of graduation standards across courses, it appears that students may be able to earn a high school diploma without taking courses aligned to the full set of graduation standards.

As an example of the confusion around the Graduation Standards consider that in the supporting document, the *South Carolina High School Mathematics Course Pathways*, South Carolina highlights two possible pathways that high school students might pursue. One option is for students to complete Algebra 1, Geometry, Algebra 2, and one other course. The Algebra 1, Geometry, and Algebra 2 sequence does not meet all of the South Carolina Graduation Standards, as some are found in Probability and Statistics and Pre-Calculus courses. According to the Pathways document, however, there exist seven middle school standards that cover those missing high school standards. The middle school equivalencies for six of those standards are not provided. As such, it is not clear whether these are middle schools standards taught at the high school level or high school standards taught at the middle school level. Nor is it clear why the high school versions are included if the material has already been covered.

Students who need additional support in order to be successful in Algebra 1 might instead enroll in a two-course integrated pathway (Foundations in Algebra and Intermediate Algebra) that will provide a foundation in algebra, probability, and statistics. Students who successfully complete this two-course sequence, as well as Geometry, will address all of the South Carolina Graduation Standards. An additional mathematics course will be needed to obtain the fourth mathematics credit required for graduation.

However, there are many topics deemed important for college and career readiness in the CCSS and Indiana's Academic Standards that are not identified as part of the South Carolina Graduation Standards. These topics span the range of South Carolina's high school courses, from Algebra I through Pre-Calculus. For example, all mentions of completing the square fall outside of the Graduation Standards. Some of these topics are addressed only in courses beyond Algebra 2. All mentions of logarithms, inverse functions, and modeling periodicity with trigonometric functions are now found only in Pre-Calculus while conditional probability and standard deviation do not appear until Probability and Statistics. With these shifts it is possible that many South Carolina students will not have the opportunity to study some or all of the topics that will otherwise be seen by students taking courses aligned to the CCSS in other states.

Overall, South Carolina placed much of the CCSS' Statistics and Probability content outside of both the Graduation Standards and the Algebra 1, Geometry, and Algebra 2 course standards. That content is found in the Probability and Statistics course, which many students may not choose to take. One interesting exception, however, is the inclusion of SPMD.4, SPMD.5, and SPMD.6 (similar to CCSS' (+) standards S.MD.5, S.MD.6, and SMD.7) in the Graduation Standards but not in Algebra 1, Geometry, or Algebra 2. These standards are some of those listed in the Pathways document as having middle school equivalencies and therefore as having already been covered before high school. Neither the Pathways document nor the SCCCRS provide the specific middle school equivalencies for these standards.

Beyond these examples, the SCCCRS also diverge from the CCSS by removing some topics overall or adding or changing emphasis on others. The SCCCRS, for example, removed the focus on explaining why the *x*-coordinates of the intersection of two graphed functions, *f(x)* and *g(x)*, represent the solution to the equation *f(x)=g(x)*. There is no mention of graphing piecewise or absolute value functions, using completing the square to find the center and radius of a circle given an equation, or applying concepts of density to modeling situations.

The SCCCRS also diverge from the CSSS and Indiana's Academic Standards by changing emphasis or requirements in other ways. The Graduation Standards include additional theorems to be proved in Geometry with an increased emphasis on applying those theorems. There is also a clear shift to using the triangle congruence theorems and the Angle-Angle criterion rather than establishing or explaining them. Beyond the Graduation Standards, some SCCCRS differences include requiring linear programming (Algebra 2); specifically requiring finite geometric series to be applied to financial problems (Pre-Calculus); understanding, rather than just finding, inverse functions (Pre-Calculus); clearly attending to six trigonometric functions (Pre-Calculus); using Venn diagrams (Probability and Statistics); and planning and conducting a statistical survey (Probability and Statistics). Many of these changes may impact the selection of new curricular and instructional materials and will require clear communication to teachers.

Another difference between the CCSS and the SCCCRS is in the treatment of mathematical modeling. The CCSS call modeling out as one of the conceptual categories used to organize the high school standards and to help portray a coherent view of high school mathematics, in addition to addressing modeling with mathematics as a Standard for Mathematical Practice. Since modeling is best interpreted in relation to other standards rather than as a collection of isolated topics, the CCSS identify specific modeling standards throughout the other conceptual categories. South Carolina and Indiana both deal with modeling differently, perhaps since they each have developed course-based standards. Both South Carolina and Indiana include modeling in their Process Standards and have written standards that include specific references to modeling. They also have standards that call for students to create equations or inequalities that represent relationships between quantities in real-world problem-solving situations, solve the problems mathematically, and then interpret the solutions within the context of the situations. This mirrors many of the steps of the basic modeling cycle defined in the CCSS.

Standards for Mathematical Practice

The CCSS define a set of eight Standards for Mathematical Practice that apply to all grade levels from kindergarten through high school. These Practices describe the expertise and skills that teachers in the mathematics classroom should seek to develop in their students. Similarly, both the SCCCRS and the Indiana Academic Standards include process standards (called Mathematical Process Standards in South Carolina and Process Standards for Mathematics in Indiana).

South Carolina appears to have adapted the Standards for Mathematical Practices by rewording them and by providing much briefer descriptions of what is meant by each of the Practices. Rather than having eight Mathematical Process Standards like the CCSS, South Carolina has decided to define seven Process Standards. It appears that the intent of Process Standard 7 ("identify and utilize structure and patterns") is to encompass both CCSS Practice 7 ("look for and make use of structure") and Practice 8 ("look for and express regularity in repeated reasoning"), but this is not clear given the brevity of the descriptions associated with each of the South Carolina Process Standards. The decision to go with abbreviated descriptors for the Process Standards is understandable in that they may be more accessible to teachers. However, in most cases some critical aspects from the Standards for Mathematical Practice are left out. Indiana, on the other hand, adapted the Practices for their own use by maintaining the paragraph descriptors associated with each of the CCSS Practices, but deleting grade-span-specific examples, thereby making their Process Standards functional for each grade level.

Coherence

Coherence refers to how well a set of standards conveys a unified vision of the discipline, establishing connections among the major areas of study and showing a meaningful progression of content across the grades, grade spans, and courses.

The SCCCRS are organized by grade level in K–8. At the high school level, the standards are organized both by conceptual category and course. Grade-level standards for grades K–8 are further organized into Key Concepts that arrange content into broad categories of related standards, and the overviews for grades K–5 and grades 6–8 provide tables that depict the Key Concepts by grade band. This provides a sense of the organizational structure of the standards and also, in some cases, of how progressions develop. For example, while number sense and base ten are addressed at all grades from kindergarten through grade 5, number sense with fractions is introduced in grade 3, progressing to number sense and operations with fractions in grades 4 and 5.

The overview for grades 6–8 stresses the importance of broadening students' understanding of the interconnectedness of mathematical concepts that were introduced in grades K–5 and that will continue even after the middle school grades. The overview also points out that Key Concepts vary across grades 6–8, with two major shifts occurring. First, there is a conceptual shift from data analysis and statistics in grade 6 to data analysis, statistics, and probability in grades 7 and 8. Second, while students in grades 6 and 7 focus on the key concept of ratio and proportional relationships, a shift is made in grade 8 to focus on functions as a precursor to more concentrated work on functions in high school. The overview for grades 6–8 further attends to coherence by explaining the purposeful wording of some of the standards. For example, some standards at this level call for students to extend their knowledge. Standard 6.NS.8, which calls for students to extend knowledge of the coordinate plane to solve real-world and mathematical problem(s) involving rational numbers, expands upon what students did in grade 5 when graphing ordered pairs only in the first quadrant of the coordinate plane.

At the high school level, South Carolina uses the same basic structure to establish and communicate the standards. Standards are organized first by conceptual category and later by course, but the same Key Concepts are used in both cases to organize content into related standards. The overview points out that in each of the courses students build on earlier work as they expand their content knowledge and skills. As students progress through the courses, they are intended to deepen their knowledge and gain insight into the relevance of mathematics to other disciplines.

The high school SCCCRS standards use many of the same conceptual categories used in the CCSS and Indiana's Academic Standards, although they are sequenced differently in the organization by conceptual category with algebra, functions, and geometry preceding number and quantity. As previously noted, the CCSS include a modeling conceptual category, which South Carolina does not have — although the CCSS do not compile a set of standards that address modeling but rather delineate the modeling standards in other conceptual categories. In addition, South Carolina extends its conceptual categories to address calculus, which the CCSS do not do.

The SCCCRS communicate a unity of vision by placing the Mathematical Process Standards at the beginning of each grade-level set of standards and at the beginning of each set of high school course standards. This sends the clear message that while the content may progress from K–12, there is the expectation that these important standards be integrated into teaching and learning for each grade level and course.

The development of the cross-grade progression addressing ratio, rate, and proportional reasoning is one that should be revisited. In grade 6 (6.RP.2b), the SCCCRS define rate as "a type of ratio involving two different units." Yet this is contradicted in 7.RP.1 when students are asked to find rates when the units are the same. There is an additional mathematical issue in the handling of rate in 7.RP.2e. While the CCSS clarify the distinction between the unit rate, *r,* and the point (1,r) on a proportional graph, the South Carolina standards confuse the issue by inaccurately referring to the rate *itself* as a point on the graph.

Focus

High-quality standards establish priorities about the concepts and skills that should be acquired by students. A sharpened focus helps ensure that the knowledge and skills students are expected to learn is important and manageable in any given grade or course.

Overall, the focus of the SCCCRS in K–8 is fairly comparable to that of the CCSS and Indiana's Academic Standards since alignment between the documents is strong. While South Carolina has added a few expectations in the various grade spans, deleted a few expectations that are addressed in the CCSS, and changed the grade level at which a few expectations get treated, the collective impact of these changes is minimal. The SCCCRS are generally focused and manageable, with a few exceptions.

One perplexing example is the inclusion of a single standard on matrices in grade 8 (8.DSP.5). This is a high school level (+) topic in the CCSS, and even in the SCCCRS, the topic is not again addressed until Pre-Calculus, which many students will not take as part of their high school course sequence.

In order to make its high school algebra content focused and manageable for students not prepared to take a comprehensive Algebra I course, South Carolina has designed an integrated two-course sequence that is intended to provide a foundation in algebra, probability, and statistics. This course sequence includes all of the Graduation Standards identified in the Algebra 1 and Algebra 2 courses (and those Probability and Statistics standards similarly identified as Graduation Standards) and provides teachers with a more realistic pace for working with struggling mathematics learners.

Students who follow the Algebra 1, Geometry, and Algebra 2 pathway might choose either Pre-Calculus or Probability and Statistics for their fourth course. The Pre-Calculus students will miss out on many of the expectations in the CCSS' Statistics and Probability such as understanding, calculating, recognizing, and explaining conditional probability; using data from sample surveys to estimate population mean or proportion; constructing and interpreting two-way frequency tables; distinguishing between correlation and causation; and distinguishing between experiments, observational studies, and sample surveys. Students who choose Probability and Statistics will miss out on logarithms, inverse functions, additional work with polynomials, and much of the trigonometry in the CCSS. Then again, a student might choose something altogether different and miss the experiences and standards contained within both courses.

Students who follow the Foundations, Intermediate Algebra, and Geometry pathway might choose to take Algebra 2, Probability and Statistics, or something else as their fourth course. However, it appears that students who choose Algebra 2 will experience a significant overlap and repeat of the content in Intermediate Algebra and Foundations in Algebra. Those students would also miss out on the standards unique to Pre-Calculus and Probability and Statistics. Students who select Probability and Statistics for a fourth course would miss out on the few standards in Algebra 2 not already covered in the previous courses. Examples of these standards include graphing polynomials, identifying zeros when suitable factorizations are available and indicating end behavior, writing a polynomial function of least degree corresponding to a given graph, solving systems using linear programming, or solving systems of linear and quadratic equations.

While the full body of South Carolina high school standards is similar to the CCSS and Indiana's Academic Standards, if any pathways are limited to just the Graduation Standards, then the focus of teaching and learning will be significantly out of alignment with what the CCSS define as mathematics that all students should study to be college and career ready. A periodic review of the Graduation Standards to ensure that they indeed prepare students to be college and career ready is recommended.

Specificity

Quality standards are precise and provide sufficient detail to convey the level of performance expected without being overly prescriptive. Those that maintain a relatively consistent level of precision are easier to understand and use. Those that are overly broad or vague leave too much open to interpretation, while atomistic standards encourage a checklist approach to teaching and learning.

The SCCCRS are generally specific enough to convey the level of performance expected of students at each grade level and in each course. They are sufficiently detailed without being overly prescriptive.

Clarity/Accessibility

High quality standards are clearly written and presented in an error free, legible, easy-to-use format that is accessible to the general public.

The SCCCRS are generally clearly written and presented in a format that is usable by both educators and the general public. This format is clearly explained in the K–12 overview and the overviews that precede the standards for K–5, 6–8, and high school. The format is functional and straightforward, with standards presented by grade level through grade 8 and then both by conceptual category and course at the high school level. The course structure for high school is likely more meaningful for parents and teachers, but the presentation of the standards by conceptual category will be helpful to curriculum developers and professional developers.

The wording of the standards is generally clear, although users unfamiliar with mathematics may not understand all of the terminology used. If one does not already exist, a glossary should be included. South Carolina uses the overviews for grades K–12 and grades 6–8 to clarify the meaning of certain words used extensively in the SCCCRS. For example, in the K–12 overview, explanation is provided for how the terms "including," "fluently," "fluency," and "real-world" are used. The overview for grades 6–8 provides similar clarity to how some of the verbs used to define student expectations (e.g., "investigate," "explore," "apply," "extend," "discover," "translate among," and "translate between") are used.

Measurability

Standards should focus on the results, rather than the processes of teaching and learning. They should make use of performance verbs that call for students to demonstrate knowledge and skills, with each standard being measurable, observable, or verifiable in some way.

The SCCCRS are generally measurable, observable, or verifiable in some way. They tend to emphasize what it is that students should know and be able to do rather than the processes of teaching and learning. They tend to set limits, as is also the case with the CCSS and the Indiana Academic Standards, to define parameters not only for teaching and learning but also for assessment. For example, 4.NSF.2 in the SCCCRS calls for students to be able to compare two given fractions by creating common denominators or numerators or by comparing to a benchmark fraction. The denominators (2, 3, 4, 5, 6, 8, 10, 12, 25, and 100) that students should be able to use are specified in the standard.

There are some verbs used within the SCCCRS that are not measurable, although they may be observable, and some of these verbs are discussed in the overview portions of the standards document. For example, the overview for grades 6–8 discusses use within the standards of the verbs "investigate," "explore," and "discover." Both "investigate" and "explore" indicate an initial understanding of a concept, and it is noted that educators may consider using inquiry-based methods to introduce this concept. The overview also explains that the verb "discover" indicates that students will be given the opportunity to determine or uncover some aspect of mathematics through the use of manipulatives or inquiry-based activities and the degree to which this performance can be observed is questionable. The CCSS use non-measurable verbs more sparingly than the SCCCRS.

Summary

While South Carolina has added more advanced mathematics to the full set of adopted standards, the combination of the state's designation of graduation standards and the design of their graduation course requirements might mean that students in South Carolina could earn a high school diploma and not have the opportunity to be exposed to much of the mathematics experienced by students in most of the rest of the country (i.e., states that have adopted CCSS and states with their own college-and career-ready standards, such as Indiana). In other words, South Carolina appears to have added more advanced mathematics to the standards yet lowered expectations for all students.

Achieve

Appendix: The Criteria Used for the Evaluation of College- and Career-Ready Standards in English Language Arts and Mathematics

Criteria	Description
Rigor: What is the intellectual demand of the standards?	Rigor is the quintessential hallmark of exemplary standards. It is the measure of how closely a set of standards represents the content and cognitive demand necessary for students to succeed in credit-bearing college courses without remediation and in entry-level, quality, high- growth jobs. For Achieve's purposes, the Common Core State Standards represent the appropriate threshold of rigor.
Coherence: Do the standards convey a unified vision of the discipline, do they establish connections among the major areas of study, and do they show a meaningful progression of content across the grades?	The way in which a state's College- and Career-Ready Standards are categorized and broken out into supporting strands should reflect a coherent structure of the discipline and/or reveal significant relationships among the strands and how the study of one complements the study of another. If College- and Career-Ready Standards suggest a progression, that progression should be meaningful and appropriate across the grades or grade spans.
Focus: Have choices been made about what is most important for students to learn, and is the amount of content manageable?	High-quality standards establish priorities about the concepts and skills that should be acquired by graduation from high school. Choices should be based on the knowledge and skills essential for students to succeed in postsecondary education and the world of work. For example, in mathematics, choices should exhibit an appropriate balance of conceptual understanding, procedural knowledge, and problem-solving skills, with an emphasis on application, and in English, standards should reflect an appropriate balance between literature and other important areas such as informational text, oral communication, logic, and research. A sharpened focus also helps ensure that the cumulative knowledge and skills students are expected to learn is manageable.
Specificity: Are the standards specific enough to convey the level of performance expected of students?	Quality standards are precise and provide sufficient detail to convey the level of performance expected without being overly prescriptive. Standards that maintain a relatively consistent level of precision ("grain size") are easier to understand and use. Those that are overly broad or vague leave too much open to interpretation, increasing the likelihood that students will be held to different levels of performance, while atomistic standards encourage a checklist approach to teaching and learning that undermines students' overall understanding of the discipline. Also, standards that contain multiple expectations may be hard to translate into specific performances.
Clarity/Accessibility: Are the standards clearly written and presented in an error-free, legible, easy-to-use format that is accessible to the general public?	Clarity requires more than just plain and jargon-free prose, which is free of errors. The College- and Career-Ready Standards also must be communicated in language that can gain widespread acceptance not only by postsecondary faculty but also by employers, teachers, parents, school boards, legislators, and others who have a stake in schooling. A straightforward, functional format facilitates user access.
Measurability: Is each standard measurable, observable, or verifiable in some way?	In general, standards should focus on the results, rather than the processes, of teaching and learning. The College- and Career-Ready Standards should make use of performance verbs that call for students to demonstrate knowledge and skills and should avoid using those that refer to learning activities — such as "examine," "investigate," and "explore," — or to cognitive processes, such as "appreciate."

Attachment 3: The Louisiana standards review process, including the standard-by-standard before and after comparison

Louisiana Believes

Academic Content Standards Review Process

2015-2016

DEPARTMENT of EDUCATION

Background

Louisiana Standards

The Department proposes a standards review process led by professional Louisiana educators that results in the best Louisiana standards for students.

Louisiana is free to use the standards that best prepare students and meet state laws. Louisiana's state laws require that standards be rigorous and prepare students for college and the workplace, as determined by educators, experts, and business and industry leaders. Nothing prevents Louisiana from making any adjustments to current state content standards deemed appropriate, and there are no limitations on the extent to which the standards are adjusted to meet local needs and priorities.

The following principles will guide this local review:

1. **Consistency:** The standards review will be consistent with the legally required process and with past Louisiana standards reviews.
2. **Focus on the standards:** The review process will focus on the substance of the actual standards themselves.
3. **Improve what exists today rather than start from scratch:** The review process will improve current standards based on local, expert input and results, rather than requiring of teachers another five years of work to re-do classroom plans.
4. **Public input:** The review process will include opportunities for the public to weigh in on every standard. In addition, all meetings will be open to the public.

Directives from BESE & the Legislature

In April, BESE required the Department to commence the next scheduled review of state academic content standards in English language arts and mathematics, as required in Bulletin 741, §2301(C).

In June, the Legislature, through House Bill 373, called on BESE to move ahead with the following additions:

The state Department of Education, with the approval of the State Board of Elementary and Secondary Education, shall develop and establish statewide state content standards for required subjects to be taught in the public elementary and secondary schools of this state.

State content standards for English language arts and mathematics shall be reviewed and developed as follows:

(a) Not later than July 1, 2015, the State Board of Elementary and Secondary Education shall begin reviewing and developing state content standards in English language arts and mathematics.

(b) The board shall hold at least one meeting for such purpose in each Louisiana congressional district.

(c) The board shall submit the minutes from each meeting held pursuant to this Paragraph to each member of the legislature not later than thirty days after the meeting.

(d) All meetings held by the board for the review and development of the standards shall be subject to the Open Meetings Law.

(e) The board shall post the standards on its website not later than February 21, 2016, and shall adopt the standards not later than March 4, 2016.

(f) The board shall promulgate the standards in accordance with the Administrative Procedure Act prior to implementation of the standards.

Committee Membership

Standards Committees & Participation

Standards Committee

26 members

Guide process and updates

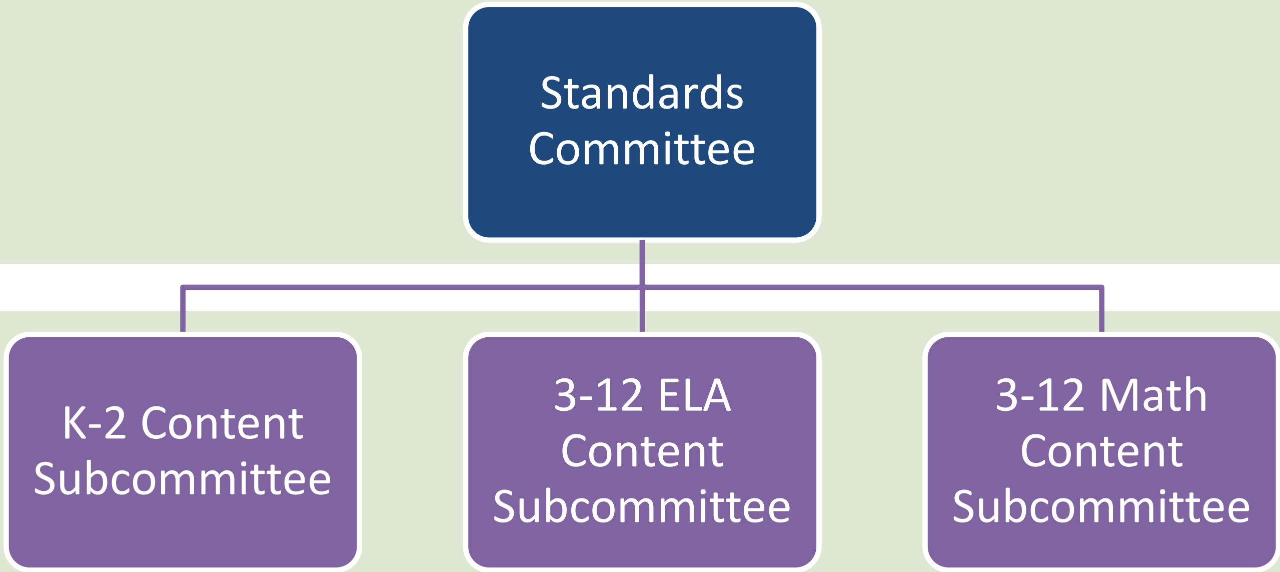
Make final recommendation to BESE

2015-2016 Cycle Only

29 members each

Review public comments

Propose content recommendations



Standards Committee

Louisiana academic content standards should be a living set of nationally recognized expectations designed to meet the ever-changing needs of our students, in order to ensure their success in postsecondary education and in the workplace. BESE policy provides for a regular review of standards to ensure that they meet these goals.

A standing Standards Committee will oversee the 2015-2016 review of English language arts and mathematics standards and will meet on an annual or as needed basis in subsequent years. This committee will oversee and coordinate the review process pursuant to BESE and legislative directives, monitor progress, ensure alignment across grade levels and subjects, and make final recommendations to BESE.

Given the technical nature of the work required to review content standards and to ensure that such reviews are rooted in quality instruction, at least half of this committee will be current Louisiana, district and school-based educators. Given their expertise, many of these members will also serve on one of three content subcommittees.

Standards Committee Nominees

Seat	Name	District/Organization	Current Role
K-2 Committee	Anne Smith*	Vernon	Curriculum Director
K-2 Committee	Aeneid Mason*	Zachary	Director of Special Education Services
K-2 Committee	Kim Shackelford*	Lincoln	Coordinator of State and Federal Program
ELA Committee	Regina Sanford*	St. Tammany	Assistant Superintendent of Curriculum and Instruction
ELA Committee	Jawan Alexander*	New Orleans	Assistant Head of School
ELA Committee	Zanovia Curtis*	West Feliciana	District Instructional Coach
Math Committee	Charlotte Boothe*	Rapides	Middle School Curriculum Specialist
Math Committee	Tammy Hall*	Bossier	High School Teacher
Math Committee	Sheldon Jones	Richland	Superintendent
Louisiana Association of Educators	Suzette Riddle	Vermilion	Elementary Educator
Louisiana Federation of Teachers (LFT)	Steve Monaghan	LFT	President
A+PEL	Angelle Lailhengue	St. Bernard	Teacher
University (Math)	Frank Neubrander*	Louisiana State University	Department of Mathematics
LA Assn of Teachers of Mathematics (LATM) & LA Council of Supervisors of Math (LCSM)	Penny Gennuso	Lafayette	K-12 Math and Science Academic Specialist
University (English)	Lisa Rougeou	Northwestern	Writing Project Director and Instructor
Louisiana Reading Association (LRA)	Debbie Rickards*	LRA	Retired Teacher and Curriculum Coordinator
Louisiana Early Childhood Association (LAECA)	Michelle Joubert	LAECA	President
Board of Regents (BOR)	Jeanne Burns	BOR	Associate Commissioner of Teacher and Leadership Initiatives
Louisiana Parent Teacher Association (PTA)	Chad Aucoin	PTA	St. Charles, PTA
Black Alliance for Educational Options (BAEO)	Dr. RaeNell Houston	BAEO	Parent
Urban League	Arielle McConduit	Urban League	Parent
Louisiana Association of Principals (LAP)	Dedra Bailey	St. Bernard	Principal
Louisiana Assn of School Supts (LASS)	Hollis Milton	West Feliciana	Superintendent
Louisiana School Board Association (LSBA)	Scott M. Richard	LSBA	Executive Director
Louisiana Assn of Public Charter Schools	Kathy Riedlinger	LAPCS	CEO, Lusher Charter School
Louisiana Assn of Business and Industry (LABI)	Keith Leger	LABI	Program Manager

2015-2016 Content Subcommittees

For the current review process (2015-2016), three content subcommittees will review each set of standards in depth.

- K-2 Content Subcommittee
- 3-12 ELA Content Subcommittee
- 3-12 Math Content Subcommittee

Each content subcommittee will propose a set of revised standards to the Standards Committee for consideration.

Seventy five percent of each content subcommittee will be current, district and school-based educators.

K-2 Content Subcommittee Nominees

Position	Name	District/Org	Role
K Educator	Michelle Abadie	St. Bernard	K-2 Teacher
K Educator	Karen Parrino	Livingston	K-2 Teacher
K Educator	Denean Trigs-Keys	St. Tammany	Literacy Coach K-3
K Educator	Jenny Kelly	St. John the Baptist	K-2 Teacher
K Educator	Misti Segura	East Baton Rouge	K-12 ELA Assessment Specialist
K Educator	Lacey Richey Fontenot	Calcasieu	K-2 Teacher
Grade 1 Educator	Travis Durling	Iberville	K-2 Teacher
Grade 1 Educator	Joan Rhodes	Richland	K-2 School-Based Coach
Grade 1 Educator	Crystal Legnon	Iberia	K-2 Teacher
Grade 1 Educator	Shawri Landry	Vermilion	Curriculum Facilitator
Grade 1 Educator	Fara Seal	Calcasieu	K-3 Teacher
Grade 1 Educator	Erica Yanner	Terrebonne	K-2 Teacher
Grade 2 Educator	Angelia Grabert	Jefferson Parish	K-2 Principal
Grade 2 Educator	Meredith Starks	Bossier	K-3 Teacher
Grade 2 Educator	Bridget Flanders	Desoto	K-2 Teacher
Grade 2 Educator	Angel Maxey	Rapides	K-2 Teacher
Grade 2 Educator	Brandie McNabb	Zachary	K-2 Teacher
Grade 2 Educator	Cindy Ourso	West Baton Rouge	Elementary Supervisor
K-2 District Staff	Ann Hardy	Vermilion	Elementary Supervisor
K-2 District Staff	Alesia Blanchard	Terrebonne	K-6 ELA Specialist
K-2 District Staff	Kim Shackelford*	Lincoln	Coordinator of State and Federal Programs
K-2 District Staff	Anne Smith*	Vernon	Curriculum Director
K-2 District Staff	Tricia Miller	Calcasieu	K-5 Curriculum Specialist
University	Mary Breaud	Nicholls State University	Early Elementary Expert
LA Early Childhood Assn.	Michelle Joubert*	LAECA	President
Elementary Special Educ.	Aeneid Mason*	Zachary	Director of Special Education Services
BESE Appointment	Darlene Hills	New Orleans	Assistant Head of School
BESE Appointment	Deborah Catherine Wiltse	Rapides	Elementary Teacher
BESE Appointment	Jan Benton	Livingston	Former Assistant Superintendent

3-12 ELA Content Subcommittee Nominees

Position	Name	District/Org	Role
3-5 Educator	Connie Hebert	Jefferson Davis	3-5 Teacher
3-5 Educator	Jasmine Hall	Lincoln	3-5 Teacher
3-5 Educator	Lindsey Parker	Desoto	3-5 Teacher
3-5 Educator	Christol Williams	Central	3-5 Teacher
3-5 Educator	Dennis Johnson	Concordia	3-5 Teacher
3-5 Educator	Zelda Smith	Orleans	Curriculum Specialist
6-8 Educator	Brittni Duhon	Iberia	6-8 Teacher
6-8 Educator	Lori Pennison	Assumption	Middle School Principal
6-8 Educator	Stacy Gunter	Rapides	6-8 Teacher
6-8 Educator	Nicolette Doughty	Caddo	6-8 Teacher
6-8 Educator	April Horn	Lafourche	Middle School Curriculum Specialist
6-8 Educator	Spencer Arenaud	St. Landry	Middle Instructional Coach
High Educator	Lee Wall	Acadia	Middle School Principal
High Educator	Jamie Guillot	Lafourche	6-12 Coordinator
High Educator	Amy Brown	St. Charles	High School Teacher
High Educator	LaQuisha Comeaux	Baker	High School Teacher
High Educator	Misti Segura	East Baton Rouge	ELA Assessment Specialist
High Educator	Latoya Winston	Tensas	High School Teacher
ELA District Staff	Jawan Alexander*	New Orleans	Assistant Head of School
ELA District Staff	Zanovia Curtis*	West Feliciana	District Instructional Coach
ELA District Staff	Jill Foster	Tangipahoa	District Master Teacher
ELA District Staff	Regina Sanford*	St. Tammany	Assistant Superintendent of Curriculum and Instruction
ELA District Staff	Laurie Carlton	Plaquemines	Secondary supervisor
University	Stan Barrerra	LA Assn of Colleges of Teacher Ed	Louisiana State University
Louisiana Reading Association (LRA)	Debbie Rickards*	LRA	Former Teacher and Curriculum Coordinator
Special Education	Demarious Poole	Livingston	Curriculum Coordinator, Special Education
BESE Appointment	Margo Guillot	St. Tammany	Retired Asst Supt of Curriculum and Instruction
BESE Appointment	Kelly Hobson	Caddo	4th Grade Teacher
BESE Appointment	Jasmine Porter	St. John	Master Teacher

3-12 Math Content Subcommittee Nominees

Position	Name	District/Org	Role
3-5 Educator	Cleveland Mouton, III	Monroe City	3-5 Teacher
3-5 Educator	Stephanie Smith	Franklin	3-5 Teacher
3-5 Educator	Janet Picou	Washington	K-5 Math Coach
3-5 Educator	Jodi Benoit	Lafayette	3-5 Teacher
3-5 Educator	Alnata Dione Bradford	Vernon	3-5 Teacher
3-5 Educator	Jada Singleton	Lafayette	Math Coach
6-8 Educator	Shelia Banks	Jefferson	District School Support Specialist
6-8 Educator	Debbie Evans	Caldwell	6-8 Teacher
6-8 Educator	Tessi Jean-Batiste	St. Martin	6-8 Teacher
6-8 Educator	Michael Brown	Pointe Coupee	6-8 Teacher
6-8 Educator	Jason Eric Smith	Jefferson	Curriculum Coordinator
6-8 Educator	Karin Lawless	Zachary	Supervisor Accountability, Math
High Educator	Tammy Hall*	Bossier	High School Teacher
High Educator	Ronda Lloyd	Franklin	High School Teacher
High Educator	Trayvonia Duhe	New Orleans	Director of Curriculum, Instruction, and Assessment
High Educator	Renee Sears	Webster	High School Teacher
High Educator	Jessica Hungerford	Beauregard	High School Teacher
High Educator	LaDeisha George	Allen	High School Teacher
Math District Staff	Maribeth Holzer	Ouachita	Math Instructional Coach
Math District Staff	Stephen Zafirau	St. John	Math Curriculum Facilitator
Math District Staff	Serena White	Monroe City	K-12 Curriculum Supervisor
Math District Staff	Charlotte Boothe*	Rapides	Middle School Curriculum Specialist
Math District Staff	Dawn Henry	West Baton Rouge	Secondary Supervisor
University	Frank Neubrander*	Louisiana State University	Department of Mathematics
LA Assn of Teachers of Math (LATM) & LA Council of Supervisors of Math (LCSM)	Ellen Brupbacher Daugherty	LATM	LSU Laboratory School
Special Education	Allison Cupit	St. John	Principal
BESE Appointment	Deborah McCollum	St. Tammany	Former Principal
BESE Appointment	Brenda Quigley DeFelice	Calcasieu	High School Teacher
BESE Appointment	Shawna Dufrene	Calcasieu	3-5 Teacher

Review Process and Meeting Procedures

Review Process: Timeline Overview

Step	Date	Location
Public Comment Portal	June– August, 2015	Online
Standards Committee and Content Subcommittees *Organizational meeting*	Wednesday, August 19th 9 am – 3 pm	Baton Rouge
Content Subcommittees *Produce first draft*	K-2: Tuesday, October 13th ELA: Wednesday, October 14th Math: Thursday, October 15th All Meetings: 9 am – 3 pm	Shreveport Alexandria Crowley
Standards Committee *Review first draft and feedback*	Thursday, November 12th 9 am – 1 pm	Covington
Content Subcommittees *Update if needed*	Thursday, December 3rd 9 am – 3 pm	Meet only as needed *Locations repeated from above*
Standards Committee *Final draft and vote*	Tuesday, February 2nd 9 am – 12 pm	New Orleans

Review Process: Public Comment

Step	Details
Public Comment *July-August, 2015*	• Standards posted on the website for public comment • Parents, committee members, educators, and other citizens share their feedback on each individual standard, K-12, math and ELA • The Southern Regional Education Board (SREB) summarizes public comments and shares a report with the committees to inform their review

Meeting Procedures

- **Public meetings**: All meetings will be advertised, will be open to the public, and will be held pursuant to the Louisiana Open Meetings Law.
- **Public comment at meetings**: Public comment will be received during each meeting and prior to any votes. Members of the public may also submit written comments for the record.
- **Content of public comment**: All public comment must relate to the review and development of standards, not other matters of policy.
- **Committee leadership**: Each committee and subcommittee will be facilitated by a chairman.
- **Voting**: Subcommittee members will work together to finalize any recommended revisions or additions to standards. Votes will then be taken as a slate, not by individual standard or edit, to move proposed standards forward to the committee and to BESE.
- **Voting proxies**: No proxies will be allowed for voting purposes. Participants must be in attendance to vote.
- **Legislative liaisons**: Appointed legislative liaisons will attend all meetings and report back to the Legislature.

Review Process: Details

Step	Details
Standards Committee and Content Sub-committee ***Organizational Meeting*** *Wednesday, August 19th* *9 am – 3 pm* *Baton Rouge*	**Before the meeting:** • Participants review the standards and alignment documents • Participants review public comments • Agenda, PowerPoint presentation, and participant pre-work posted by August 10th **During the meeting:** • Detailed standards review and SREB presentation summarizing public comment • Content subcommittees begin their review • Public comment taken mid-day (full group) and end of day (subcommittees) • At the end of the meeting, the Chair will task members representing each grade level to determine preliminary findings and proposed updates, and to prepare to share them at the next meeting **After the meeting:** • Minutes from meeting posted by Monday, August 24th • Content subcommittees draft updates by Friday, September 25th

Review Process: Details

Step	Details
Content Subcommittees *9 am – 3 pm* *K-2: Tuesday, October 13th Shreveport* *ELA: Wednesday, October 14th Alexandria* *Math: Thursday, October 15th Crowley*	**Before the meeting:** • Content subcommittee members draft their findings by Friday, September 25th • Department content staff assembles findings, making no changes • Participants receive compiled findings by Friday, October 9th • Agenda, PowerPoint presentations, and participant pre-work posted by Monday, October 12th **During the meeting:** • Full review of each individual standard, findings, and proposed updates (presentation and discussion from each grade level) • Check for alignment from K-2 to 3-12 content subcommittees • Subcommittees vote on standards for submission to Standards Committee **After the meeting:** • Minutes from meeting posted by Monday, October 19th • Department content staff send compiled updates to participants by October 21st • Department posts recommended updates online by October 21st • Participants finalize updates in writing (to be included for the standards committee) by October 28th

Review Process: Details

Step	Details
Standards Committee *Thursday, November 12th* *9 AM – 1 PM* *Covington*	**Before the meeting:** • Participants review recommended updates to standards, consider grade band alignment, and receive any additional comments from subcommittee members and the public • Participants receive documents above by Wednesday, November 4th • Agenda, PowerPoint presentation, and participant pre-work posted by Wednesday, November 4th **During the meeting:** • Full review of each subcommittee's proposed updates (presentation by Chairs from each subcommittee) • Full review of alignment considerations between grade bands, reviewed individually and reconciled • Chair directs content subcommittees to review small revisions where required **After the meeting:** • Minutes from meeting posted by Monday, November 16th • Content subcommittees notified by Friday, November 13th if they must convene

Review Process: Details

Step	Details
Content Subcommittee *Thursday, December 3rd* *Locations only as needed* *Alexandria – ELA* *Shreveport – K-2* *Crowley – Math*	**Before the meeting:** • Content subcommittees notified by Friday, November 13th if they must convene at the directive of the Standards Committee • Participants review updates for consideration by Wednesday, November 18th • Agenda, PowerPoint presentation, and participant pre-work posted by Wednesday, November 25th **During the meeting:** • Full review of every Standards Committee update • Work to reconcile and propose final updates • Review alignment to other content subcommittees • Content subcommittees vote on standards for submission to Standards Committee **After the meeting:** • Minutes from meeting posted by Monday, December 7th • Content subcommittees send final updates by Wednesday, December 16th

Review Process: Details

Step	Details
Standards Committee *Tuesday, February 2nd* *9 AM – 1 PM* *New Orleans*	**Before the meeting:** • Participants receive final copy of standards with updates highlighted by Wednesday, January 20th • Agenda, PowerPoint presentation, and participant pre-work posted by Monday, January 25th **During the meeting:** • Full review of updates • Committee votes on final standards for submission to BESE **After the meeting:** • Minutes from meeting posted by Friday, February 5th

Organizational Meeting Agenda

Standards Committee and Content Subcommittees:

9:00 – 9:30: Introductions, overview of BESE and Legislative expectations
9:30 – 10:00: Process and operations
10:00 – 11:00: Standards training (how they work, research, investigation)
11:00 – 11:30: Presentation summarizing public comments (SREB)
11:30 – 12:00: Public comment

Content Subcommittees:

12:30 – 1:30: Identify areas of focus and need (public comments, research, other states review, member observations)
1:30 – 2:30: Complete one full grade as a group for review (standard by standard)
2:30 – 3:00: Public comment
3:00 – 3:30: Process for drafting updates and assignments by grade level
3:30 – 3:45: Timeline and next steps

Attachment 4: The Tennessee standards review process

TENNESSEE
STATE BOARD OF EDUCATION

Standards Review

MATH AND ELA KICK-OFF WEEK

JUNE 3, 2015

Agenda

- Welcome and Introductions
- Committee's Charge
- Timeline
- Committee Structure
- Week's Agenda at a Glance

Committee's Charge

- Develop the draft set of standards to be presented to the Standards Recommendation Committee
- In order to successfully develop these revisions the committee will:
  - Thoughtfully consider the public feedback and comments
  - Use professional expertise to guide decision-making
  - Ensure our collective commitment to rigorous standards that prepare our students for postsecondary and the workforce is maintained
  - Be mindful of the public nature of this work

Timeline

October 2014

- Governor Haslam outlines standards review process for Math and ELA
- Educator advisory groups are selected and announced

November 2014

- Standards review website opens for public feedback

April 2015

- General Assembly passes standards review legislation via HB 1035
- Feedback collection via the website concludes

Timeline

June 2015

- Educator advisory groups begin review and revision work

Fall 2015

- Draft standards reviewed by Recommendation Committee
- Second public comment period begins

April 2016

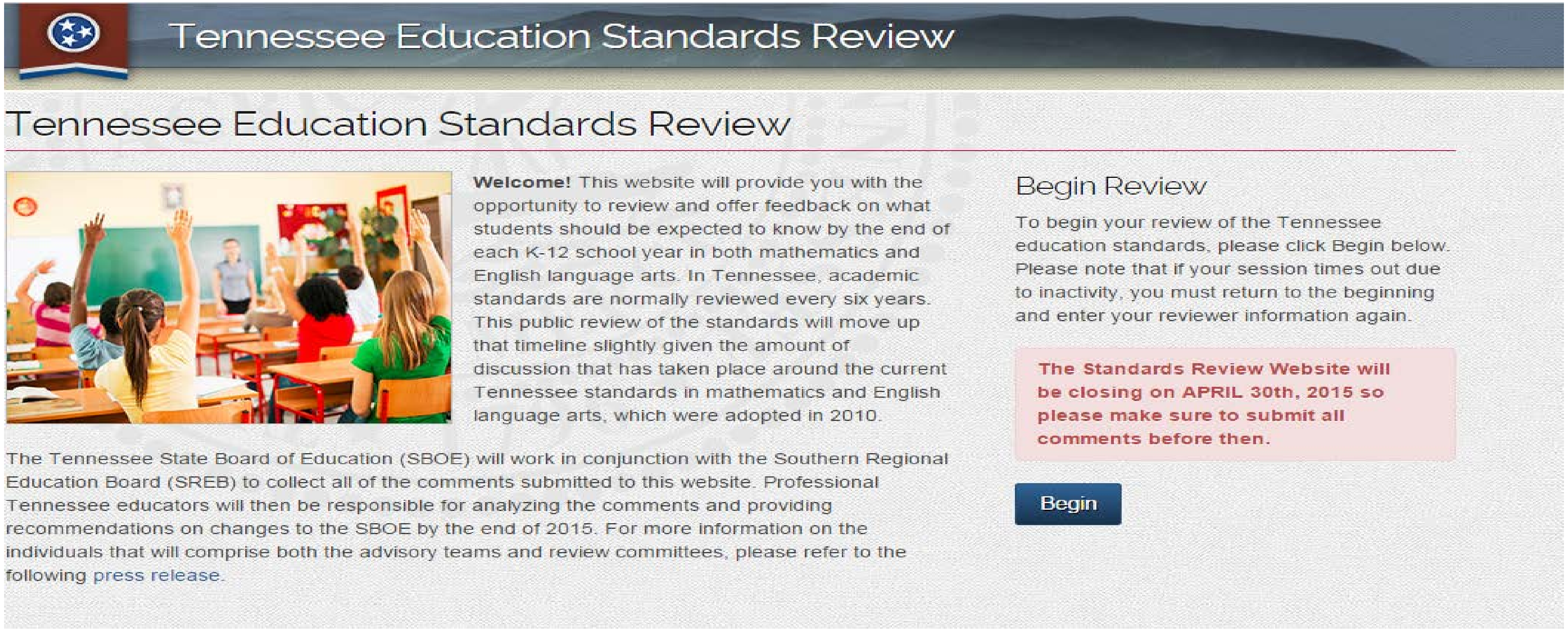
- Recommendation Committee presents new standards to the State Board for FIRST reading

Timeline

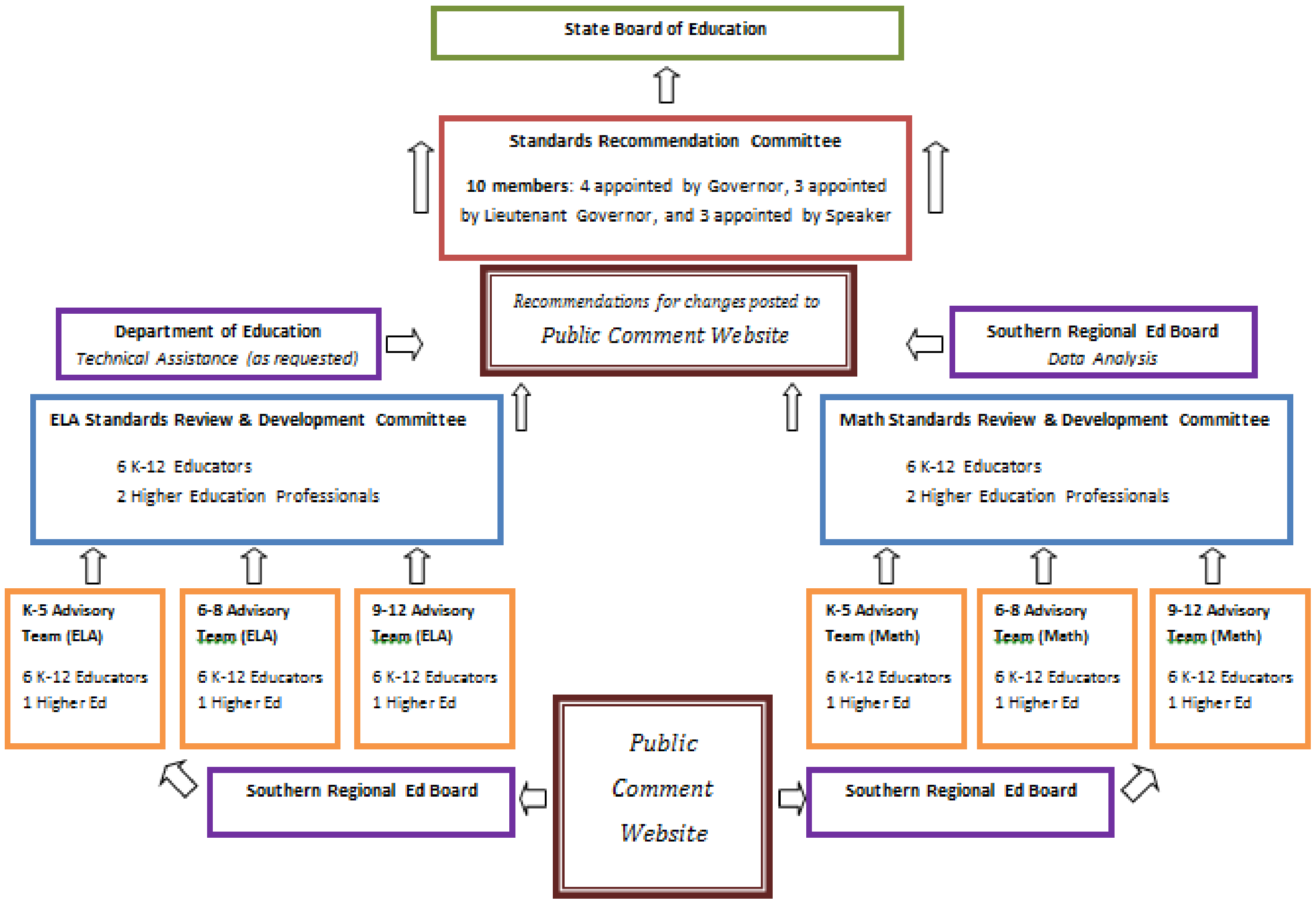
July 2016	• Recommendation Committee presents new standards to the State Board for FINAL reading
2016-17	• Transition year; training on new standards
2017-18	• First year of implementation and assessment on new standards

Website Collection

- Open November 6, 2014 through April 30, 2015
- Received more than 131,000 reviews by 2,300 unique reviewers



Committee Structure



Resources & Questions

- Binder Materials:
  - Tab 1: Agenda and Contact List
  - Tab 2: Process
  - Tab 3: Current Standards
  - Tab 4: Subject Level Reports
  - Tab 5: Grade Level Reports
  - Tab 6: Resources

- Questions:
  - Schedule: Tammy, Laura, or your chair/lead
  - Contracts: Laura
  - Logistics: Tammy or Laura
  - Data or Reports: Laura, Erin, or Paige

Week's Agenda

- Wednesday:
  - Subject Groups—Introductions and planning for the work
  - Subject Groups—Examining vertical alignment and progressions
- Thursday:
  - SREB—Data Reports
  - Subject and Grade Bands—Reviewing feedback and working on standards
- Friday and Saturday:
  - Subject and Grade Bands—Reviewing feedback and working on standards
  - Subject Groups—Checking in on vertical alignment and progressions
- Sunday:
  - Subject Groups—Wrap-up and determining next-steps

Standards Review Process

Background

In October 2014, Governor Haslam announced the creation of a standards review website that would be open to the public to review and offer feedback on what Tennessee students should know and be able to do by the end of each K-12 school year in both mathematics and English language arts (ELA). At the time of that announcement, the Governor laid out a process for review, which was incorporated and expounded upon in HB 1035 approved by the General Assembly this year.

Process

The review process includes educator development and advisory teams who are charged with reviewing the public feedback collected from the review website and proposing revisions to the math and ELA standards. As part of this process, an external research entity, the Southern Regional Education Board (SREB) has partnered with the State Board of Education (SBE) to prepare a series of data reports analyzing that feedback for use by the educator teams. At the conclusion of the educator review and development teams' work, the resulting new draft of standards will be reviewed by both the Standards Recommendation Committee, composed of four representatives appointed by the Governor and three each by the Speaker of the House and the Lt. Governor, and the public. The Standards Recommendation Committee will consider additional public feedback and propose to the State Board a set of revised math and ELA standards for first reading in April 2016 and final reading in July 2016. The revised standards will be implemented during the 2017-18 school year.

Public Feedback Collection

The standards review website, which launched November 6th 2014, allowed any individual to comment on the over 1,100 content standards in ELA and over 900 content standards in math. The website closed on April 30th, 2015, and below is an overview of the public participation:

- The website was open for six months, and, in the end, nearly 3,000 people logged in to view the site, while a total of 131,424 reviews and 20,344 comments were received from 2,262 reviewers.
- The majority of the feedback on the website came from Tennessee K-12 teachers who compromised more than 70% of all reviews. Parents and guardians made up another 12% of the total reviews.

Reviewers by Role Group

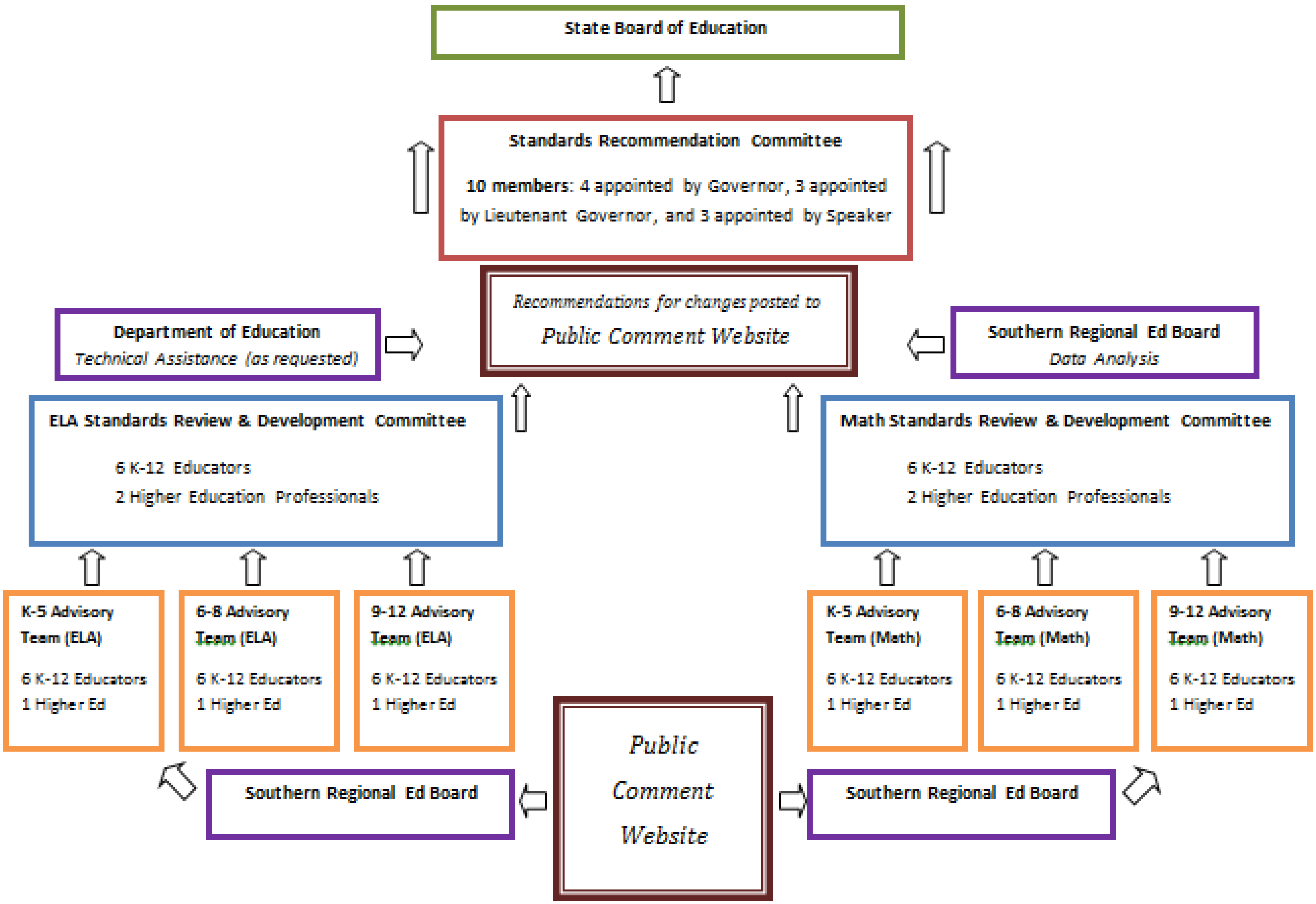
Total Reviewers = 2,262	
K-12 teacher	1,614
Parent/guardian	320
K-12 administrator	141
Other (e.g., media, business or industry representative, community member)	94
Higher education (e.g., administrator, faculty, student)	39
Retired educator	32
K-12 student	15
Elected official	7

English Language Arts Reviews

Total Reviews = 85,028			
	Keep	Review	Remove
Elected official	99	3	2
Higher education (e.g., administrator, faculty, student)	838	63	36
K-12 administrator	5,921	198	36
K-12 student	143	51	24
K-12 teacher	52,083	6,512	2,478
Other (e.g., media, business representative, community member)	4,019	329	81
Parent/guardian	8,394	1,106	588
Retired educator	1,413	148	463
Total	72,910	8,410	3,708

Math Reviews

Total Reviews = 46,395			
	Keep	Review	Remove
Elected official	27	1	0
Higher education (e.g., administrator, faculty, student)	257	49	33
K-12 administrator	3,274	172	29
K-12 student	139	20	22
K-12 teacher	26,107	3,962	1,608
Other (e.g., media, business representative, community member)	2,546	187	52
Parent/guardian	4,719	831	625
Retired educator	606	142	987
Total	37,675	5,364	3,356



State Board of Education
Standards Recommendation Committee
10 members: 4 appointed by Governor, 3 appointed by Lieutenant Governor, and 3 appointed by Speaker
Recommendations for changes posted to
Public Comment Website
Department of Education
Technical Assistance (as requested)
Southern Regional Ed Board
Data Analysis
ELA Standards Review & Development Committee
6 K-12 Educators
2 Higher Education Professionals
Math Standards Review & Development Committee
6 K-12 Educators
2 Higher Education Professionals
K-5 Advisory Team (ELA)
6 K-12 Educators
1 Higher Ed
6-8 Advisory Team (ELA)
6 K-12 Educators
1 Higher Ed
9-12 Advisory Team (ELA)
6 K-12 Educators
1 Higher Ed
K-5 Advisory Team (Math)
6 K-12 Educators
1 Higher Ed
6-8 Advisory Team (Math)
6 K-12 Educators
1 Higher Ed
9-12 Advisory Team (Math)
6 K-12 Educators
1 Higher Ed
Southern Regional Ed Board
Public Comment Website
Southern Regional Ed Board

Feedback Report on Revised Tennessee State Standards
Higher Education Faculty

Introduction

In reviewing the Tennessee State Standards, the State Board of Education sought feedback from higher education faculty from colleges and universities within Tennessee. Ten faculty members from nine different institutions reviewed the English/Language Arts (ELA) and Mathematics Standards and provided critical feedback bolstered by a deep content knowledge in their respective field. Reviewers represented each of the state's higher education systems, University of Tennessee, Tennessee Board of Regents, and the Tennessee Independent Colleges and Universities Association (TICUA) and were selected by the presidents of each of those institutions to serve on this review team. Several different institution types, including community colleges, technical colleges, and four-year universities, were represented through the diverse group of reviewers.

After participating in an overview session and reviewing the standards in-depth, each reviewer completed a thorough 22-question survey in which he or she was able to propose specific revisions, affirm previous changes, or raise questions about how these standards might look in practice. The survey asked reviewers to not only consider the standards as a whole, but also to dive deeply into each course and grade. The following report provides a summary of the major themes found within the surveys as well as proposals for precise revisions to the standards.

General Impressions

"If our goal is that students are college ready, then I believe these standards hit the mark."
--Math Reviewer

Respondents were asked to evaluate the standards as a complete document. In general, the standards' and the corresponding revisions were well received by these higher education faculty members:

- 10 out of 10 reviewers said that the standards are *clear or have greatly improved clarity*.
- 10 out of 10 reviewers said that the *coding of the standards is generally understandable or well ordered/consistent*.
- 9 out of 10 reviewers said that the *format of the standards is easy or very easy to follow*.
- 9 out of 10 reviewers said that *coherence of the standards is improved or coherence is strong and flows logically*. This includes 100% of ELA reviewers.
- 9 out of 10 reviewers said that the *rigor of the standards is just right*. This includes 100% of ELA reviewers.
- 7 out of 10 reviewers said that the *introductions within the standards are definitely useful*. 100% of ELA reviewers that that the *introductions are definitely thorough and clear*.

In-Depth: English/Language Arts

"I have found that the standards for all literacy, reading and writing, are excellent. They are well paced according to the grade level, and take into consideration all aspects of learning for students at each individual grade. The standards are not too rigorous, and each standard is reinforced carefully and added on to from one grade level to another, so that learning takes place gradually and effectively."
–ELA reviewer

Overall, the higher education reviewers deemed the ELA standards to be excellent: the standards are rigorous and well paced, the structure is functional, and the wording is clear and applicable. They found the layout of the standards to be clear. The explanations between the strands were helpful to ensuring the flow of the document. The introductions were well written and easy to read. The higher education faculty particularly applauded the research-based evidence and specific studies that supported the explanations. Reviewers found the glossary to be extremely helpful. Additionally, the formatting with regard to headings/subheadings, graphs, charts, and colors exemplified the thoughtfulness that went into developing the standards.

The reviewers found the coding to be easy to follow, with a logical progression that makes sense. They gave high marks for the coherent progression of the standards. Most agreed that while the previous standards were not necessarily unclear, the revised standards are certainly improved and more succinct. As for the rigor, the reviewers concurred that the level of rigor is very important—and these standards got it right. One reviewer pointed out that this is especially important in light of the rapidly changing world and needs of the workforce. The standards are high, but in the best possible way.

Foundational Literacy

Throughout the Foundational Literacy Standards, as well as all of the ELA Standards, the reviewers lauded the new vertical format of the standards, where you can see all grade levels simultaneously. They felt that this structure, along with increased clarity and appropriate sequencing, would help teachers with curriculum mapping.

Specifically, reviewers noted that students are asked to explain the way that grammar functions—as in the rules rather than just memorization. One reviewer appreciated that writing is now addressed in Word and Sentence Composition in the early grades.

One outstanding question regarded handwriting and writing being addressed in the same standard. A reviewer asked, "Does this encourage teachers/students to view handwriting and writing in the same manner?" Another reviewer proposed the addition of a standard to teach students how to physically read a book: front to back, left to right, top to bottom, and page by page. This proposed revision is not currently explained within this strand.

Language 6-12

In this strand, reviewers found the language of the revised standards to be more precise and clear. For example, 6.L.5 now does not have an "a." and "b.", which reviewers felt would make it easier for teachers to use. Additionally, reviewers thought that the sequencing of the language standards was appropriate for student learning.

There was a question as to why the vocabulary standards for grades 6-8 are identical. One reviewer questioned, "Should there be a nuance between those years' objectives?" Another reviewer thought the shift in focus from writing and speaking in grades 6-8 to reading and listening in 9-12 seemed a bit artificial.

Reading

The new standards document has the standards for literature and informational text side-by-side in the reading strand. Reviewers appreciated this revision in the standards format; they found it very helpful, allowing the reader to easily compare and contrast the reading skills needed for each type of text. They also found the language of the standards to be more direct and succinct, which demonstrated more clearly the manner in which scaffolding unfolded across grade levels. The reviewers found the revisions to the standards to be clear and developmentally appropriate. One reviewer was pleased that in 4.RL.4, "mythology" was broadened to include texts from "literature and history."

Reviewers valued the diversity statements for early grades in standard #2, and even wished there was more explicit diversity mentioned in the later grades. One reviewer, however, questioned whether the true focus is on diverse cultures or on theme more broadly. Another concern centered on standard #4 in which a reviewer thought that the progression seemed slower for informational text than it did for literature.

Reviewers' standard-specific feedback in this strand included:

- For 2.RL.2, a reviewer recommends adding the phrase "key details," which is included for grades K, 1, and 3 but not included for grade 2. The proposed standard would read: "Recount stories, including fables and folklore from diverse cultures, and determine their central message, lesson or moral with the support of key details."
- For all of reading standard 2, a reviewer recommends adding the word "countries" wherever "diverse cultures" is mentioned. This would enable students to also understand the location of countries in a global context. The phrasing would read "diverse cultures and countries" throughout the standards.
- For 5.RL.4, a reviewer questioned what "sound devices" means. Flagging this term as a good addition to the glossary.
- For 5.RL.5, one reviewer is concerned that there is no longer any mention of analyzing different register/dialects of English. The old standards addressed code switching and different varieties of English, but it does not appear in these Language standards. The reviewer asked whether this something that might be covered in the Speaking and Listening standards.
- A reviewer proposed that reading standard 1 comes before reading standard 8, since in the current order the means of research is discussed after the way of preparing it.

Speaking and Listening

Reviewers called the revised speaking and listening standards "fantastic." They found the inclusion of the new linking standards column to be extremely helpful in making connections across standards. Reviewers felt the revised language is more precise and succinct, and the standards are well suited to the grades spanning K-12.

However, one reviewer thought 3.SL.3 was unclear, saying it reads as if the student is required to elaborate or add detail to what the speaker is saying, rather than to identify the supporting details of the argument. Another concern centered on standard #4. This reviewer believed that eye contact, volume, and pronunciation should remain part of the standards for grades 9-12 in addition to grades 6-8, unless there is an assumption that these skills are mastered.

Writing

The writing strand was well received by reviewers. Specifically, one reviewer "adores" standard #3, saying it is so incredibly useful for and engaging to students. Another was pleased that in the revisions, standards #4 and #10 now address K-2 and standard #9 includes grade 3. They appreciated the inclusion of nonfiction and fiction within writing, and they reinforced the need for providing supporting evidence throughout.

One recommendation was to have students work from a mixture of primary and secondary sources. Another reviewer recommends a revision in standard #2 for grades 6-8. Under point "a.", the reviewer proposes adding the phrase "a strong thesis statement." The revised standard may read: "Introduce a topic clearly, by using a strong thesis statement in the introduction, to prepare the reader for what is to follow."

Technology, with regard to standard #6, was a concern for one reviewer. This person understood that in grade 3, a student must be able to type a complete product in a single setting using technology, which makes sense in terms of preparing students for a computer assessment. However, it could be problematic in settings where computers are not readily accessible, particularly within primary grades.

In-Depth: Mathematics

"It seems that clarity must have been a major focus in the revision. Language is much more friendly in places and the extra examples are a tremendous help. I believe that any certified K-12 teachers will be able (should be able) to read these standards, consult their resources, and prepare lessons to engage students in these standards."

--Math reviewer

Overall, the higher education reviewers appreciated the thoroughness and hard work that the educator advisory committee put into the standard revisions. They were impressed with the rigor, coherence, continuity, and clarity of the new standards and felt they were incredibly comprehensive and grade-appropriate. In particular, reviewers lauded the further development of the Statistics, Integrated Math, Geometry, and Calculus standards. They appreciated the additional examples and tables that are offered within the document.

Format and Layout

Reviewers found the format of the standards to be generally clear and easy to follow; however, they did have a few suggested revisions to improve the document:

- The sideways text for domain and clusters requires the reader to turn her head to read the text. One reviewer wondered whether it was possible to format this in another manner.

- A reviewer questioned whether it would be possible to have one section (an appendix, perhaps) that is devoted to tables, and then just refer to those in the standards as needed. Another reviewer suggested that if these tables are significant, then they should be referenced in the standards. Currently, there is very little explanation for the inclusion of the tables. Also, there should be a consistent naming convention for the tables. Reviewers felt the tables are nice and have the potential to be helpful to teachers and parents, but they need to be given additional context.
- If feasible, one reviewer recommended including examples on most standards.
- The color-coding of the major and supporting content was highly confusing for one reviewer. She raised the issue of color-blind accessibility; there is too much of the color blue throughout the standards, and the shades are not dramatically different or contrasting. She suggested that if color is used in text headings, for visual appeal, or for identification, then it needed to be substantially different than other colors that are used.

Reviewers thought the coding of the standards was very easy to understand. One reviewer suggested that the key for major content and supporting content be placed at the beginning of the overview page, rather than at the end of the grade level standards. Another asked that with each domain name, we include its abbreviation in parentheses beside it as well as in the overview at the start of each grade level.

Introductions

The overall introduction is thorough and useful because the introductions generalize what the students will learn in each particular grade/course. Reviewers detailed a few ideas for revision and points of concern:

- For each grade/course, it might be helpful to include an explanatory paragraph about goals and an emphasis to accompany the bullet points that show the organization of topics. What will students do in this grade/course?
- One reviewer suggested giving teachers a document detailing the major changes from the previous standards. For example, this would help them to note what may have been emphasized before that is no longer in a given course.
- One reviewer is concerned about the name “supporting work.” She worries that this will give the perception that these aren’t standards to worry about, even though they will be assessed just like the “major work”. Perhaps this can be clarified further within the introductions.

Coherence and Rigor

The reviewers felt that the progression of the standards was coherent. There was a suggestion to include a review of concepts from prior years, so that teachers can ensure students are prepared for each grade level. With the rigor of the standards, reviewers wanted to ensure that students do not fall behind. The language of these standards is much improved. For example, there is increased clarity, which should help teachers to better read and understand the standards. Reviewers found the examples extremely helpful, but suggested that the document include an example with most if not all standards.

Most reviewers believed the rigor of the standards was appropriate and that they will prepare Tennessee students for college. With the rigorous design of these standards, reviewers reinforced that supporting students through tutoring, smaller class sizes, or specialized instructors may help with their academic success.

<u>Grades K-5</u>

In general, the reviewers agreed that the grades K-5 standards were coherent, rigorous, easy to follow, and greatly improved from before and appreciated the extra examples provided. Reviewers commended the progression, particularly the early introduction of basic fractional concepts in the Number and Operations domain, which is essential to the natural development of fluency with fractions. The newly added items related to currency recognition and problems involving money were also particularly well received. Reviewers called out that within the Geometry domain the progression of the development of reasoning about properties, via the description and classification of shapes, is well done.

Reviewers' standard specific feedback in this grade band included:

- One reviewer would like to add to the study of shapes within Kindergarten. He felt that students need to be presented with a wide variety of shapes, including highly irregular, hard-to-describe ones, so that they can begin to identify that the shapes they will study are somehow special.
- For 2.OA.B.2, the standard should be revised. "Add and subtract within 20" should actually be 30, to correspond with the cluster.
- A reviewer recommended avoiding the use of the word "understand," because this is not measurable; instead, she suggested using terms like "name," "identify," or "demonstrate."
- For K.CC.A.3 and K.CC.C.7, one reviewer said that these standards should call attention to the importance of connecting quantities to the symbols that represent them, which is one of the main components in the development of number sense.
- In the introductions for grades 1-2 mathematics, underneath Number and Operations in Base Ten, it should read "Understand place value." In grade 2, below Operations and Algebraic Thinking, is the major work of grade 2 to add and subtract within 20? Or is it 100?
- For 3.NF.A.1 through 3, the cluster calls for the denominators to be limited to 2,3,4,6, and 8. One reviewer believed the inclusion of 5 and 10 would contribute to the flow from grade 3 to grade 4.
- Need for additional clarification in particular standards:
    - For 2.NBT.A.2, a clarification of scope is needed. Are students only expected to skip-count starting from any point in the established skipping sequences, or are they expected to skip-count starting from any number in the given range?
    - For 4.NF.B.4, this standard has notation issues due to the presence of multiple fonts in the text of the single standard, and it needs to be edited.
    - For 4.OA.A.2, a clarification is needed. How are students supposed to distinguish between multiplicative comparison and additive comparison as required by the standard? Is the intent that students are able to respond with the correct kind of comparison when given verbal cues, or is there more to this standard?
    - For 1.OA.C.5, a clarification is needed. Does this standard mean that students will do problems like 20 + 20, or does it mean that the sums and differences will be within 20?
    - For 1.G.A.2, a clarification is needed.
- Need for additional or clarified examples:
    - One reviewer thought the following standards would benefit from examples: 3.NBT.A.2, 4.OA.C.5, 4.NBT.B.4, 4.NBT.B.5, 4.NBT.B.6, 4.NF.C.5.

  - A reviewer also called for the example within 3.OA.A.1 to be revised, as the language is unclear.
  - Additionally, a reviewer identified that the example within 3.NF.A.2a is missing words.

Grades 6-8

On the whole, the reviewers believed that the standards in this grade band are appropriate, coherent, rigorous, easy to follow, clearer, and have a reasonable progression of concept development. In particular, one reviewer appreciated the progression in the Expressions and Equations domain, especially with respect to linear expressions and inequalities, as well as that of the Statistics and Probability standards. Also, one reviewer felt confident with the emphasis in grades 6-7 on understanding ratios as rates—this understanding is fundamental and critical to success in advanced courses, such as calculus, where rates of changes are one of the essential applications of the course material. Reviewers found that these standards demand flexible knowledge, which is essential to the goal that students be able to use their knowledge later. Reviewers agreed that if students adhere to these standards, then they would be on track to be prepared for grades 9-12.

Reviewers' standard-specific feedback in this grade band included:

- One reviewer wondered why function notation is not required for grade 8. One of the major work areas listed in the initial overview for grade 8 is "Define, evaluate, and compare functions." Doesn't function notation help students understand the input/output concept?
- Another reviewer was concerned that there is a big jump in the number and difficulty of standards for grade 6. Is there a way to redistribute those some? We don't want to overwhelm students.
- There was also a question with regard to the 7.SP standards. One reviewer worried that 7th grade students are unprepared to draw inferences about populations and think through complex data.
- Need for additional clarification in particular standards:
  - For 8.G.B.6, clarification is needed. What does it mean to explain a proof? This sounds different from "prove the Pythagorean Theorem."
  - For 7.SP.D.8b, clarification is needed. How are students to describe the shape of a distribution? Are the names of some standard distribution types to be introduced? Are shape descriptions limited to informal descriptions at this level?
  - For 8.NS.A.2, clarification is needed.
- Need for additional or clarified examples:
  - For 6.EE.C.9, the example needs revision. The current problem is not an example of the standard.
  - For 7.EE.A.2, the example is missing a few words.
  - For 8.EE.A.2, this standard should address the issue of distinguishing between solving an equation and evaluating the expression.

Algebra I and II

For these courses, reviewers thought the standards were rigorous, coherent, clearer, easy to follow, and had a reasonable progression of conceptual development. Reviewers appreciated the addition of new examples. One reviewer specifically liked the scope and clarification column that begins in Algebra I. She also liked that it refers to whether or not that standard will also be revisited in Algebra II. Another reviewer commented that these standards would ensure students are prepared for college mathematics.

Reviewers' standard-specific feedback in these courses included:

- More clarity is needed within many of the standards in the Algebra and Functions domain, regarding the scope of the polynomial expressions/equations/functions.
- For A.REI.D.10, one reviewer believed that there should be a limit to the types of equations students are asked to graph.
- For F.LE.B.5, there is a typo in the example. The phrase should be "7,000 instead of 5,000," not "7,000 instead of 8,000."
- One reviewer was concerned that Algebra II still had too many standards and worried that it cannot all be completed within the course calendar.
- One reviewer believed the Algebra I and II standards are more separated than the Integrated Math standards.
- Clarification is needed for coefficient types available for polynomials.
- For A.SSE.A.2, there is a typo in the scope and clarification. It should read (a + 7)(a +2).
- For S.ID.A.1, one reviewer thought "stem plots" should actually be "stem and leaf plots."

<u>Geometry</u>

The Geometry standards received high praise from the reviewers. They agreed that the standards support higher order thinking skills and generally expose students to shapes, axioms, theorems, and proofs, which are vital for strengthening students' mathematical skills. They found the standards to be reasonable and appropriate, and well supported by prior work in the Geometry domain in grades K-8. The emphasis on transformations to define, visualize, and reason about congruence and similarity is excellent. The balance between formal and informal reasoning is essential to thorough understanding and rigorous development of formal reasoning skills.

Reviewers' standard-specific feedback in these courses included:

- For G.SRT.C.6, the example needs to be clarified. What is the purpose of using the definitions? How should students demonstrate their understanding of similarity and of the definitions of the trigonometric ratios?
- For G.CO.A.5, one reviewer suggested that a specific form of technology be mentioned here if students are expected to do this on an online assessment.
- For G.GPE.A.1, there is an inconsistency with the cluster. The cluster refers to "Translate between the geometric description and the equation of a conic section," while the standard only refers to circles. Would it be better to specifically use "circle" instead of the broader term "conic section"? Or was this done for consistency throughout the standards?

<u>Integrated Math I, II, and III</u>

The standards for Integrated Math I, II, and III are pulled directly from the Algebra I and II and Geometry courses and read exactly the same. For reference to the content of those standards, please review the Algebra and Geometry sections of this report.

With regard to the organization of the Integrated Math coursework, the organization of each course is clear and the progression of concepts through the course sequence is appropriate and reasonable. One reviewer especially liked the distribution of the Geometry standards across the courses as well as the changing focus from congruence in Integrated Math I to similarity in Integrated Math II, followed by circles and proofs in Integrated Math III.

Statistics and Applied Mathematical Concepts

For Statistics, reviewers found these standards to be appropriate and consistent with a freshman or sophomore level course in college statistics. Reviewers identified an issue with some of the standards being cut off from the draft document, S.MD.A.5, 6, and 7 are missing.

Reviewers' standard-specific feedback in these courses included:

- Reviewers again called for extra examples to be added to the standards.
- One reviewer thought it needed to be specific that confidence intervals should be found by both hand and technology. An outstanding question is whether standard deviation will also be calculated both ways.

For Applied Mathematical Concepts, much of the same feedback applies. Modeling is emphasized in the Applied Mathematical Concepts standards, which is vital for helping students to relate to real life problems involving mathematics. Another reviewer thought the course looked interesting and valuable to everyday life. However, one reviewer wondered if students, parents, and community members are familiar with this new course. Another reviewer believed that although this course is well chosen and useful, the content is too extensive and includes a lot of material that is covered in Statistics.

Bridge Math

Reviewers agreed that the Bridge Math standards are reasonable and appropriate for a course that attempts to revisit most of the material from the Algebra I-Geometry-Algebra II and Integrated Math sequences. The extra standards that focus on modeling and applications provide needed direction and framework for the repetition of the required sequences material. Again, reviewers thought extra examples would improve the clarity of these standards.

There was also the question if students, parents, and community members are familiar with this course: "What types of students will be encouraged to take this course versus other fourth-year courses?" Reviewers interpreted the standards to be that non-college bound students may take Bridge Math. If this is so, then Bridge Math could benefit from having some financial standards similar to the ones seen in Applied Mathematical Concepts. Also, more real-life application problems, like in Algebra I and II, are important to include.

Precalculus and Calculus

The Precalculus and Calculus courses both received significant positive feedback from the reviewers. They agreed that the Precalculus standards are clearly a thorough and rigorous preparation for any sequence in single- and multi-variable Calculus. One reviewer thought that, now, Precalculus looks like a well designed STEM course because students are seeing concepts of vectors and matrix application to games. Concerns regarding Precalculus include a fast pace (due to the volume of material) and extensive variety of material being potentially overwhelming to students who were not exceptional in preceding courses. However, reviewers felt that most of the material is necessary in order to adequately prepare students for Calculus.

In general, reviewers felt that the Calculus standards will prepare students for, and aligns well with, college coursework. The relatively short list of standards for this course is a thorough but succinct summary of the essential content of a first course in Calculus. One reviewer mentioned that the Calculus standards could use more clarity, but that otherwise they are rigorous and easy to follow.

Appendix A: Higher Education Reviewers

English Language Arts:

- Dr. Kathy Brashears, Tennessee Technological University
- Aggie Mendoza, Nashville State Community College
- Dr. Donna Summerlin, Martin Methodist College
- Erin Smith, University of Tennessee Knoxville

Mathematics:

- Dr. Samuel Jator, Austin Peay State University
- Carryl Weaver, Tennessee College of Applied Technology, Athens
- Michael Welham, Volunteer State Community College
- Dr. Brandon Barnes, Lipscomb University
- Dr. Jennifer Aust, Martin Methodist College
- April Conner, University of Tennessee Knoxville

Standards Review FY 17 Budget Increase

V1-9/19/15

Main Subject Review: 1 review per year		
Educator Review Team		
Educator Stipends	$	15,000.00
Lead Stipends	$	9,000.00
Chair Stipend	$	5,750.00
Food	$	11,880.00
Hotel	$	6,750.00
Mileage	$	45,000.00
Meeting Space	$	15,000.00
Supplies	$	2,000.00
Printing	$	10,000.00
Subtotal	**$**	**120,380.00**
Standards Recommendation Committee		
Stipends	$	12,500.00
Food	$	3,300.00
Hotel	$	3,000.00
Mileage	$	12,500.00
Meeting Space	$	3,000.00
Printing	$	3,000.00
Supplies	$	500.00
Subtotal	**$**	**37,800.00**
Total for Main Review	**$**	**158,180.00**
Minor Subject Review: 2 reviews per year		
Educator Review Team		
Educator Stipends	$	18,000.00
Chair Stipend	$	4,000.00
Food	$	3,168.00
Hotel	$	2,400.00
Mileage	$	12,000.00
Meeting Space	$	3,000.00
Supplies	$	500.00
Subtotal	$	43,068.00
2 minor reviews per year	$	86,136.00
Total for FY17 Reviews	**$**	**244,316.00**

5 educators per grade band @ $750 per month for 3 months + 15 additional days @ $250 each
2 leads @ $1000 per month for 3 months + $500 per month for 3 additional months
1 chair at @$1250 per month for 3 months +$500 per month for 4 additional months
Per diem costs ($66) at 10 days per person times 18 people, times 10 days
1/2 of reviewers need a hotel stay $150 per night per meeting
18 people @ an average $250 per meeting, times 10 meetings
5, 2 day meetings @ $3000 each meeting
Chart paper, markers, etc.
Printing of website feedback notebooks

5 meetings at $250 per meeting, 10 people
Per diem costs ($66) at 5 days, 10 people
1/2 of SRC members need a hotel stay $150 per night per 4 meetings
10 people @ an average of $250 per meeting, 5 meetings
Most likely free meeting space, but $3,000 for streaming capabilities
Printing of second round of website feedback

12 reviewers, 2 months at $750 each
4 months at $1000
Per diem ($66) at 4 days per 12 people
1/2 of reviewers will need a hotel stay at $150 per night per 4 meetings
12 people @$250 an average of $250 per meeting, 4 meetings
Most likely free meeting space, but $3,000 contingency

A Review of Tennessee's Draft Mathematics Academic Standards

November 2015

Table of Contents

Introduction

The purpose of this review is to examine the October 2015 draft of the Tennessee Math Standards (Draft TMS) to determine whether they are high-quality standards that prepare students, over the course of their K–12 education careers, for success in credit-bearing college courses and quality, high-growth jobs.

When evaluating standards, Achieve uses a set of six criteria: rigor, coherence, focus, specificity, clarity/accessibility, and measurability. For the purposes of this analysis, the TMS were compared with the current Tennessee State Standards (TSS) for Mathematics and analyzed with respect to these criteria.

The current high school TSS specify the mathematics content all students should have mastered to become college and career ready. In addition to the standards for all students, the TSS also include additional standards that some students should know to prepare for advanced mathematics courses such as Calculus. These additional standards are identified in the TSS with a (+). Throughout this report, as in the TSS, we will refer to these additional standards as (+) standards. All TSS without a (+) symbol are intended to be common to all college- and career-ready students.

For grades 9–11, the TMS offer standards designated for two different course sequences: a Traditional sequence (Algebra I, Algebra II, and Geometry) and an Integrated sequence (Math I, Math II, and Math III). With the exception of a few variations in the two sequences, they generally have the same level of focus, rigor, and coherence. Tennessee is among the few states that require four years of math, including one year beyond Algebra II. To accommodate that requirement, the TMS include five different options for fourth-year courses: Bridge Math, Precalculus, Statistics, Applied Mathematical Concepts, and Calculus. This approach allows for at least eight different pathways for a four-year math student, with varying levels of rigor, coherence, and focus. The high school expectations intended for all students in the TMS provide a college- and career-ready set of standards, except for a few instances where they are somewhat less focused, rigorous, and/or coherent than Tennessee's current standards. Details about those areas can be found in this report and in the accompanying chart.

This report does not include close analysis of the fourth-year course standards and assumes that all Tennessee students would, minimally, be exposed to either the Traditional or the Integrated sequence of three courses in addition to one of the fourth-year courses. A complete review of the strengths and weaknesses of those course standards is advised in the future to ensure that students are prepared for various postsecondary pathways, including some that would require higher-level mathematics.

Review of Tennessee's Draft Mathematics Standards

This report provides a review of the draft of the TMS released in October 2015. The draft document provides grade-level standards for each of the grades from kindergarten through grade 8. In high school, course standards for the first three years are presented for both Traditional and Integrated sequences. The Traditional sequence consists of Algebra I, Algebra II, and Geometry, while the Integrated courses are simply titled Integrated Math I, Integrated Math II, and Integrated Math III. The draft also includes proposed standards for advanced fourth-year courses in Precalculus, Statistics, and Calculus, as well as for courses titled Bridge Math and Applied Mathematical Concepts. The TMS are structured around domains, clusters, and content standards, with the high school standards also being grouped by broader conceptual categories. The TMS are aligned to progressions, as indicated below. **The TMS progressions, listed on page 3 of the draft, reflect highly rigorous academic standards.**

TMS	Grade
Counting and Cardinality	K
Number and Operations in Base Ten	K–5
Number and Operations — Fractions	3–5
Ratios and Proportional Relationships	6–7
The Number System	6–8
Number and Quantity	9–12
Operations and Algebraic Thinking	K–5
Expressions and Equations	6–8
Functions	8
Algebra and Functions	9–12
Geometry	K–12
Measurement and Data	K–5
Statistics and Probability	9–12

The TMS include the same eight Standards for Mathematical Practice as those found in the TSS. These standards are included to recognize that success "requires that development of approaches, practices, and habits of mind be in place as one strives to develop mathematical fluency, procedural skills, and conceptual understanding. The Standards for Mathematical Practice are meant to address these areas of expertise that teachers should seek to develop within their students" (page 8). The Standards for Mathematical Practice, as they first appear in the TMS are shown below:

TMS Standards for Mathematical Practice
1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

On page 8 of the TMS, the eight Standards for Mathematical Practice have the same titles and numbering as in Tennessee's current standards. In the more detailed descriptors that appear on pages 9–12 of the TMS, however, the same practices are presented in a different order. Specifically, MP4 and MP6 have changed places and numbers, as have MP5 and MP7. However Tennessee chooses to number and order the practices, Achieve recommends that the same numbering and order be used consistently throughout the TMS document.

According to the TMS, "Communication in mathematics employs literacy skills in reading, vocabulary, speaking and listening, and writing. Mathematically proficient students communicate using precise terminology and multiple representations including graphs, tables, charts, and diagrams. By describing and contextualizing mathematics, students create arguments and support conclusions. They evaluate and critique the reasoning of others and analyze and reflect on their own thought processes." To this end, the TMS include Literacy Skills for Mathematical Proficiency. These skills, with no direct counterpart in the TSS, include reading, vocabulary, speaking and listening, and writing and are summarized as follows:

TMS Literacy Skills for Mathematical Proficiency
1. Use multiple reading strategies. 2. Understand and use correct mathematical vocabulary. 3. Discuss and articulate mathematical ideas. 4. Write mathematical arguments.

Given the mismatch in the numbering of the Mathematical Practices, the alignments of the Mathematical Practices to the Literacy Skills should be reviewed.

Since many of the high school standards in the TMS are used multiple times in the various courses, we have added to the TMS coding schema for this report to identify and compare the standards based on which course and sequence it is addressing. In most cases the standard is used multiple times but in the exact same form. For example, A.SSE.A.2 is addressed in four courses for grades 9–11: Algebra I and II and Integrated Math I and II. In each course the wording of the standard is exactly the same. We have indicated the course in the codes for the standard in the following way: **AI.**A.SSE.A.2, **AII.**A.SSE.A.2, **MI.**A.SSE.A.2, **MII.**A.SSE.A.2.

However, there are a few standards that are slightly changed when used in different courses. For example, A.CED.A.1 is addressed in five of the six TMS courses for grades 9–11 in the following ways:

TMS Traditional Sequence	TMS Integrated Sequence
AI.A.CED.A.1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and rational and exponential functions.	**MI.**A.CED.A.1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and rational and exponential functions.
	MII.A.CED.A.1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions and rational and exponential functions.
AII.A.CED.A.1. Create equations and inequalities in one variable and use them to solve problems.	**MIII.**A.CED.A.1. Create equations and inequalities in one variable and use them to solve problems.

By adding the course designation to the coding scheme for each standard, we are able to identify, for the purposes of this report, the course to which a standard is connected.

Rigor

Rigor refers to the intellectual demand of the standards. It is the measure of how closely a set of standards represents the content and cognitive demand necessary for students to succeed in credit-bearing college courses without remediation and in entry-level, quality, high-growth jobs. Rigorous standards should reflect, with appropriate balance, conceptual understanding, procedural skill and fluency, and applications. For this report, Achieve compared the rigor of current Tennessee State Standards to that of the draft TMS.

In most respects, the TMS reflect comparable levels of rigor to the baseline standards for college- and career-readiness. As such, the emphasis on the three components of rigor, conceptual understanding, procedural skill and fluency, and application in the TMS has very nearly the same balance as that of the TSS. We do see a few instances, however, where the TMS have deemphasized an understanding, explanation, or proof associated with a given TSS standard. In the examples below, words or phrases in the aligned TSS were deleted with the result being the reduction of emphasis on conceptual understanding:

TSS Standard	**Draft TMS Standard**
1.NBT.4. Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.	1.NBT.C.4. Add a two-digit number to a one-digit number and a two-digit number to a multiple of ten (within 100) using concrete models, drawings, strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.
1.NBT.5. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.	1.NBT.C.5. Mentally find 10 more or 10 less than a given two-digit number without having to count by ones.

2.NBT.7. Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.	2.NBT.B.7. Add and subtract within 1,000 using concrete models, drawings, strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

In some cases, wording changes from prior standards could lead to reduced rigor. In these examples, for example, the word "prove" was changed to "use" or "recognize:"

TSS Standard	Draft TMS Standard
A.APR.4. Prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity (x^2 + y^2)^2 = (x^2 – y^2)^2 + (2xy)^2 can be used to generate Pythagorean triples.	**AII(MIII).**A.APR.C.4. Use polynomial identities to describe numerical relationships.
F.LE.1a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.	**AI(MI).**F.LE.A.1a. Recognize that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
F.TF.8. Prove the Pythagorean identity sin^2(A) + cos^2(A) = 1 and use it to find sin(A), cos(A), or tan(A) given sin(A), cos(A), or tan(A) and the quadrant of the angle.	**AII(MIII).**F.TF.C.8. Use trigonometric identities to find values of trig functions.
G.C.1. Prove that all circles are similar.	**G.**G.C.A.1. Recognize that all circles are similar.

Below is another example from grade 5 in which the opening explanatory remarks in the TSS are replaced with the procedural "graph and label..." TMS 5.G.1 is limited to the first quadrant, which means that the graph uses only positive values. Given this limitation, the description of two perpendicular lines does not work.

TSS Standard	Draft TMS Standard
5.G.1. Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis,	5.G.A.1 Graph and label points using the first quadrant of the coordinate plane. Understand that the first number indicates the horizontal distance traveled along the *x*-axis from the origin and the second number indicates the vertical distance traveled along the *y*-axis with the convention that the names of the two axes and the coordinates correspond *(e.g., x-axis and x-coordinate, y-axis and y-coordinate).*

with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).	

The TMS have lost the foundational understanding for this expectation. In addition, the change in wording caused the expressions "first number" and "second number" to have lost their connection to the coordinates in an ordered pair. This TMS change also inserts a limitation that requires only graphing points in the first quadrant, while the TSS do not.

Even though these sorts of changes are exceptions to the rule rather than the rule, consideration should be given to these types of changes that affect the rigor of the TMS.

Coherence

Coherence refers to how well a set of standards conveys a unified vision of the discipline, establishing connections among the major areas of study and showing a meaningful progression of content across the grades, grade spans, and courses.

The coherence of the draft TMS is comparable to that found in the TSS. There are a few subtle differences between the two sets, some of which arise from the challenge of creating two high school course sequences. It is helpful that the TMS include the Scope and Clarifications for each standard in each course.

One issue to consider is the TMS grade 8 handling of both similarity and congruence but also of dilations in connection to similarity. Dilations are addressed in grade 8 in both the TSS and draft TMS, but the connection to similarity is not a part of the TMS. It can be seen in the table below, that the foundation for understanding and using transformations is laid in the TMS with the inclusion of their 8.G.A.1 and 8.G.A.2. (Note: TMS 8.G.A.2 is coded as 8.G.3 in the TSS.) However, connecting that understanding of transformations to similarity and congruence has been omitted in the TMS decision not to include alignments to 8.G.2 and 8.G.4 in the TSS.

TSS Grade 8	Draft TMS Grade 8
8.G.1. Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines.	8.G.A.1. Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines.
8.G.2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.	There is no match in the TMS.

8.G.3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	8.G.A.2. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
8.G.4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.	There is no match in the TMS.

Tennessee students will likely miss the connection between dilations and a definition and understanding of similarity. The lack of coherence in these changes is amplified in that the cluster heading for TMS 8.G.A.2 claims to include understanding congruence and similarity:

> *8.G.A. Understand congruence and similarity using physical models, transparencies, or geometry software.*

Under this heading we would expect, at the very least, to see standards that address both similarity and congruence and, at best, a connection to the transformations that would be related to the "physical models, transparencies, or geometry software" mentioned in the heading.

The draft TMS address the Laws of Sines and Cosines in the high school course sequences standards (in the first three years). The TSS address this as a (+) standard (G.SRT.11), intended for those students who have an interest in math-related studies or careers. However, in the Geometry and Math II course standards, "understand and apply" has been changed to "recognize and use," with respect to the laws. In doing so, the TMS have removed the notion of understanding the laws, instead expecting only for students to recognize and apply them. Further, it is not clear what the draft standard means by "recognize" the Laws of Sines and Cosines. The intention of the TMS may be that students know *when* to use the Laws of Sines and Cosines. If that is the case, this wording should be made clearer. This standard appears again in the draft Precalculus TMS. In the Precalculus class, the standard uses "understand and apply." The coherence issue here is that understanding the laws comes after using them and only outside of the sequenced courses. It should also be noted here that G.SRT.10 (+), requiring proof of the laws, is not addressed in the TMS at all. This completely eliminates the requirement that students know that the Laws of Sines and Cosines are true and defendable.

TSS Geometry	Draft TMS Geometry	Draft TMS Precalculus
G.SRT.11. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).	**G(MII).**G.SRT.C.8b. Recognize and use the Law of Sines and the Law of Cosines to solve triangles in applied problems.	G.AT.A.6. Understand and apply the Law of Sines (including the ambiguous case) and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

Standards reviewers should also address inconsistent limits between the two course sequences. For example, consider A.CED.A.4: *Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.* The standard is addressed in Algebra I and in each of the three Integrated courses. The table below shows the scope of this standard at each level:

Algebra I	Integrated I	Integrated II	Integrated III
There are no assessment limits for this standard. The entire standard is assessed in this course.	i) Tasks are limited to linear equations. ii) Tasks have a real-world context.	i) Tasks are limited to quadratic, square root, cube root, and piecewise functions. ii) Tasks have a real-world context.	i) Tasks have a real-world context. ii) Tasks are limited to polynomial, rational, absolute value, exponential, or logarithmic functions.

Given that the Algebra I course is restricted to linear, quadratic, and exponential functions, there is a higher expectation for students in the Integrated sequence for this particular standard.

Similarly, there is a mismatch in expectation with respect to:

> A.REI.A.1 Explain each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

This standard is addressed in Algebra I, Algebra II, and Integrated II and III. The students in the Traditional sequence, missing alignment to piecewise, square roots, and cube roots, will have a lower overall expectation to apply this standard. The table below shows the limitations for A.REI.A.1 at each level:

Algebra I	Algebra II	Integrated II	Integrated III
Tasks are limited to linear and quadratic equations.	Tasks are limited to simple rational or radical equations.	Tasks are limited to linear, quadratic, exponential equations with integer exponents, square root, cube root, piecewise, and exponential functions. The redundancy of exponential functions here should be clarified.	Tasks are limited to simple rational or radical equations.

Another example of mismatched limits between the course sequences is with:

> *A.REI.C.6 Write and solve a system of linear equations in context.*

In this case, students in the Integrated sequence are not expected to solve a system with three equations in three variables.

Algebra I	Algebra II	Integrated I
Solve systems both algebraically and graphically. Systems are limited to at most two equations in two variables.	When solving algebraically, tasks are limited to systems of at most three equations and three variables. With graphic solutions, systems are limited to only two variables.	Solve systems both algebraically and graphically. Systems are limited to at most two equations in two variables.

The handling of the trigonometry topics in high school presents an unclear intended coherence. The TMS have removed all notions of proof, periodicity, and trigonometric modeling (TSS F.IF.4, F.TF.5, and F.TF.8) from the Traditional and Integrated sequences. In turn, the TMS have added two standards, F.TF.C.8a and F.TF.C.8c, with no direct alignments in the TSS. The TMS have also moved part of the TSS (+) standard, F.TF.3, to TMS F.TF.A.1b. In doing so they introduce the notion of "commonly recognized angle" to the sequences. Consider the full list of trigonometry standards included in both Algebra II and Integrated Mathematics III:

TMS Algebra II and Integrated Mathematics III
Cluster: Extend the domain of the trigonometric functions using the unit circle F.TF.A.1. Understand and use radian measure of an angle. a. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. b. Use the unit circle to find *sin* θ, *cos* θ, and *tan* θ when θ is a commonly recognized angle between 0 and 2π.
Cluster: Prove and apply trigonometric identities. F.TF.A.2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. F.TF.C.8. Use trigonometric identities to find values of trig functions. a. Given a point on a circle centered at the origin, recognize and use the right triangle ratio definitions of *sin* θ, *cos* θ, and *tan* θ to evaluate the trigonometric functions. b. Given the quadrant of the angle, use the identity $\sin^2 \theta + \cos^2 \theta = 1$ to find *sin* θ given *cos* θ, or vice versa. c. Given the quadrant of the angle, use the identity *tan* θ = *sin* θ/*cos* θ to find *sin* θ, *cos* θ, or *tan* θ given *sin* θ or *cos* θ for commonly recognized angles between 0 and 2π on the unit circle.

There are a few points of clarification that would be helpful to readers in understanding the intended coherence of these standards:

- The final TMS should explain the thinking behind teaching the unit circle while excluding the idea of periodicity.
- The TMS should clearly articulate any intended differences between F.TF.A.1b, F.TF.C.8a, and F.TF.C.8c.
- There are two "givens" in F.TF.C.8c ("given the quadrant of the angle" and "given sin θ and cos θ"). The standard would be clearer with one set of givens. Further, since these are commonly recognized angles, it is not clear why one would need the tangent identity to find sine when given cosine.
- The TMS should describe how any of the F.TF.C.8a, F.TF.C.8b, and F.TF.C.8c standards meet the "prove" part of the cluster intention to "Prove and apply trigonometric identities."
- The TMS could explain why F.TF.A.1b is a part of F.TF.A.1 and not F.TF.A.2.

Focus

High-quality standards establish priorities about the concepts and skills that should be acquired by students. A sharpened focus helps ensure that the knowledge and skills students are expected to learn are important and manageable in any given grade or course.

There are a few noteworthy differences in focus between the TSS and the draft TMS. In the table below, we list each of the aligned standards and provide a brief description of the shift in focus.

Grades K–3

TSS Standard	Draft TMS Standard	Comments
K.CC.1. Count to 100 by ones and by tens.	K.CC.A.1. Count to 100 by ones, fives, and tens. Count backward from 10.	TMS added the expectation to count backward from 10.
K.OA.5. Fluently add and subtract within 5.	K.OA.A.5. Fluently add and subtract within 10 using mental strategies.	TMS expanded the expectation of fluency to 10 instead of 5.
	K.MD.B.3. Identify the penny, nickel, dime, and quarter and recognize the value of each.	TMS added this standard related to money. There is no match in the TSS.
1.OA.5. Relate counting to addition and subtraction (e.g., by counting on 2 to add 2).		TMS have no similar standard.

1.OA.6. Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).	1.OA.C.5. Add and subtract within 20 using strategies such as counting on, counting back, making 10, using fact families and related known facts, and composing/decomposing numbers with an emphasis on making ten (e.g., 13 - 4 = 13 - 3 - 1 = 10 - 1 = 9 or adding 6 + 7 by creating the known equivalent 6 + 4 + 3 = 10 + 3 = 13). 1.OA.C.6. Fluently add and subtract within 20 using mental strategies. By the end of Grade 1, know from memory all sums up to 10.	TMS expect students to fluently add and subtract within 20 instead of 10.
1.NBT 1. Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral	1.NBT.A.1. Count to 120, starting at any number. Read and write numerals to 120 and represent a number of objects with a written numeral. Count backward from 20.	TMS added counting backward from 20.
	1.MD.B.4. Count the value of a set of like coins less than one dollar using the ¢ symbol only.	Money begins in grade 2 in the TSS.
2.OA.2. Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.	2.OA.B.2. Fluently add and subtract within 30 using mental strategies. By the end of Grade 2, know from memory all sums of two one-digit numbers and related subtraction facts.	TMS expect fluency within 30, while the TSS expect 20.
	3.G.A.3. Define and recognize attributes of polygons.	There is no match in the TSS. This standard, though, lacks specificity.

Grades 4–6

TSS Standard	TMS Standard	Comments
4.NF.4. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.	4.NF.B.4. Apply and extend previous understandings of multiplication as repeated addition to multiply a whole number by a fraction.	TMS limit to repeated addition. (This added limitation seems incongruous to the sub-standards for 4.NF.B.4.)

6.RP.3d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.	6.RP.A.3d. Use ratio reasoning to convert customary and metric measurement units (within the same system); manipulate and transform units appropriately when multiplying or dividing quantities.	TMS add the limitation of working in the same system.
6.SP.5.c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.	6.SP.B.5c. Give quantitative measures of center (median and/or mean) and variability (range) as well as describing any overall pattern with reference to the context in which the data were gathered.	TMS removed both interquartile range and mean absolute deviation, which are more useful measures of spread than range, in that they provide a sense of how spread out the data is. This provides a foundation for students to later make more precise interpretations of data distributions, with, and without, clustering around the mean, (e.g. normal distributions).

Grades 7–8

The TMS have removed all mention of two-way tables from grades 7–8. Two TSS that deal with two-way tables, S.ID.5 and S.CP.4, have been postponed to the fourth-year Statistics course.

TSS Standard	TMS Standard	Comments
7.SP.3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.*	7.SP.B.3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers. *For example, the mean height of players on the basketball team is 10 centimeters greater than the mean height of players on the soccer team; on a dot plot or box plot, the separation between the two distributions of heights is noticeable.*	TMS removed variability from this standard.
7.SP.8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. 7.SP.8a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.	8.SP.B.4. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for	These three TSS have been collapsed into one and moved to grade 8 in the TMS.

7.SP.8b. Represent sample spaces for compound events using methods such as organized lists, tables, and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.	which the compound event occurs. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.	
7.SP.8c. Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?*		This TSS has no match in the TMS.
8.SP.4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?		Unmatched in the TMS. Two-way tables have been deemphasized in the TMS for grades 8–11, postponed until the fourth-year Statistics course.

Grades 9–11

The high schools standards offer many different perspectives we might consider when we think about focus. In the tables and narratives that follow we will:

- Indicate the standards intended for all students that are unique to either set.
- Indicate which TSS standards intended for all students exist beyond the first three years in the TMS.
- Indicate which TSS (+) standards are found in courses beyond grades 9–11.
- Indicate which TSS (+) standards are nowhere in the TMS.
- Indicate shifts in focus that occur within standards.
- Compare and highlight the differences between the scopes of the two sequences.

In some cases there are standards between the two sets that have no match. Consider the following TSS non-(+) standards that are missing from the TMS:

TSS	Comments
N.RN.3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.	This standard addresses closure for the set of rational numbers and opens the door to a discussion of closure for the set of real numbers. It is very conceptual. Deemphasis in this area makes it less likely that students will ponder these relationships, aside from the usual commutative, associative, and distributive properties. The concept of closure is fairly intuitive and will be referenced in an advanced course.
A.REI.5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.	This is a proof standard that relates to solving a system of two equations. The TMS include all of the standards that require students to solve systems so they should, intuitively, have this concept. However this standard is designed to help students understand how the procedure for solving a system works and would be particularly helpful when they work to solve systems of three equations in Algebra II.
G.GPE.2 Derive the equation of a parabola given a focus and directrix.	The only conic section the whole TMS (including Precalculus) recognize is the circle, while the TSS require equations for both circles and parabolas for all students. The TMS expect students to find the equation of a circle given a radius and the center (G.GPE.1) but do not address the parabola. The TSS add equations for ellipses and hyperbolas in the (+) standards, which is also not addressed anywhere in the TMS.
G.GMD.4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	This standard expects a visual understanding of cross-sections of 3-D figures and provides an opportunity for a hands-on experience that will allow all students to grasp this concept. This approach provides a visual connection to a later study of conic sections as well as a foundation for finding volume in integral calculus. (Note: This concept is deleted from grade 7 as well.)

These two TMS for Grades 9–11 have no TSS counterpart:

Draft TMS	Comments
F.TF.C.8a. Given a point on a circle centered at the origin, recognize and use the right triangle ratio definitions of sin θ, cos θ, and tan θ to evaluate the trigonometric functions.	There is no match in the TSS. See the Coherence section for further discussion.
F.TF.C.8c. Given the quadrant of the angle, use the identity tan θ = sin θ/cos θ to find sin θ, cos θ, or tan θ given sin θ or cos θ for commonly recognized angles	There is no match in the TSS. Note: TMS add an emphasis on “commonly recognized angles” at this level, which is addressed in the (+) TSS: F.TF.3. See the Coherence section for further discussion.

In some cases there are high school standards from the TSS intended for all students (not the (+) standards) that are matched only in courses beyond the Algebra and Integrated course sequences.

These standards represent expectations of TSS students during the first three years of high school but are not a part of the same in the TMS. The table provides the standard by code along with comments about what Tennessee standards currently would not include:

TSS	Comments
F.IF.3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by* $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ *for* $n \neq 1$.	This standard recognizes that sequences are functions that can be defined recursively. The TMS have eliminated the concept of recursive generation of sequences (see F.BF.2). However, the role of sequences as functions is not completely neglected, as F.LE.2 is included in the TMS verbatim. This standard is addressed in the fourth-year TMS Bridge Math and in Precalculus.
F.TF.5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.	This standard addresses modeling with trigonometric functions. The TMS have removed the concept of periodicity from the grades 9–11 standards. This one focuses on the graphic representation. Note that for F.IF.4, periodicity was deleted, and for F.IF.7e, the part addressing trigonometric functions was also deleted.
S.ID.5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. S.CP.4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.*	These non-(+) TSS are both addressed only in the TMS fourth-year Statistics course. They address relative frequencies and interpretation of two-way frequency tables. The TMS are consistent in eliminating two-way tables, which can be an important connection for students between statistics and probability. Frequency is addressed in grade 7 in the TMS but eliminated in the high school standards for grades 9–11. (Note: Two-way tables are deleted from the grade 7 and 8 statistics standards as well. For more information, see the grades 7–8 table in this section of the report.)
S.ID.6b. Informally assess the fit of a function by plotting and analyzing residuals.	This standard, requiring using residuals to informally fit a function to its data, is addressed in the fourth-year TMS Bridge Math and is extended to include regression equations in Precalculus.
S.IC.5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. S.IC.6. Evaluate reports based on data.	Both of these non-(+) TSS are addressed in the fourth-year Statistics course. The first requires the use of simulations to gather data and compare two treatments. The second expects that students can evaluate reports based on data. Both emphasize the importance of scrutiny in reading and interpreting data.

	It is important to note that S.IC.1 and S.ID.9 are both addressed in the TMS for grades 9–11, which support the concepts missing with the elimination of these standards.

This indicates, as we mentioned earlier in this report, that it will take at least five high school courses for a student to see all of the TSS non-(+) standards that the TMS address.

There are 55 (+) standards in the TSS. Two of them overlap somewhat with the grades 9–11 courses, G.SRT.11, requiring students to apply the Laws of Sines and Cosines, and F.TF.3, focusing on commonly recognized angles. Both are related to trigonometry and both have a partial alignment to the TSS:

TSS	Draft TMS	Comments
F.TF.3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π–*x*, π+*x*, and 2π–*x* in terms of their values for *x*, where *x* is any real number.	**AII(MIII).**F.TF.A.1b. Use the unit circle to find *sin* θ, *cos* θ, and *tan* θ when θ is a commonly recognized angle between 0 and 2π.	These TMS do not address the TSS (+) aspects of π–x, π+x, and 2π–x in terms of their values for x, where x is any real number. The TMS bring in part, but not all, of this TSS (+) standard. *This is the only match for this TSS requiring knowledge of special right triangles and their angles (30°, 45°, 60°, 90°). The TMS, in contrast, relate finding sine, cosine, and tangent of these "common" angles to the unit circle. (Note: The unit circle is not related to periodicity and trigonometric functions in the TMS.)*
G.SRT.11. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).	**G(MII).**G.SRT.C.8b. Recognize and use the Law of Sines and the Law of Cosines to solve triangles in applied problems.	This TSS (+) standard also appears again in TMS Precalculus where it is then addressed with exactly the same wording as in the TSS. In the TMS, understanding the laws comes after using them and only outside of the sequenced courses.

The following 47 TSS (+) standards can be found in fourth-year courses as indicated below:

TMS Course	TSS (+) Standards	Included Topics
Precalculus	N.CN.3, N.CN.4, N.CN.5, N.CN.6, N.CN.8, N.CN.9, N.VM.1-12, A.APR.7, F.IF.7d, F.BF.1c, F.BF.4bcd, F.BF.5, F.TF.4,6-7, F.TF.9, G.SRT.9-10, G.SRT.11	Complex numbers, vectors, matrices, the Binomial Theorem, Fundamental Theorem of Algebra, function composition, inverse functions, trigonometric functions, and prove Laws of Sines and Cosines.

Statistics	S.CP.8-9, S.MD.1-5, S.MD.7	Multiplication rule for compound events, permutations and combinations, and expected value.
Applied Math Concepts	S.MD.2, S.MD.5-7, S.CP.9	Expected value, probability distributions, outcomes and decisions, and permutations and combinations.
Bridge Math	F.IF.3	Sequences as functions.

And finally, these six TSS (+) standards are not addressed in any course in the TMS:

TSS (+) Standards not in the Draft TMS
A.APR.5. (+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.
A.REI.8. (+) Represent a system of linear equations as a single matrix equation in a vector variable.
A.REI.9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 X 3 or greater).
G.C.4. (+) Construct a tangent line from a point outside a given circle to the circle.
G.GPE.3 (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.
G.GMD.2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.

A change of wording in a standard, before adoption, can shift the focus or emphasis of the original TSS. In some cases the shift is minimal and in others, more consequential. The following table indicates examples of shifts in focus that occur within standards and provides some commentary on the differences:

TSS	Draft TMS	Difference
N.CN.2. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	**AII(MII).**N.CN.A.2. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers, and to divide complex numbers by numbers of the form *a* + *bi* where *a* = 0 and *b* is a non-zero real number.	The TMS add division of complex numbers.
A.SSE.3b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.	**AI(MII).**A.SSE.B.3b. Complete the square in a quadratic expression in the form $Ax^2 + Bx + C$ where A = 1 to reveal the maximum or minimum value of the function it defines.	TMS limit the leading coefficient to be equal to one. *This limitation reduces the rigor of the original TSS.*
A.SSE.4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve	**AII(MIII).**A.SSE.B.4. Recognize a finite geometric series (when the common ratio is not 1), and use the	TMS remove deriving the formula. *This change deemphasizes the conceptual understanding of the sum*

problems. *For example, calculate mortgage payments.*	sum formula to solve problems in context.	*formula that students are required to use.*
F.IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.	**AI(AII)(MI)(MII)(MIII).**F.IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.	Periodicity is missing in the TMS. This modeling standard is never applied to trigonometric functions in the TMS. *None of the uses of this standard in the TMS address the concept of periodicity. (Note: This TSS also has partial alignments in Precalculus course standards.)*
F.IF.7e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	**AII.**F.IF.C.7e. Graph exponential and logarithmic functions, showing intercepts and end behavior. **MIII.**F.IF.C.7d. Graph exponential and logarithmic functions, showing intercepts and end behavior.	Trigonometric functions are missing in this TMS. *In addition it is not clear why the MIII version has a different coding for the standard.*
F.BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.	**AII(MI).**F.BF.A.2. Write arithmetic and geometric sequences with an explicit formula and use them to model situations.	The recursive expectation is removed from the TMS.
G.C.5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.	**G(MIII).**G.C.B.5. Find the area of a sector of a circle in a real world context.	The TMS remove arc length and derivation of the area of a sector. Arc length is not included in the 9–11 TMS. *This TMS is in the cluster titled, "Find arc lengths and areas of sectors of circles." Arc length would be assumed but it is not specifically addressed in the TMS until Precalculus.*
S.ID.1. Represent data with plots on the real number line (dot plots, histograms, and box plots).	**AI(MI).**S.ID.A.1 Represent single or multiple data sets with dot plots, histograms, stem plots, and box plots.	The TMS added stem plots. *This change has little consequence in the TMS.*

The differences between the grades 9–11 sequences are somewhat discrete and usually minor, with a few exceptions. In many cases the difference between the sequences is that a concept is split over a different time span, two versus three years or one versus two. Most of these issues are explained in the Scope and Clarifications. Nearly all of the more significant gaps between the two sequences deal with algebra and functions. Some differences (as shown below) are significant and should be revisited.

- **A.SSE.B.3c:** This standard is addressed in Algebra I and II but only shows up in the Integrated sequence in Math I. This would not allow for rational exponents in the Integrated sequence. These two sequences will have different overall expectations of scope for this same standard, with the lower expectation in the Integrated sequence.
- **A.CED.A.2 and A.CED.A.4:** The difference in the treatment of these in the two sequences is considerable, in that this standard is specifically addressed only in the first year of the Traditional sequence and in all three years of the Integrated. Given the types of functions covered in the courses in the different years, the Traditional students will likely experience a lower expectation for these standards.
- **A.REI.B.4b:** Even though Math II addresses knowledge of, and operations with, the *a + bi* form for complex numbers (N.CN.A.1 and N.CN.A.2), the TMS requirement for the Integrated sequence has deleted the last part of the standard requiring students to write complex solutions to quadratic equations in *a + bi* form. The Algebra II version of the standard maintained the requirement that solutions be written in *a + bi* form. The Integrated sequence has a lower expectation.
- **A.REI.C.6:** While Algebra I and Math I are limited to two equations with two unknowns, the scope in Algebra II includes three equations with three unknowns. There is no requirement in the TMS Integrated sequence to match the Algebra II requirement. With no expectation to address this standard in other Integrated courses, the scope indicates a lower expectation for that sequence.
- **F.IF.C.7a:** This TMS is addressed only in Algebra I in the Traditional sequence but is addressed with identical scope in all three of the Integrated courses. It is made clear in the Scope and Clarifications that Math I will address linear and Math II will address quadratic graphs. It is not clear how this standard would be addressed differently in Math III, where there are no limits.
- **F.IF.C.7b:** This TMS requires knowledge of functions that go beyond the scope of Algebra I (square root, cube root, piecewise, step, and absolute value). The Scope and Clarifications state that there are no limits in Algebra I. However, for Algebra I students these functions would be considered "more complicated cases" and would be graphed using technology. This means that the Traditional sequence may not match the Integrated for this standard. The application of this standard in Math II and III would exceed the rigor in Algebra I, since those students in Math III, for example, would have had experiences with these functions and would be required to graph without technology.
- **S.ID.B.6:** The TMS address this standard in Algebra I and II and in all three of the Integrated sequence courses. The Scope and Clarifications for Math III specifically require polynomial and logarithmic functions for this standard, which are not required in the Scope and Clarifications for the Traditional sequence. The Traditional courses have a lower expectation here.

Specificity

Quality standards are precise and provide sufficient detail to convey the level of performance expected without being overly prescriptive. Those that maintain a relatively consistent level of precision are easier to understand and use. Those that are overly broad or vague leave too much open to interpretation, while atomistic standards encourage a checklist approach to teaching and learning.

On the whole, the draft TMS are specific according to the Achieve criteria. In some cases the TMS combine TSS standards into a single standard; in other cases they split one TSS into separate TMS standards. Neither of these actions greatly impacts the overall specificity of the standards.

For an example of multiple TSS being collapsed into one, consider TMS 5.NBT.A.3:

TSS	Draft TMS
5.NBT.3. Read, write, and compare decimals to thousandths. 5.NBT.3b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	5.NBT.A.3. Read and write decimals to thousandths using standard form, word form, and expanded form (e.g., the expanded form of 347.392 is written as 3 x 100 + 4 x 10 + 7 x 1 + 3 x (1/10) + 9 x (1/100) + 2 x (1/1000)). Compare two decimals to thousandths based on meanings of the digits in each place and use the symbols >, =, and < to show the relationship.

There are also instances when the TMS split a TSS standard into multiple standards, such as in 7.EE.B.3:

TSS	Draft TMS
7.EE.3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.	7.EE.B.3. Solve multi-step real-world and mathematical problems posed with positive and negative rational numbers presented in any form (whole numbers, fractions, and decimals). 7.EE.B.3a. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate. 7.EE.B.3b. Assess the reasonableness of answers using mental computation and estimation strategies.

There are numerous instances where the TMS turn a TSS example into an expected part of the standard itself. This creates a further level of specificity, as what the TSS intend as an illustration becomes a required expectation. This may become too prescriptive, and we recommend following up on the difference. Consider the following example that appears to change the TSS intention to be more prescriptive:

TSS Grade 4	Draft TMS Grade 4
TSS 4.NF.3c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.	4.NF.B.3c. Add and subtract mixed numbers with like denominators by replacing each mixed number with an equivalent fraction and/or by using properties of operations and the relationship between addition and subtraction.

There are also instances of repeated standards in the Integrated sequence. For example, F.IF.C.7b and F.IF.C.7c are repeated in Integrated II and Integrated III with exactly the same scope.

Clarity/Accessibility

High-quality standards are clearly written and presented in an error-free, legible, easy-to-use format that is accessible to the general public. By this definition, **the TMS are generally clear and accessible.** There are, however, a few potential issues to consider. It is evident that the writers of the draft TMS have carefully considered the wording of the standards and have subsequently rephrased many TSS standards in an effort to add clarity. Consider the example below:

TSS Grade 1	Draft TMS Grade 1
TSS 1.G.1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.	1.G.A.1. Distinguish between attributes that define a shape (e.g., number of sides and vertices) versus attributes that do not define the shape (e.g., color, orientation, overall size); build and draw two-dimensional shapes to possess defining attributes.

At some points in the TMS, rewording makes the standards less precise, such as in the case of 2.G.1 where a limitation is added in the TMS version that clouds the clarity of the expectation. Also consider 6.EE.5, where “Understand solving an equation or inequality as a process of answering a question…” is replaced with “Understand solving an equation or inequality using substitution….” The new rephrasing subtly shifts the focus from understanding what it generally means to solve an equation to focusing only on using substitution as a way of understanding. Both examples can be seen below:

TSS Standard	Draft TMS	Issue
2.G.1. Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.	2.G.A.1. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes. Draw two-dimensional shapes having specified attributes, such as a given number of angles or a given number of sides of equal length (as determined directly or visually, not by measuring).	The limitation offered in this TMS is not clear. How would one "measure" the given number of angles or sides? If this limitation is related to the requirement to "draw" the shapes, which comes earlier in the sentence, that should be made clear.

6.EE.5. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	6.EE.B.5. Understand solving an equation or inequality using substitution to determine whether a given number in a specified set makes an equation or inequality true.	By removing the red section, the understanding of solving becomes connected to a focus on substitution.

On at least one occasion the rewording creates a progression issue:

TSS Standard	Draft TMS	Issue
6.G.3. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.	6.G.A.3. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side that joins two vertices. Apply these techniques in the context of solving real-world and mathematical problems.	By removing the requirement of same coordinates (as in the TSS), this problem allows for non-horizontal or vertical segments. Solving these kinds of problems requires methods that are beyond grade 6.

In an effort to improve clarity, the TMS have added or modified numerous examples throughout. This can be helpful, but should also be done with care, as examples can become a primary way to interpret a standard. There are numerous issues of clarity with the new and modified examples. Here are some to consider:

Draft TMS Standard	Issue
6.EE.A.4. Identify when expressions are equivalent (i.e., when the expressions name the same number regardless of which value is substituted into them). *For example, the expression 5b + 3b = (5 +3) b = 8b.*	The TMS example is not an expression.
6.EE.C.9. Use variables to represent two quantities in a real-world problem that change in relationship to one another. *For example, Susan has $1 in her savings account. She is going to save $4 each week. How much will she save weekly?*	The question "She is going to save $4 each week. How much will she save weekly?" is trivial and does not address the standard.
7.EE.A.2. Understand that rewriting an expression in different forms in a problem context can provide multiple ways of interpreting the problem and how the quantities in it are related. *For example, students understand that a 20 percent discount is the same as finding 80 percent of the cost (.80c).*	The standard is about different forms of an expression. The example is not.
3.NF.A.2b. Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number on the number line. *For example, 5/3 is the quantity you get when*	The new example does not address locating the fraction on the number line.

combining 5 parts together when the whole is divided into 3 equal parts.	
4.OA.A.2. Multiply or divide to solve contextual problems involving multiplicative comparison and distinguish multiplicative comparison from additive comparison. *For example, school A has 300 students and school B has 600 students: school B has two times as many students is multiplicative comparison; school B has 300 more students is additive comparison. (See Table for Addition and Subtraction Problem Types and Multiplication and Division Problem Types.)*	This example might be clearer as "For example, school A has 300 students and school B has 600 students: to say that school B has two times as many students is an example of a multiplicative comparison; to say that school B has 300 more students is an example of additive comparison."
5.NF.B.4a. Interpret the product a/b x q as a x (q ÷ b) (partition the quantity q into b equal parts and then multiply by a). Interpret the product a/b x q as (a x q) ÷ b (multiply a times the quantity q and then partition the product into b equal parts). *For example, use a visual fraction model or write a story context to show that 3/4 x 16 can be interpreted as 3 x (16 ÷ 4) or (3 x 16) ÷ 4. Do the same with 2/3 x 4/5 = 8/15. (In general, a/b x c/d = ac/bd.)*	The example in this question could be clearer. Consider the phrasing in the Progressions for the TSS for Mathematics: Number and Operations – Fractions, 3-5 (p.19)[1] $\frac{1}{3} \times 5$ is one part when 5 is partitioned into 3 parts, so $\frac{4}{3} \times 5$ is 4 parts when 5 is partitioned into 3 parts.
5.NF.B.5a. Compare the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. *For example, the product of 1/2 and 1/4 will be smaller than each of the factors.* 5.NF.B.5b. Explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relate the principle of fraction equivalence a/b = (n x a)/(n x b) to the effect of multiplying a/b by 1.	TSS 5.NF.5 is split into three separate TMS standards. This new example for 5.NF.B.5a blurs the distinction between it and 5.NF.B.5b.

Similarly, some of the elements in the high school Scope and Clarifications lack precision:

TMS Standard	TMS Scope and Clarifications	Issue
Ai(AII)(MII).F.IF.C.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions.	For example, identify rate of change in functions such as $y = 2^x$, $y = (1/2)^x$, $y = 2^{-x}$, $y = (1/2)^{-x}$. (Algebra II, p.113).	The connection here to rate of change is unclear. Is the intention percent rate of change?

[1] Available at http://math.arizona.edu/~ime/progressions/.

AI(AII)(MI).F.LE.B.5. Interpret the parameters in a linear or exponential function in terms of a context.	For example, the equation y = 5000 $(1.06)^x$ models the rising population of a city with 5000 residents when the annual growth rate is 6 percent. What will be the effect on the equation if the city's population is 7,000 instead of 8,000? (Algebra II, p. 115)	Is the intention here to ask about changes to the initial population?
AI(AII)(MII).A.REI.B.4. Solve quadratic equations and inequalities in one variable. a. Use the method of completing the square to rewrite any quadratic equation in *x* into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, applying the quadratic formula, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions.	Note: Solving a quadratic equation by factoring relies on the connection between zeros and factors of polynomials (cluster A-APR.B). Cluster A-APR.B is formally assessed in Algebra II. (Algebra I, p.100)	This is unclear. Should students be expected to solve quadratics by factoring in Algebra I? Also, note that this standard includes "inequalities," but only does so in the Algebra I version of the standard. This should be revisited.

Other issues of clarity that should be addressed include:

- There are standards in the TMS that are used multiple times across the course sequences that unnecessarily include slightly different wordings. For example, consider the version of A.CED.A.1 addressed in Algebra I, Math I, and Math II compared to the version of the same standard in Algebra II and Math III. All courses could use the same standard, with the differences pointed out in the Scope and Clarifications. This example, and others, should be revisited.
- Although this review does not include a review of content in the fourth-year courses, we noticed that there are often very different standards with the same standard identifier. For example, there are at least three versions of S.ID.A.1. One version is shared between the Traditional and Integrated course sequences. The other two versions are different from that, and different from each other, and are found in Bridge Math and Statistics.
- The precision and modeling practices are listed as MP.6 and MP.4 in one part of the document and reversed in another. This is also the case with MP.5 and MP.7, which are exchanged in the same way. The coding should consistently be applied across the TMS document.

- In the high school Geometry standards there are occasions where the TSS requirement to "prove" a theorem is changed to "recognize" or "identify." An example of this was mentioned earlier in G.SRT.11, where "understand and apply" was changed to "recognize and use." In this case it is not clear what it actually *means* to "recognize" the Laws of Sines and Cosines. The meaning should be made clear or the wording changed.

These issues could be readily addressed in the next draft of the TMS.

Measurability

Standards should focus on results rather than the processes of teaching and learning. They should make use of performance verbs that call for students to demonstrate knowledge and skills, with each standard being measurable, observable, or verifiable in some way.

The K–8 TMS reflect a comparable level of measurability to that of the TSS. The high school standards, having been aligned to two course sequences for the first three years, helpfully provided the Scope and Clarifications for those standards that cut across courses. With a few corrections, those additional supports will help clarify the measurability of the standards.

Summary

The math standards work group has clearly done a great deal of work to thoughtfully produce a highly rigorous set of standards. In grades K–8, the alignment to college- and career-ready expectations and research is very strong. The one key exception for focus is in the handling of Statistics in grades 6–8. Regarding clarity, there are specific standards that would benefit from wording changes. We hope that this detailed report and the information in the accompanying chart will help to this end.

For high school, there is a strong overlap with the overall set of high school college- and career-ready standards, including alignment with the expectations set by Tennessee's current standards. With respect to standards expected for all students, the TMS for grades 9–11 lack a few of the conceptual standards. There are a few topics that are simply not found in the TMS, such as the cross-sections of three-dimensional figures and deriving the equation of a parabola using the focus and directrix. Additionally, Tennessee students will have to take the fourth-year Statistics course to learn some of the content expected of all students under Tennessee's current standards. Similarly, students will have to take the fourth-year Precalculus course to work with periodicity and model with trigonometry, also expected of all students under Tennessee's current standards. By selecting just one fourth-year course, Tennessee students will miss out on a few of the standards that are considered important to prepare all students for postsecondary education and careers.

The specific wording of some of the high school standards in the TMS (such as from "prove" to "use") sets a lower expectation than benchmark college- and career-ready standards. Additionally, while this review identified other issues of concern with respect to coherence, focus, specificity, and clarity, they can, for the most part, be readily addressed.

There are a few notable differences between the expectations of the Traditional and Integrated sequences in the high school TMS for grades 9–11. Details are provided in the Focus section of this report and should also be addressed.

This review of the high school TMS indicates some issues of consistency with both the coding of standards across all courses and the expectations between the two grade 9–11 sequences within the TMS. Resolving these issues will provide clear guidance to Tennessee educators to inform their decisions about instructional materials and the best ways to prepare students. They will also be able to share and gain insights with educators using comparably rigorous standards in other states across the country.

Key Recommendations for Tennessee's Draft Mathematics Standards

The draft TMS are generally rigorous, coherent, and focused. This finding is especially true for grades K–8, with only a few exceptions, which are detailed in this report and in the accompanying alignment chart. To ensure the final TMS reflect the highest levels of rigor for educational standards, the Standards Review Committee may consider the following recommendations.

1. **This analysis has uncovered a few noteworthy gaps in content alignment between the TMS and the TSS. Consider the implications of these gaps and whether they require further scrutiny.**

Gaps in the alignment between the TSS and the current draft TMS may result in breaks in coherent progressions or a shortage of focus or rigor in the TMS. The accompanying side-by-side chart identifies all gaps in the alignment between the TMS and the TSS by highlighting in yellow any cell containing a standard that has no full or partial match. To identify TMS standards that partially align with the TSS, the cell is highlighted in grey. Red font is used to draw attention to differences in the two standards and/or words or phrases that are referenced in the commentary. In the K–8 alignments, there are very few yellow-highlighted cells. In K–8 we found only three TMS that have no TSS counterpart (all three are found in grades K–3). These add specific TMS expectations related to the use of money in kindergarten and grade 1 and to the attributes of polygons in grade 3. There are about 20 TMS in grades K–5 with partial alignment and an additional seven in grades 6–8. Those can be found with an explanation for each in the accompanying chart.

For the TSS in grades K–8, there are six standards that have no TMS counterparts. Those standards include one in grade 1 and the remaining five in Geometry and Statistics and Probability for grades 7–8. In addition to these there are several TMS K–8 standards that have a partial alignment to the TSS. In some cases the difference is negligible but in others there is a significant difference that affects rigor, coherence, or focus. For example, consider this grade 1 alignment:

TSS	TMS
1.NBT.4. Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.	1.NBT.C.4. Add a two-digit number to a one-digit number and a two-digit number to a multiple of ten (within 100) using concrete models, drawings, strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

The TMS counterpart is a match with the first part of the TSS but eliminates the conceptual requirements "relate … and explain" and "understand." This amounts to a sizeable reduction in rigor when compared to the TSS.

For high school standards, we have to consider both the standards for all students as well as the subset of the TSS that are designated for students who plan to study or work in math-related fields (the (+) standards). When we compare the TSS high school standards intended for all students (the non-(+) standards) with the TMS for grades 9–11 (Algebra I-Algebra II-Geometry, or Math I-Math II-Math III), we find that the topics of 11 TSS high school standards are not found in the skills and understandings of the Traditional or the Integrated sequences.

When we consider the full set of TSS high school standards, including the (+) standards, we find that the **fourth-year courses include nearly all of the TSS topics. However, there is no single fourth-year course that addresses all of the missing TSS topics intended for all students in the TMS for grades 9–11.**

2. **There are frequent instances where the TMS have adopted, but slightly modified, a standard from the TSS and in doing so have lowered the level of rigor, coherence, or clarity of the standard, particularly in high school. Consideration should be given to the consequences of these changes in wording.**

There are several instances in the high school TMS where there are slight changes in wording as compared to the TSS. In many cases those changes do not significantly change the focus or rigor of the TSS counterpart. For example consider this TMS, which is used in five of the six sequenced courses and also addressed (verbatim) in the Bridge Math course:

TSS	Draft TMS Sequence Courses	TMS Bridge Math
N.Q.2. Define appropriate quantities for the purpose of descriptive modeling.	**AI (AII)(M1)(MII)(MII).**N.Q.A.2. Identify, interpret, and justify appropriate quantities for the purpose of descriptive modeling.	N.Q.A.2. Define appropriate quantities for the purpose of descriptive modeling.

In some instances, however, a minor change in wording carries more significant ramifications. Consider the following comparison where the TMS changed the expectation from “prove … and use …” to just “use” polynomial identities:

TSS	Draft TMS Sequence Courses
A.APR.4. Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity (x^2 + y^2)^2 = (x^2 – y^2)^2 + (2xy)^2 can be used to generate Pythagorean triples*.	**AII (MIII).**A.APR.C.4. Use polynomial identities to describe numerical relationships.

Note: A different example than this one is provided in the Scope and Clarifications for Algebra II.

Unfortunately, at the high school level, changes like this one often reduce the rigor of the intentions of the TSS. This TMS eliminates the need to prove the polynomial identities students are asked to use, taking the underlying belief that they are true (i.e., a foundational understanding of the truth of those identities) out of the picture.

We provide many more comments in the accompanying chart to highlight these differences in wording and also to reference new, or modified, examples or elements of the section of the high school standards. We hope these comments can be used to identify differences that might be problematic for users of the TMS.

3. **This report and the accompanying alignment chart point out a few breaks in the coherence of mathematical progressions in the TMS standards. Examine the indicated progressions and consider strengthening connections.**

For example, transformations are taught in grade 8 (see TMS 8.G.2) but are not connected to similarity and congruence (see TSS 8.G.2 and 8.G.4). In addition, there are instances where the connections between cluster headings and the standards that follow are fragile.

Another type of coherence issue (using a procedure before understanding it) can be found in a high school example where the Laws of Sines and Cosines are addressed in Geometry and Math II and then in Precalculus. In the TMS, students are asked to "recognize and use" in grades 9–11 and then to "prove and use" and "understand and apply" the laws in the fourth-year course. This means that understanding the laws is not required until the Precalculus course, for those who take it, which is about two years after students have used them.

These kinds of gaps in the coherence of the standards may cause confusion and inhibit student understanding. More details about gaps in coherence can be found in the Coherence section of this report, as well as in the comment column of the accompanying chart.

4. **There are some slightly different expectations between the Traditional and Integrated sequences. Consider all inconsistencies between the two high school sequences. Review the course standards and the Scope and Clarifications sections for each to make sure they are consistent.**

Creating the limits and examples for two parallel pathways for grades 9–11 is noteworthy and helpful, but as we compared the two sequences with the TSS, we found some inconsistencies between them. Some examples are outlined in this report. We recommend that Tennessee continue to examine the TMS for other inconsistent treatment of the standards across the two sequences.

5. **There are issues with the coding of standards in the TMS. Revise the codes used for standards where indicated in this report and the accompanying alignment chart.**

In examining the TMS, we found the same coding schema is used for standards in multiple courses and levels. Sometimes they are for the same or related standards and sometimes not. Consider, for example, the use of the code, N.RN.1, for standards for grades 9–11 and also in Bridge Math:

TMS Algebra II	TMS Math II	Bridge Math
AII.N.RN.A.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.	**MII.**N.RN.A.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.	N.RN.A.1. Use rational and irrational numbers in calculations and in real-world context.

In this example the standards have the same code and, even though they are not exactly the same, are related.

In some cases, the same code is used for different standards in different courses with no clear relationship between those standards. For example, consider N.Q.A.3:

TMS Algebra I	TMS Math I	Bridge Math
AI.N.Q.A.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	**MI.**N.Q.A.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	N.Q.A.3. Solve problems involving evaluation of exponential functions, for example applications involving simple and compound interest.

The same code is used in Bridge Math, but that standard does not align with those of the same code in the sequenced courses. This may become confusing during discussion of the standards among mathematics teams and may be particularly troublesome for high school teachers who happen to teach both sequence courses and Bridge Math.

There are also instances where the codes have been changed without an apparent reason. For example, in grade 8 Geometry, we found TMS labeled as 8.G.A.1, 8.G.A.2, 8.G.A.4, 8.G.B.6, 8.G.B.7, 8.G.B.8, and 8.G.B.9. There are no standards labeled with 8.G.A.3 or 8.G.A.5. Yet in the alignment we found that TMS 8.G.A.2 and 8.G.A.4 were exact matches for TSS 8.G.3 and 8.G.5, respectively:

TSS	Draft TMS
8.G.3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	8.G.A.2. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
8.G.5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*	8.G.A.4. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*

In TMS Algebra II F.IF.C.7e is a partial match with the TSS, F.IF.7e. However, the same standard is called F.IF.C.7d in Math III. The actual TSS F.IF.7d does not show up in the TMS for grades 9–11. See the chart below:

TSS	Draft TMS Algebra II	Draft TMS Math III
F.IF.7e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	**AII.**F.IF.C.7e. Graph exponential and logarithmic functions, showing intercepts and end behavior.	**MIII.**F.IF.C.7d. Graph exponential and logarithmic functions, showing intercepts and end behavior.

Another coding issue is in the treatment of the Standards for Mathematical Practice. On pages 9–12, the numbering and codes are different from all other places in the TMS.

A consequence of this seemingly inadvertent mismatch of the codes will lead to confusion when teachers have discussions about the standards with colleagues outside of Tennessee or when Tennessee teachers search beyond Tennessee for resources based on the codes for the standards.

Appendix: The Criteria Used for the Evaluation of College- and Career-Ready Standards in English Language Arts and Mathematics

Criteria	Description
Rigor: What is the intellectual demand of the standards?	Rigor is the quintessential hallmark of exemplary standards. It is the measure of how closely a set of standards represents the content and cognitive demand necessary for students to succeed in credit-bearing college courses without remediation and in entry-level, quality, high-growth jobs. For Achieve's purposes, the Common Core State Standards represent the appropriate threshold of rigor.
Coherence: Do the standards convey a unified vision of the discipline, do they establish connections among the major areas of study, and do they show a meaningful progression of content across the grades?	The way in which a state's college- and career-ready standards are categorized and broken out into supporting strands should reflect a coherent structure of the discipline and/or reveal significant relationships among the strands and how the study of one complements the study of another. If college- and career-ready standards suggest a progression, that progression should be meaningful and appropriate across the grades or grade spans.
Focus: Have choices been made about what is most important for students to learn, and is the amount of content manageable?	High-quality standards establish priorities about the concepts and skills that should be acquired by graduation from high school. Choices should be based on the knowledge and skills essential for students to succeed in postsecondary education and the world of work. For example, in mathematics, choices should exhibit an appropriate balance of conceptual understanding, procedural knowledge, and problem-solving skills, with an emphasis on application. In English language arts, standards should reflect an appropriate balance between literature and other important areas, such as informational text, oral communication, logic, and research. A sharpened focus also helps ensure that the cumulative knowledge and skills that students are expected to learn are manageable.
Specificity: Are the standards specific enough to convey the level of performance expected of students?	Quality standards are precise and provide sufficient detail to convey the level of performance expected without being overly prescriptive. Standards that maintain a relatively consistent level of precision ("grain size") are easier to understand and use. Those standards that are overly broad or vague leave too much open to interpretation, increasing the likelihood that students will be held to different levels of performance, while atomistic standards encourage a checklist approach to teaching and learning that undermines students' overall understanding of the discipline. Also, standards that contain multiple expectations may be hard to translate into specific performances.
Clarity/Accessibility: Are the standards clearly written and presented in an error-free, legible, easy-to-use format that is accessible to the general public?	Clarity requires more than just plain and jargon-free prose that is also free of errors. College- and career-ready standards also must be communicated in language that can gain widespread acceptance not only from postsecondary faculty but also from employers, teachers, parents, school boards, legislators, and others who have a stake in schooling. A straightforward, functional format facilitates user access.
Measurability: Is each standard measurable, observable, or verifiable in some way?	In general, standards should focus on results rather than the processes of teaching and learning. College- and career-ready standards should make use of performance verbs that call for students to demonstrate knowledge and skills and should avoid using those verbs that refer to learning activities — such as "examine," "investigate," and "explore" — or to cognitive processes, such as "appreciate."

Attachment 5 - North Carolina Standards Review Commission Memo

Newly Proposed NC Math Standards Are Not So New, NPR

North Carolina Committee Stuns State, Fails To Suggest Common Core Replacement, Daily Caller

Legislatively Required Standards Review Process in Other States:

Indiana (2013)

State revoked adoption of Common Core in 2013, and initiated a standards revision process. The state education agency was charged with rewriting the standards. Agency staff referred both to Indiana's previous standards and the Common Core for guidance. They produced two draft iterations that were both available online for public comment and for which they sought external independent reviews. They received approximately 2,000 public comments; external reviews were sought from:

- The Fordham Institute: Indiana team self reported that they found this review unhelpful in their revision efforts.
- Terrence Moore (anti-CCSS advocate): unserious effort, with no recognition of actual learning needs of students.
- Sandra Stotsky (ELA standards writer, anti-CCSS advocate): refused to provide feedback, demagogued process.
- James Milgram (Math standards writer, anti-CCSS advocate): provided thoughtful feedback, IN standards writers determined not to incorporate recommendations.
- Achieve: provided actionable recommendations for incorporation into final draft on both ELA and math standards

Final draft approved for use in 2014-15 school year. Aftermath of process is that Governor Pence and legislature have peace of mind that they conducted an Indiana-specific process. Nevertheless, there continues to be Tea Party sniping that the Indiana standards "contain too much Common Core," the threat of more legislation and the state education agency estimates that the revision, retraining of teachers and development of new Indiana-specific assessments has a fiscal impact of $65 million.

Missouri (2014)

Legislation passed in 2014 calls for the establishment of a standards revision process, leaving the CCSS in place during the review. Working groups in both mathematics and ELA were seated last week. Working groups consist of Missouri educators, higher education representatives, employers, content experts and state education agency officials. So far, process has proven unwieldy with multiple working groups each consisting of over a dozen members, and without requisite funding or guidance to conduct work.

Oklahoma (2014)

Legislation passed in 2014 revoked the Common Core immediately, reverting to Oklahoma's 2007 standards until new standards could be developed for the 2016-17 school year. Parents, teachers and State Board of Education members subsequently, unsuccessfully sued the state to reverse the legislation; Oklahoma lost its NCLB waiver for not being able to demonstrate that its 2007 standards met US ED requirements that they are college and career ready (Oklahoma higher education system would not certify the 2007 standards); have a number of local school districts that are continuing with implementation of the Common Core; and do not have a state assessment in place for 2014-15 school year (CTB/McGraw Hill withdrew from contract and no new vendors have expressed interest in delivering assessment.)

South Carolina (2014)

Legislation passed in 2014 calls for the establishment of a standards revision process leaving the CCSS in place during the review. Process will be led out of state education agency, actual work still to be determined.

Other State Review Processes:

Kentucky (2014)

In 2014, the state education agency in partnership with community-based organizations launches **Kentucky Core Academic Standards Challenge**. The effort seeks to increase awareness and understanding of the Kentucky Core Academic Standards in English/language arts and mathematics and to solicit actionable feedback, with evidence, on the standards as part of the Kentucky Department of Education's regular review process of academic standards. The process is web-based (http://kentucky.statestandards.org) and open to all to provide feedback, results will be released in April 2015, and vetted by Kentucky educators to provide recommendations to the State Board of Education.

Attachment 6 - The Colorado standards

Colorado adopted the Common Core State Standards in 2010 and those remain Colorado's standards for English Language Arts and math. However, Colorado has recently gathered feedback on its social studies standards and provides this video tutorial on the standards feedback system it uses for review of any of its standards.

In addition, Colorado surveyed stakeholders for overall awareness of and opinion on its whole system of standards. Here is the Colorado Academic Standards Stakeholder Survey - not part of a standards review process.

Attachment 7 - Oklahoma's rewrite

Oklahoma's rewrite is widely acknowledged to have been a failure. Here is some of the feedback they got:

Drafting Oklahoma Standards, Oklahoma DOE page showing every step of the process.

A State Is Finally Killing Common Core, But Nobody Seems Happy About It, The Daily Caller

Repealing Common Core Means Nothing If Oklahoma's New Academic Standards Are Not Better than Common Core, Reclaim Oklahoma Parent Empowerment

Expert's critique of OK education standards is worth noting, The Oklahoman Editorial Board about Sandra Stotsky's review.

A Review of the Oklahoma January 2016 English Language Arts and Mathematics Academic Standards, Achieve (As North Carolina memo says, Att. 5, Indiana said that Achieve was the only reviewer of their standards to provide actionable recommendations.)

A Side-by-Side Analysis of the Oklahoma Academic Standards for Mathematics (Third Draft, March, 2016) with the Common Core State Standards for Mathematics, Achieve