



Achieve, Inc.

Measuring Up

A Report on
Education Standards and
Assessments for

INDIANA

ACHIEVE'S
BENCHMARKING
INITIATIVE



About Achieve, Inc.

Achieve is an independent, bipartisan, nonprofit organization created by governors and corporate leaders to help states and the private sector raise standards and performance in America's schools. Achieve was founded at the 1996 National Education Summit and subsequently sponsored another Summit in the fall of 1999 that brought together over 100 governors, business leaders and education officials from around the nation.

Achieve helps states raise academic standards, measure performance against those standards, establish clear accountability for results and strengthen public confidence in our education system. To do this, we:

- provide sustained public leadership and advocacy for the movement to raise standards and improve student performance;
- help states benchmark their standards, assessments and accountability systems against the best in the country and the world;
- build partnerships that allow states to work together to improve teaching and learning and raise student achievement; and
- serve as a national clearinghouse on education standards and school reform.

MEASURING UP

An Achieve Standards and Assessments
Benchmarking Report for

INDIANA

Prepared by Achieve, Inc. for

Governor Frank O'Bannon
State of Indiana

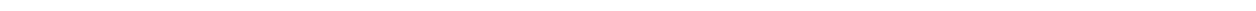
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EXECUTIVE SUMMARY

Achieve, Inc. was created in 1996 by governors and business leaders to serve as a clearinghouse and resource center on education standards, assessment and accountability. As part of its mission, Achieve provides states with candid feedback on the quality of their academic standards and assessments. At the request of the governor, state superintendent of education and commissioner for higher education, Achieve conducted such an evaluation for the state of Indiana over the summer and fall of 1999.

This report presents the results of Achieve's in-depth evaluation of the quality, rigor and alignment of Indiana's standards and assessments in English language arts (English) and mathematics. In particular, it provides Indiana policymakers with answers to the following questions:

- How do Indiana's education standards compare with those of high-performing states and nations? Are the expectations for Indiana's students and schools high enough?
- How well do Indiana's assessments measure the knowledge and skills laid out in the standards?

RESULTS FOR INDIANA

- ✓ Achieve's benchmarking evaluation found that Indiana's restated standards show significant strengths, including grade-by-grade specificity and use of jargon-free language. At this stage, the state appears to have achieved the goal of making the English and mathematics standards documents more useful to teachers, students, parents and other members of the school community at every grade level. By setting specific academic goals at each grade level, rather than in clusters of grades, the standards clarify what students are expected to learn each year, providing much-needed guidance to educators. And by replacing unnecessary educational jargon with plain-English terms, the state has made the standards easier for parents and students to understand and use.
- ✓ Achieve's review found that Indiana's standards are less rigorous than the benchmark standards from other states and nations — notably Arizona, California, North Carolina, Texas, Massachusetts and Japan. The standards' low level of rigor is caused in large part by the repetition of content across and within grades, so expectations for students do not grow sufficiently over time. In addition, the standards tend to underestimate what students can do at key grade levels and leave out some important subject matter.
- ✓ Achieve's review found that the Indiana Statewide Testing for Educational Progress (ISTEP+) exams in English and mathematics for grades 3, 8 and 10 measure important content and skills that are found in the standards. The state can feel confident that nearly everything covered on the tests can be found in the standards. Schools and students who have used the standards to guide curriculum and instruction should not be surprised by material on the tests.
- ✓ Achieve found that Indiana's assessments are not as challenging as they could be and do not measure the full breadth of the standards. Achieve's review found that, in general, Indiana's assessments are not sufficiently rigorous, largely because the standards the tests measure are not as rigorous as those of the benchmark states and nations. However, the tests sometimes exacerbate this

problem by placing even lower demands on students than the standards call for. In addition, the tests do not measure all of the standards evenly. Some standards are assessed too much, while others are underassessed.

RECOMMENDATIONS FOR MOVING FORWARD

Given Indiana's unique cross-sector support for higher standards and the state's willingness to critically examine its education standards and assessments, we recommend that policymakers continue to assist educators and the public in understanding and implementing world-class standards. In particular, we recommend that the following steps be taken:

- ✓ Revise the academic standards to provide more clarity and coherence, reducing repetition across and within grades.
- ✓ Increase the level of rigor throughout the standards, paying special attention to early literacy, algebra and geometry.
- ✓ Once the new standards are adopted, revise the assessments to ensure that they measure the full range of the standards and that they are sufficiently challenging.

INTRODUCTION

Since the 1996 National Education Summit, 49 states have developed academic standards for their students and have begun to put in place assessments to measure those standards. States have made substantial investments in the new standards and tests, and many states are beginning to hold students and schools accountable for performance, so policymakers and the broader public want to know how their standards compare with those of other states and countries.

At the 1999 National Education Summit, the nation's governors, leading corporate executives and state education officials endorsed plans to advance these efforts further. Because state decisionmakers, taxpayers, parents and others need to know how well their state's standards compare with those of other states and whether their students meet those standards, Summit participants this year identified strengthening standards, assessment and accountability systems as a key priority for school reform. This work is already under way.

Achieve, Inc. was created by governors and business leaders in 1996 to help states ensure that their standards compare favorably with the academic expectations of other states and high-performing nations and that their assessments accurately measure student achievement against those standards. An independent, bipartisan, nonprofit organization overseen by a Board of Directors composed of governors and corporate CEOs, Achieve serves as a clearinghouse and resource center on education standards, testing and accountability, working primarily with states to support their work in these areas.

BENCHMARKING TO THE BEST

One of the services Achieve provides to states is *standards and assessment benchmarking*: comparing a state's academic expectations with the best available models from the United States and the world. States that have sought benchmarking services from Achieve — like Indiana — are committed to raising standards for student performance and holding schools accountable for performance. They want to assure their citizens that the standards the state has set for students compare favorably with the expectations of other states and nations, particularly those countries whose educational performance exceeds that of the United States. They also want to know whether the tests they use to assess student progress toward the standards truly measure what they expect all students to know and be able to do. And they want objective, credible, concrete recommendations for ways to improve their standards and assessments.

Benchmarking is a highly respected practice in the business world. It is an activity that looks outward to find best practices and high performance and then measures actual business operations against those goals. Benchmarking in education follows the same principle. This activity is appropriate at a time when state education reforms are focused on raising student and school performance, as states want and need an external yardstick to gauge their efforts.

By benchmarking academic standards and assessments, Achieve hopes to help states answer the following questions:

- How do our education standards compare with those of other high-performing states and nations? Are the expectations for our students and schools high enough?
- How well do our assessments measure the knowledge and skills laid out in the standards?

Achieve is involved in benchmarking for another important reason. States traditionally have had limited access to high-quality, trustworthy information about education standards, in part because the education standards movement is relatively young. But this lack of information is also a result of the disparate nature of the work that has been done to date. Other organizations that issue standards reviews and “report cards” have helped focus national attention on the quality of standards, but these judgments often have conflicted, and their tone has not always been constructive. States increasingly are looking for independent, credible advice on these issues.

Achieve’s benchmarking efforts are not designed to grade or rank states. Instead, we have created a diagnostic service that yields detailed, reliable information that we hope states will find useful. In addition, our focus on assessments as well as standards, and on the alignment between standards and assessments, allows us to truly determine what the state expects all its students to know and be able to do and whether the state’s standards and assessments provide a strong enough foundation for improving education performance.

THE ACHIEVE BENCHMARKING METHODOLOGY

To help develop a sound and thorough methodology for benchmarking, Achieve piloted a process for analyzing the quality, rigor and alignment of standards and assessments in 1998 with two states, Michigan and North Carolina. In Michigan, Governor John Engler was concerned that the public did not see the connection between the state's academic standards and assessments. Achieve's analysis found that the standards tended to be broad and general, while the assessments represented sound expectations for student performance. In North Carolina, Achieve found that the standards were generally strong, particularly in English language arts (English) and mathematics, but that the assessments were not as challenging as the standards implied.

Establishing and refining standards and assessments is a process of continuous improvement; so is designing procedures to judge their quality. We learned a great deal from the pilot efforts in Michigan and North Carolina, and accordingly, we refined the benchmarking method in 1999. We will continue to do so as our experience deepens.

PHASE ONE: DEVELOPMENT

The foundations for Achieve's two-step approach to judging the quality of standards and their alignment with assessments were laid when Governor Engler and North Carolina Governor James B. Hunt agreed to participate in the pilot study. At that time, Achieve contracted with two nationally recognized leaders in standards and assessment, the Council for Basic Education (CBE) and the Learning Research and Development Center (LRDC) at the University of Pittsburgh, to design and carry out standards and assessment benchmarking.

CBE designed the original procedure for comparing state standards with state, national and international "benchmark" standards recognized for their quality and/or for producing high student achievement. Using a scoring rubric developed for Achieve, CBE compared the content and skills set forth in the Michigan and North Carolina standards with several benchmark documents and further analyzed these state standards on the basis of their clarity, specificity and measurability.

LRDC developed the process for examining the extent to which the Michigan and North Carolina state assessments measure the standards. Skilled judges with expertise in academic content and assessment design applied a multistep procedure, or protocol, to determine the degree to which those states' assessments aligned with the standards. This protocol yielded valuable information about strengths and weaknesses of the assessments.

PHASE TWO: REFINEMENT

The pilot project experiences with Michigan and North Carolina allowed Achieve to examine carefully the best methods and processes for benchmarking standards and analyzing the alignment of assessments to standards. As a result, in 1999, Achieve made a number of significant improvements to the benchmarking methodology. In refining benchmarking, Achieve staff and consultants drew on the work of CBE and LRDC in the pilot study, as well as on the findings and research from the Third International Mathematics and Science Study (TIMSS) and the work of other researchers and analysts.

After reviewing the processes used in 1998 for benchmarking state standards and analyzing the quality and alignment of state assessments, Achieve decided to improve the process in several critical areas.

- Achieve commissioned expert reviews of a variety of sets of standards to ensure that the benchmark standards documents were indeed the best standards for this purpose.
- Achieve took advantage of the best research and thinking about standards by asking nationally known and respected content experts to review the Indiana standards, paying special attention to their strengths and weaknesses when compared with the benchmark standards.
- Achieve strengthened the assessment-to-standards alignment protocol to capture the most important elements of alignment.
- Achieve relied on several standards and assessment judges with extensive expertise in content and assessment design to analyze the assessments.
- Achieve broadened the impact of the benchmarking evaluations by adding a training component to train state officials in how to apply the benchmarking protocol.

PHASE THREE: WORKING WITH INDIANA

Achieve used the benchmarking process to examine Indiana’s academic standards against benchmark standards from California and Massachusetts in English and Arizona and Japan in mathematics and then compared Indiana’s assessments against the state standards.

Standards Benchmarking

As noted above, to ensure that the benchmark standards documents used as exemplars in this work were among the best in the world, Achieve asked 10 national experts with deep content knowledge and experience in developing and analyzing local, state and national standards to examine nine respected sets of English and mathematics standards. California, Massachusetts, Arizona and Japan were selected as the best and, therefore, were used as benchmark documents for this round of work.*

Selecting these benchmarks proved to be a difficult task because no one set of standards is perfect, and judgments about the quality of standards are subjective. Still, we are confident that the choices used in our current work reflect some of the best thinking from around the country and that a rigorous comparison of the state standards to these benchmarks will yield helpful diagnostic information and policy suggestions for states to consider.

Achieve will continue to examine other documents as potential benchmarks. We may decide to use part of a document as an exemplar in one strand of a content area and use a different part of another set of standards as an exemplar in another strand. For example, our English experts have suggested two other benchmarks that are particularly strong in the area of early literacy. We have taken their advice; this report compares the Indiana standards for K–3 literacy with those of Texas and North Carolina as well as those of California and Massachusetts.

After Achieve selected the benchmark standards, our consultants constructed “side-by-side” charts comparing the content and skills found in the Indiana standards with those of the benchmark standards. Then, Achieve asked more than 10 national experts in standards and assessment to review Indiana’s stan-

* Achieve created “benchmark profiles” for each of these documents that provide contextual information about the standards and summarize their strengths and weaknesses. The profiles are available upon request.

dards and the comparisons with the benchmark standards and then to react to a set of questions about the standards. These experts have diverse opinions about content, standards, curriculum and assessment, and each has considerable experience in writing and researching standards and assessments. Achieve also asked another 10 standards and assessment experts to facilitate and conduct the assessment-to-standards analysis work for Achieve.

Achieve brought these 20 experts together for two days to discuss the Indiana standards. This meeting proved extremely productive. The content experts did not agree on everything, but they did reach unexpected consensus on some important issues about standards, especially in the area of English.

Achieve's consultants compiled the various reviews, highlighting the strengths and weaknesses of the Indiana standards as agreed upon by the experts and consultants. The findings described in this report represent, to the extent possible, the consensus opinions of Achieve's consultants and experts.

In reporting the findings, Achieve hopes to answer the following questions about Indiana's standards:

- Are the standards as rigorous as they should be? Compared with the benchmark standards, when is content introduced and at which grade levels is mastery expected?
- Do the standards define a comprehensive, yet focused, academic core for all students? Are key concepts or skills missing in the standards?
- Do the standards define both what students should know (i.e., content knowledge) and what they should be able to do with that knowledge? Or is one overemphasized at the expense of the other?
- Are the standards clear and explicit, and are they conveyed in a way that educators and parents can understand and use to improve student achievement?

Aligning Assessments to Standards

First, drawing on the work done in the 1998 pilot project, Achieve staff and consultants refined and strengthened the procedure, or "protocol," for analyzing the alignment of assessments to standards. Determining how well a state assessment measures the content and skills laid out in the standards is a detailed, labor-intensive process requiring expertise and judgment. Achieve's protocol captures the most important elements of alignment and the overall quality of state assessments.

Next, Achieve needed to expand the pool of expert consultants who could conduct the alignment analysis. Dr. Lauren Resnick of LRDC, an internationally respected cognitive psychologist and expert on standards and assessment, was a key advisor to Achieve throughout the process of refining the alignment procedure and analyzing Indiana's assessments. Dr. Resnick and her lead staff helped Achieve identify several seasoned experts in teaching, curriculum, standards and testing. Achieve augmented this list with other, similar experts.

Perhaps most importantly, Achieve also wanted to broaden the impact of its benchmarking work and respond to states' requests for help in building the capacity of their own agencies to ensure that state assessments are aligned with standards. For this reason, Achieve decided to invite state officials to be trained in the alignment analysis.

Achieve's process for determining the alignment of assessments to standards considers five dimensions:

- Confirmation or construction of test blueprint. Does each test question correspond to at least one state standard? If the blueprint provided by the test developer does not stand up to scrutiny (i.e., if a significant number of items mapped to one standard or objective are found to

be more closely related to a different one), then reviewers must construct a new test blueprint. Because test blueprints are typically the basis for state score reports, they need to be as accurate as possible.

- Content centrality. Does the content of the test item match the content of the standard it is intended to measure? Reviewers judge the consistency of the content in the item with the content in the standard. If a standard is too broad or unclear, reviewers may not give the related items high marks for content centrality.
- Performance centrality. Does the type of performance presented by each test item match the type of performance described by the corresponding standard? Each test item places a certain type of cognitive demand on a student, such as “select,” “identify,” “compare” or “analyze.” If a test item simply requires students to “identify” a given fact, and the corresponding standard requires students to “analyze” a situation or interpret results, there is a mismatch between the two performances.
- Challenge. This dimension includes two components. First, for each item, does the *source* of the challenge come from content in the standards that students must know to get the item correct, or is the question hard for some extraneous factor, such as the language of the item or tricks built in to confuse test-takers? Second, for a set of items related to a given standard, does the *level* of challenge represent a range of difficulty that is appropriate for the grade level tested?
- Balance and range. These criteria attempt to uncover whether certain concepts and skills delineated in the standards are emphasized on the assessment, and if so, whether they are emphasized at the expense of other important areas. Judges measure the extent to which the *set* of test items mapped to each standard reflects the balance and range of content and performance delineated in the standard. It is very difficult for one assessment to measure the full range of knowledge and skills required by the state standards. This step provides both quantitative and qualitative information about the choices states and/or test developers have made.

In July 1999, Achieve hosted a Standards and Assessment Benchmarking Institute for state education officials from Indiana, Illinois, Oregon and Pennsylvania. Led by Achieve’s consultants, officials with responsibility for standards and assessment from each of the four states were trained in Achieve’s alignment protocol. Working in subject-area teams, Achieve’s consultants and the state officials then applied the protocol to each state’s English and mathematics assessments. (State officials analyzed tests from other states, not their own.) The teams examined individual items and reached a consensus score for content centrality, performance centrality and source of challenge. The teams then examined entire sets of items related to each strand and made qualitative judgments about the level of challenge and balance and range.

Lists of Achieve’s experts and consultants who participated in the standards benchmarking and assessment analysis for Indiana can be found in the appendix to this report.

RESULTS FOR INDIANA

Achieve's expert review found that the Indiana Academic Standards are strong in some respects but could be made even stronger with increased rigor and coherence. The review also found that although the ISTEP+ assessments measure important content and skills described by the standards, the tests are uneven in their coverage and are not as rigorous as they could be.

Indiana recently clarified and reorganized the state standards in a teacher- and parent-friendly document. According to state officials, this is the first step in a thorough process to revise and upgrade the state's standards and assessments. The state plans to write new standards to bring expectations on par with those of exemplary states and nations. Once the standards have been rewritten, reviewed by Indiana educators, parents and other concerned citizens, and adopted, Indiana will phase in new versions of the assessments to match the rewritten standards' content and rigor. Therefore, the following discussion of the current versions of the Indiana Academic Standards and the ISTEP+ assessments for English language arts (English) and mathematics is intended to highlight the strengths of these materials while also emphasizing areas the state should consider improving as it moves forward.

MAJOR FINDINGS: INDIANA'S ACADEMIC STANDARDS

In the fall of 1999, education policymakers in Indiana distributed restated standards for English and mathematics. Previously, Indiana's academic standards were organized by grade span for kindergarten through grade 8 in Proficiency Guides and by course for grades 9–12 in Core 40 Competencies. These documents were combined and restated in the Indiana Academic Standards to spell out what students should know and be able to do in core subjects at each grade level from kindergarten to grade 12.

Achieve's benchmarking evaluation is based on the restated, grade-by-grade standards. Overall, our experts agreed that the restated standards are clear, jargon free and teacher friendly. They also agreed, however, that the standards do not progress and grow enough through the grades and, when compared with exemplary standards from the United States and abroad, they are not as rigorous as they could be.

The English Language Arts Standards

Strengths

Indiana's restated English standards show four significant strengths:

1. The English standards feature grade-by-grade specificity and jargon-free language.
2. The English standards have been improved by the removal of the "habits and attitudes" standards.
3. The standards indicate that standard English is to be used for writing and speaking.
4. The standards afford the opportunity to provide detailed K–3 early literacy expectations.

Following is a detailed discussion of each of these issues.

1. The English standards feature grade-by-grade specificity and jargon-free language.

At this stage, the state appears to have achieved one goal of its standards clarification project — making the document more useful to parents, teachers, students and other members of the school community. By setting specific academic goals at each grade level, the standards specify what students are expected to learn each year, rather than by the end of three or four years. This structure helps teachers design instructional programs that enable students to meet those expectations and helps schools design coherent programs that enable students to progress from grade to grade. Indiana parents and students now will know what students are expected to learn in every grade.

The effort to clarify and clean up the language in the standards has made them more understandable and much more useful to students, teachers, parents and policymakers. By replacing unnecessary educational jargon with plain-English terms, the new version can be read and understood by all Indiana citizens. Indeed, other states could learn from Indiana's example in this area.

Finally, the standards for both English and mathematics are presented together in separate grade-level (or high school course) books. This presentation has made the documents more user-friendly for both parents and teachers. These standards are not too voluminous to be displayed in classrooms or checked regularly by parents as a reference for what their children should be learning.

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2. The English standards have been improved by the removal of the “habits and attitudes” standards.

In the previous version, the English standards included expectations such as “Show a positive attitude toward language” and “Read, write, speak and listen daily during free time.” These standards described ways that students might show their enthusiasm about literacy, which is an important characteristic for students to develop but not one that is measurable in an assessment. Similar statements described teaching techniques rather than student achievement goals. By deleting such standards, Indiana has sharpened the focus of its standards on knowledge and skills that literate students should possess at various grade levels, which is exactly what the English standards ought to do.

3. The standards indicate that standard English is to be used for writing and speaking.

The standards take the salutary position that grammar, usage and other conventions are essential content in English and that all students should demonstrate a mastery of these conventions in their writing and speaking. Both California’s and Massachusetts’ standards do this as well.

4. The standards afford the opportunity to provide detailed K–3 early literacy expectations.

The new grade-by-grade format allows for more specific expectations for reading, writing, listening and speaking in the early grades. This important step of delineating content for each grade in the early years has not been taken in many other states, and a growing number of reading experts feel it is important. In the Indiana standards, phonics instruction, within the context of the acquisition of early reading skills, is mentioned under the “Reading: Word Recognition” standard. Standards are described for phoneme awareness, word and letter recognition, word meaning, homophones, and sound blending, among others. In addition, the use of examples is helpful for teachers of this age group.

However, as discussed below, when the standards are revised, Indiana should flesh out the K–3 expectations to reflect the emerging consensus in the education community that exposure to rich literature combined with systematic phonics instruction is the most effective strategy to help all children learn to read.

Areas Needing Improvement

In spite of their strengths, Indiana’s English standards are not as rigorous as they could be, particularly when compared with the benchmark standards from California, Massachusetts, North Carolina and Texas.

Four elements contribute to Indiana’s low level of rigor:

1. A clear progression of content knowledge and skills is not always evident from grade to grade.
2. There is too much repetition within the standards for a given grade level.
3. The standards often underestimate what students are capable of learning and achieving.
4. Important content is missing or inadequately covered.

Following is a detailed discussion of each of these issues.

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1. A clear progression of content knowledge and skills is not always evident from grade to grade.

As noted above, Indiana recently took the laudable step of restating its standards to move from grade clusters to grade-by-grade expectations. This grade-by-grade format allows Indiana to make clear choices about when to introduce and emphasize important content and when that content ought to be mastered, so students can take on new, more challenging material.

Rather than effectively delineating this kind of progression, however, the state appears in many cases to have simply spread out expectations over several years, rather than build in a coherent progression for student learning. This spreading out has created another problem: repetition of language and content both *between* grade levels and *within* grade levels. As a result, the expectations for students sometimes stagnate, which contributes to the low level of rigor when compared with other states' standards.

Consider the following reading comprehension standards, in which language and content are repeated *between* grades 7, 8 and 9:

Grade 7: Compare different texts that have similar themes. Recognize how writers discuss multiple causes and effects and create mood. Make and revise predictions. Compare story events and characters. Challenge opinions and generalizations. Make inferences and draw conclusions. Interpret figurative language.

Grade 8: Compare the themes in different books. Recognize how an author uses action. Examine causes and effects. Make predictions and inferences, and draw conclusions. Challenge opinions. Understand figurative language.

Grade 9: Compare how two authors treat the same topic. Recognize how an author creates suspense. Examine causes and effects. Make inferences and draw conclusions. Make, confirm and adjust predictions. Challenge opinions. Understand figurative language.

These standards overlap; students in all three grades must make inferences and predictions, draw conclusions, challenge opinions, and work with cause and effect and figurative language. While these may, in fact, be appropriate topics to cover each year, the lack of additional clarity makes it hard to delineate how coverage at one grade level differs from the next. Thus, there is no indication of increasing depth or rigor. Note also that a relatively rigorous expectation precedes a less demanding one, as students must *interpret* figurative language in grade 7 before being asked to *understand* it in grade 8.

2. There is too much repetition within the standards for a given grade level.

Each content standard is made up of a set of broad statements with a bulleted list of more specific objectives that students must meet to master the overall standard. Each objective has a corresponding example that describes an activity a student may complete to reach the objective.

In theory, this form of organization could be quite useful: Teachers could use the objectives and examples to develop instructional plans to help students master the standard, and parents could practice the activities at home with their children. However, in practice, the Indiana standards do not take advantage of their structure. Throughout the standards, the objectives essentially repeat the standards statements, adding some clarifying detail but not enough. The result: Teachers have few additional clues to

understand the milestones students should reach on their way toward meeting the standards, and content that should be covered may get lost.

Consider, for example, the grade 4 standard for “Writing: Application” in which the objectives bulleted below repeat almost verbatim the outcomes sketched in the standard.

Grade 4: Write using a variety of forms. Use reference sources to locate information. Use varied word choices. Write for different purposes and audiences.

- Write using a variety of forms including responses to literature, informational articles and reports.
- Use references to find information for a report or description. Include details to support the main ideas.
- Use varied word choices to make writing interesting.
- Write for different purposes.
- Write to a specific audience or person.

In contrast, Massachusetts’ writing standards are structured more effectively. For example:

LS19 (Comp): Students will write compositions with a clear focus, logically related ideas to develop it and adequate detail.

PK–4: Write well-organized compositions with a beginning, a middle and an end, drawing on a variety of strategies as needed to generate and organize ideas.

LS21 (Comp): Students will demonstrate improvement in organization, content, paragraph development, level of detail, style, tone and word choice (diction) in their compositions after revising them.

PK–4: Revise their writing to improve level of detail and logical sequence after looking for missing information and determining if their ideas follow each other in a logical order.

California’s Writing Strategies standard for grade 4 is also more specific and avoids repetition.

1.0 Writing Strategies

Students write clear, coherent sentences and paragraphs that develop a central idea. Their writing shows they consider the audience and purpose. Students progress through the stages of the writing process (e.g., prewriting, drafting, revising and editing successive versions).

Organization and Focus

- 1.1. Select a focus, an organizational structure and a point of view based upon purpose, audience, length and format requirements.
- 1.2. Create multiple-paragraph compositions:
 - a. Provide an introductory paragraph.
 - b. Establish and support a central idea with a topic sentence at or near the beginning of the first paragraph.
 - c. Include supporting paragraphs with simple facts, details and explanations.
 - d. Conclude with a paragraph that summarizes the points.
 - e. Use correct indention.

1.3. Use traditional structures for conveying information (e.g., chronological order, cause and effect, similarity and difference, and posing and answering a question).

3. When compared with the benchmark standards, the Indiana standards often underestimate what students are capable of at particular grade levels.

In general, Achieve’s experts found that Indiana’s English expectations fall short of what the benchmark states demand of their students. This is due in part to cases of missing content, described more fully below. In other cases, Indiana’s standards introduce content matter much later than do the benchmark documents.

For example, the Indiana standards state that, in kindergarten, students will “show that a story is understood by drawing pictures and writing about the story.” Other benchmark states, particularly North Carolina and Texas, expect kindergartners to make predictions, ask questions, and participate in discussions about stories and informational texts in ways that demonstrate their understanding of literal and inferential information.

Other examples of this problem include the following:

- Indiana addresses prefixes and suffixes in grade 6, whereas California covers them in grades 3, 4 and 5. Massachusetts covers them in grades 2 and 3.
- Indiana students learn to use a semicolon to join two independent clauses in grade 10, while California students learn this in grade 6.
- Indiana’s standards do not include the commonly misspelled trio *their*, *there* and *they’re* until grade 8, while California covers it in grade 6 and Massachusetts covers it in grades 5–8.
- Indiana’s grade 12 students must spell correctly such words as *a lot*. This is more appropriate for elementary or middle school students.

4. Important content is missing or inadequately covered.

Some content is not covered adequately in the English standards. The following discussion attempts to address the major gaps our review uncovered in each of the most important content strands.

READING

The quality and complexity of the literature and texts that students should read are not described adequately in the standards. In the new version of the Indiana standards, there are brief references to particular books, stories, plays and other texts in the examples under the objectives in the “Reading: Comprehension” and “Reading: Application” sections. There are no more than a dozen or so of these at each grade level, and it is not clear whether these examples are intended to illustrate the quality and complexity of reading material to which students should be exposed.

In contrast, California attempts to describe the quality and complexity of relevant texts by including a list of recommended readings in literature; Massachusetts includes a comprehensive reading list of suggested authors, illustrators and works for each grade span; and North Carolina includes general guidelines about the types of reading that will help students meet the standards. Other sets of standards have indicated the approximate number of books students should read each year. It is important to note that including a sample list does not have to mean the state is mandating that those books be read by all students — none of the benchmark states have done this. Rather, the samples are presented to illustrate the quality and range of materials students should be exposed to at certain grades.

Literary and informational texts are not treated thoroughly and systematically as separate entities. To be fully literate, a student must be able to read a wide variety of texts. Different types of texts require different reading strategies. Therefore, it is important for students not only to be exposed to diverse reading materials, but also to develop the skills to approach each type of text most effectively.

By attempting to cover a range of reading materials and strategies in a single standard, the Indiana standards may not be providing teachers with enough guidance in this area. For example, in the “Reading: Comprehension” standards for grades 10, 11 and 12, the overarching standards — and the underlying objectives — are identical and attempt to cover all sorts of texts.

Grades 10, 11 and 12: Make inferences and draw conclusions. Make, confirm and adjust predictions. Challenge an author’s cause-effect argument. Understand figurative language.

- Make inferences and draw conclusions.
- Make, confirm and adjust predictions.
- Challenge an author’s cause-effect statement or assumption.
- Understand figurative language.

It is difficult to tell what types of texts students should read to meet these expectations. It is only by reading the examples used to illuminate the objectives that teachers understand that despite the identical standards and objectives, having students read a variety of texts and genres is desirable.

In contrast, the benchmark documents have separate strands for each kind of text, and they clearly outline expectations for each kind. For example, consider the following Massachusetts standards for literary text and informational text in the 5–8, 9–10 and 11–12 grade spans.

LS12 (Lit): Students will identify, analyze and apply knowledge of the structure, elements and meaning of fiction or informational material and provide evidence from the text to support their understanding.

5–8: Locate and analyze elements of plot and characterization.

9–10: Locate and analyze such elements in fiction as point of view, foreshadowing and irony.

11–12: Analyze, evaluate and apply knowledge of how authors use such elements in fiction as point of view, characterization and irony for specific rhetorical and aesthetic purposes.

LS13 (Lit): Students will identify, analyze and apply knowledge of the structure, elements and meaning of nonfiction or informational material and provide evidence from the text to support their understanding.

5–8: Identify and use common expository organizational structures and graphic features to comprehend information and compose reports or presentations in all academic disciplines.

9–10: Analyze the structure and elements of biographical or other nonfictional works, explain what they are, and use them in a similar piece of writing.

11–12: Analyze, explain and evaluate how authors use elements of nonfiction to achieve their purposes.

These standards and objectives clearly delineate the distinctions drawn between the two types of texts. Like Indiana, Massachusetts provides specific examples for each standard. However, the Massachusetts standards do not rely as heavily on these examples to clarify expectations.

WRITING

Writing is treated only briefly in the Indiana standards. There are no explicit criteria for the evaluation of writing, and there are no requirements for written work of prescribed lengths. There are two standards for writing: “Process” and “Application.” The expectations for both are worded broadly and often focus more on the process of writing than on the quality and complexity of writing that students should produce.

For example, students in grade 9 are asked to complete the following tasks, most of which are not easily measured by an assessment:

Grade 9: Discuss ideas for writing with other writers. Keep a list of writing ideas, styles and topics. Use note-taking skills. Write several drafts of literary, informational and functional writing. Use graphic organizers. Revise, edit and evaluate writing.

The grade 9 “Application” standard, while more result-oriented than the “Process” standard, is too broad to be an effective navigation tool for teachers.

Grade 9: Write using a variety of forms. Extend writing by changing mood, plot, characterization or voice. Use a variety of resources and a varied vocabulary. Write for different purposes and audiences. Choose or create visual displays to enhance presentations.

In contrast, California provides detailed standards describing the various types of writing that students should produce. Following are excerpts from the California Writing Applications standards for grades 9–10:

2.0 Writing Applications (Genres and Their Characteristics)

Students combine the rhetorical strategies of narration, exposition, persuasion and description to produce texts of at least 1,500 words each. Student writing demonstrates a command of standard American English and the research, organizational and drafting strategies outlined in Writing Standard 1.0.

2.2. Write responses to literature.

- a. Demonstrate a comprehensive grasp of the significant ideas of literary works.
- b. Support important ideas and viewpoints through accurate and detailed references to the text or to other works.
- c. Demonstrate awareness of the author’s use of stylistic devices and an appreciation of the effects created.
- d. Identify and assess the impact of perceived ambiguities, nuances and complexities within the text.

2.3. Write expository compositions, including analytical essays and research reports.

- a. Marshall evidence in support of a thesis and related claims, including information on all relevant perspectives.
- b. Convey information and ideas from primary and secondary sources accurately and coherently.
- c. Make distinctions between the relative value and significance of specific data, facts and ideas.

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- d. Include visual aids by employing appropriate technology to organize and record information on charts, maps and graphs.
 - e. Anticipate and address readers' potential misunderstandings, biases and expectations.
 - f. Use technical terms and notations accurately.

2.6. Write technical documents (e.g., a manual on rules of behavior for conflict resolution, procedures for conducting a meeting or minutes of a meeting).

- a. Report information and convey ideas logically and correctly.
- b. Offer detailed and accurate specifications.
- c. Include scenarios, definitions and examples to aid comprehension (e.g., troubleshooting guide).
- d. Anticipate readers' problems, mistakes and misunderstandings.

Research skills are not addressed as systematically in Indiana's standards as they are in the benchmark states. By not developing research skills fully in the writing standards or a separate strand, what students must learn and when is unclear. In addition, important aspects of research skills such as proper citation of texts and the understanding and use of types of sources (e.g., primary vs. secondary) are not addressed.

In contrast, Massachusetts has a distinct standard that addresses research at all grade levels, and California has a subsection titled "Research and Technology" under its "Writing Strategies" standard.

EARLY LITERACY STANDARDS

The underestimation of students' capabilities is especially apparent at the K–3 level. Indeed, the Indiana early literacy standards do not closely reflect what the preponderance of research has demonstrated to be the most effective way of delineating and delivering early reading content knowledge and skills.

Following are four major areas where the Indiana early literacy standards do not compare favorably with the benchmark standards from California, North Carolina and Texas.

Issues of word meaning and word recognition are confused. The Indiana standards blur the lines between vocabulary (word meaning) and decoding (word recognition). Vocabulary development (through the use of context clues, for example) is an aspect of comprehension, while decoding (using phonic skills, etc.) is used to recognize and identify words — not to understand them.

To parse out these two distinct parts of reading acquisition, California has devoted a subsection of its standards to vocabulary and concept development, which demonstrates a clear progression, grade-by-grade, of vocabulary knowledge and skills that is separate from phonics and decoding skills described in the early grades. Similarly, North Carolina has a section of its benchmarks titled "Decoding and Word Recognition" that is separate from "Language, Comprehension and Response to Text." Finally, Texas has standards for each of the following:

- Reading/print awareness;
- Reading/phonological awareness;
- Reading/letter-sound relationships;
- Reading/word identification; and
- Reading/fluency.

In general, standards for reading comprehension underestimate what students can do at each level. For example, students can do more in kindergarten than “show that a story is understood by drawing pictures and writing about the story” (standard 2). They can make predictions, ask questions, and participate in discussions about stories and informational texts in ways that demonstrate their understanding of literal and inferential information. Underestimating expectations in the early grades ultimately undermines the rigor of the Indiana English standards in the later grades.

Examples for the use of phonic skills could be more specific. As written, the grades 1 and 2 “Reading: Word Recognition” standards ask students simply to “use phonic skills to recognize, understand and pronounce common words.” North Carolina, in contrast, is specific about the particular phonics skills students should use. For example, in grade 1, the “Decoding and Word Recognition” benchmarks include the following:

Grade 1:

- Uses phonics knowledge of sound-letter relationships to decode regular one-syllable words when reading words and text.
- Recognizes many high-frequency and/or common irregularly spelled words in text (e.g., *have*, *said*, *where* and *two*).
- Uses pronunciation, sentence meaning, story meaning and syntax to confirm accurate decoding or self-correct errors.

Texas’ grade 1 expectations for reading/phonological awareness are even more specific.

Grade 1:

The student orally demonstrates phonological awareness (an understanding that spoken language is composed of sequences of sounds). The student is expected to:

- demonstrate the concept of word by dividing spoken sentences into individual words;
- identify, segment and combine syllables within spoken words;
- produce rhyming words and distinguish rhyming words from nonrhyming words;
- identify and isolate the initial and final sound of a spoken word;
- blend sounds to make spoken words, including three- and four-phoneme words, through ways such as moving manipulatives to blend phonemes in a spoken word; and
- segment one-syllable spoken words into individual phonemes, including three- and four-phoneme words, clearly producing beginning, medial and final sounds.

Terminology for writing conventions needs to be more specific to clarify expectations. For example, standards and examples in the area of spelling would be more helpful to teachers if they described the developmental stages of spelling acquisition (this includes consonant blends; digraphs; vowel teams; inflected endings; open and closed syllables; r-controlled vowels; and simple prefix, suffix and root patterns). As written, the Writing: Conventions standards ask grade 1 students to “write common words using correct spelling.”

It is helpful to contrast the Indiana standards with those of both North Carolina and Texas at the same grade levels. For example, consider the following grade 1 spelling standards for each state. Because Indiana’s standards are grade by grade, there is an opportunity to be more explicit about expectations for early literacy.

GRADE 1 SPELLING STANDARDS

North Carolina	Texas	Indiana
<p>Spelling and Writing</p> <ul style="list-style-type: none"> ● Writes all uppercase and lowercase letters of alphabet. ● Uses phonics knowledge and basic patterns (e.g., <i>an</i>, <i>ee</i> and <i>ake</i>) to spell correctly three- and four-letter words. ● Applies phonics to write independently, using temporary and/or conventional spelling. 	<p>Writing/spelling</p> <p>The student spells proficiently.</p> <p>The student is expected to:</p> <p>A. write with more proficient spelling of regularly spelled patterns such as consonant-vowel-consonant (CVC) (<i>hop</i>), consonant-vowel-consonant- silent <i>e</i> (CVCe) (<i>hope</i>), and one-syllable words with blends (<i>drop</i>). (1–3)</p> <p>B. write with more proficient spelling of inflectional endings such as plurals and verb tenses. (1–2)</p> <p>C. spell single-syllable words that have r-controlled vowels such as <i>burn</i> or <i>star</i>; that have the final consonants <i>f</i>, <i>l</i> and <i>s</i> such as <i>miss</i> or <i>doll</i>; and that have <i>ck</i> as the final consonants such as <i>buck</i>. (1)</p> <p>D. use resources to find correct spellings, synonyms and replacement words. (1–3)</p> <p>E. use conventional spelling of familiar words in final drafts. (1)</p>	<p>Writing: Conventions</p> <p>Write common words using correct spelling. Spell rhyming words to show letter and sound matching.</p> <p>Use spelling that is close to correct spelling for less-common words.</p>

LISTENING AND SPEAKING

Listening and speaking standards are primarily focused on process rather than on results. There are only limited objectives for recitation and oral presentations. In addition, the standard statements include a medley of activities and may be hard for teachers to use. For example:

Grade 8: Listen and react to spoken presentations. Read a conversation from a book aloud. Present an oral review of a play or movie. Take part in an informal discussion. Conduct an interview. Write and present a song lyric.

In contrast, Massachusetts has four standards, with related objectives, that more specifically address measurable aspects of listening and speaking:

LS1 (Lang): Students will use agreed-upon rules for informal and formal discussions in small and large groups.

LS2 (Lang): Students will pose questions, listen to the ideas of others, and contribute their own information or ideas in group discussions and interview in order to acquire new knowledge.

LS3 (Lang): Students will make oral presentations that demonstrate appropriate consideration of audience, purpose and the information to be conveyed.

LS18 (Lit): Students will plan and present effective dramatic readings, recitations and performances that demonstrate appropriate consideration of audience and purpose.

California's two listening and speaking standards are also quite explicit, with detailed objectives that specify desired results. For example, the grade 8 standards and a selection of objectives are as follows:

1.0 Listening and Speaking Strategies

Students deliver focused, coherent presentations that convey ideas clearly and relate to the background and interests of the audience. They evaluate the content of oral communication.

2.0 Speaking Applications

Students deliver well-organized formal presentations employing traditional rhetorical strategies (e.g. narration, exposition, persuasion and description). Student speaking demonstrates a command of standard American English and the organizational and delivery strategies outlined in Listening and Speaking Standard 1.0.

2.1. Deliver narrative presentations (e.g., biographical and autobiographical).

- a. Relate a clear coherent incident, event or situation by using well-chosen details.
- b. Reveal the significance of, and the subject's attitude about, the incident, event or situation.
- c. Employ narrative and descriptive strategies (e.g., relevant dialogue, specific action, physical description, and comparison or contrast of characters).

VOCABULARY

The standards lack a systematic vocabulary development strand. Although vocabulary is addressed in the "Reading: Word Recognition" standard, the expectations are stated in broad terms.

Also, while the standards themselves change slightly from year to year, the objectives underneath those standards are often almost identical. Thus, it is difficult to see the progression from year to year.

For example, at each of the following grades, the expectations for using context clues are quite similar:

Grade 2: Recognize, understand and pronounce words using phonic skills, knowledge of word arts and the meaning of other words. Recognize that words that sound the same can be spelled differently and have different meanings. Recognize the meaning of punctuation marks.

- Recognize the meaning of less-common words from the surrounding words, sentences and paragraphs.

Grade 4: Recognize, understand and pronounce words through the flexible use of word-recognition skills. Recognize the meaning of unknown words from other words. Use reference tools to find word meanings and pronunciations. Read aloud to express meaning. Self-correct errors when reading aloud and silently.

- Recognize the meaning of less-common words from the meaning of surrounding words.

Grade 6: Recognize the meaning of words from word parts and other words. Select one of a word's possible meanings from a dictionary. Self-correct reading errors.

- Use the words and sentences that surround a word with more than one meaning and pronunciation in order to decide which meaning and pronunciation go with that context.

Grade 8: Use clues from surrounding text to decide the meaning of less well-known words. Consult a glossary to find meanings of unknown words.

- Recognize and understand the meaning of words that are less well known by using surrounding words, sentences and graphic texts, such as diagrams and charts.

In contrast, California's expectations for "Word Analysis, Fluency and Systematic Vocabulary Development" clearly differ from year to year, as the following excerpts show:

Grade 4: Students understand the basic features of reading. They select letter patterns and know how to translate them into spoken language by using phonics, syllabication and word parts. They apply this knowledge to achieve fluent oral and silent reading.

- 1.2. Apply knowledge of word origins, derivations, synonyms, antonyms and idioms to determine the meaning of words.
- 1.3. Use knowledge of root words to determine the meaning of unknown words within a passage.
- 1.4. Know common roots and affixes derived from Greek and Latin and use this knowledge to analyze the meaning of complex words (e.g., *international*).

Grade 6: Students use their knowledge of word origins and word relationships, as well as historical and literary context clues, to determine the meaning of specialized vocabulary and to understand the precise meaning of grade-level-appropriate words.

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- 1.4. Monitor expository text for unknown words or words with novel meanings by using word, sentence and paragraph clues to determine meaning.
 - 1.5. Understand and explain “shades of meaning” in related words (e.g., *softly* and *quietly*).

Grade 8: Students use their knowledge of word origins and word relationships, as well as historical and literary context clues, to determine the meaning of specialized vocabulary and to understand the precise meaning of grade-level-appropriate words.

- 1.3. Use word meanings within the appropriate context and show ability to verify those meanings by definition, restatement, example, comparison or contrast.

GRAMMAR, USAGE AND PUNCTUATION

For the most part, English language conventions are handled effectively, but these standards could be more rigorous. While the overarching standards for grammar, usage and punctuation are repetitive from year to year, the objective statements are effective in illuminating the specific expectations and increasing complexity at each grade. For example, the overarching standard at grades 3 and 4 is identical.

Grade 3 and 4: Use correct handwriting. Use correct spelling, punctuation, capitalization and grammar. Write in complete sentences.

Yet the objectives provide clarifying detail: While students in grade 3 are expected to use question marks, quotation marks, periods and apostrophes and write in complete sentences, by grade 4, they must know the comma as well, and compound and complex sentences are introduced.

Progression is fairly strong throughout the grades; however, in some instances, expectations are out of sequence. In grade 1, students must “begin proper nouns with capital letters,” but they have not been asked to identify or use *any* kind of noun yet. Also in grade 1, students must “begin sentences with capital letters” and “use periods, exclamation marks and question marks,” but complete sentences are not covered until grade 2.

Overall, Indiana’s conventions expectations do not match the rigor of those of the benchmark states. For example, in California, students must use appositives in grade 4, while in Indiana, students are not explicitly expected to use them until grade 11. This rigor problem also is related to the use of nonspecific language (e.g., the grade 2 expectation “use complete sentences when writing” would be stronger if it stated, “use knowledge of subject and predicate to write complete sentences”). Some content is not discussed explicitly, such as subordination and coordination (seen in California in grade 8) and parallel structure and diction (seen in California in grades 9 and 10).

A final concern is that the structure of the convention standards is hard to follow. Punctuation, spelling, grammar and sentence structure are mentioned in no particular order. The California conventions standard is more effectively organized and, therefore, easier for teachers to use. Consider the California standard at grade 4:

1.0 Written and Oral English Language Conventions

Students write and speak with a command of standard English conventions appropriate to this grade level.

Sentence Structure

- 1.1. Use simple and compound sentences in writing and speaking.
- 1.2. Combine short, related sentences with appositives, participle phrases, adjectives, adverbs and prepositional phrases.

Grammar

- 1.3. Identify and use regular and irregular verbs, adverbs, prepositions, and coordinating conjunctions in writing and speaking.

Punctuation

- 1.4. Use parentheses, commas in direct quotations and apostrophes in the possessive case of nouns and in contractions.
- 1.5. Use underlining, quotation marks or italics to identify titles of documents.

Capitalization

- 1.6. Capitalize names of magazines, newspapers, works of art, musical compositions, organizations and the first word in quotations when appropriate.

Spelling

- 1.7. Spell correctly roots, inflections, suffixes and prefixes, and syllable constructions.

It is also important to note that California mentions explicitly that these skills are to be incorporated in instruction in writing, listening and speaking, whereas Indiana's conventions standard is located solely within the writing portion of the standards.

The Mathematics Standards

Strengths

Indiana's restated mathematics standards show two significant strengths:

1. The mathematics standards include grade-by-grade specificity and jargon-free language.
2. The mathematics standards are stronger in some respects than the English standards, particularly with regard to the treatment of important content.

Following is a detailed discussion of each of these issues.

1. The mathematics standards feature grade-by-grade specificity and jargon-free language.

As with the English standards, the state appears to have achieved one goal of its standards clarification project — making the documents more useful to parents, teachers, students and other members of the community. By setting specific academic goals at each grade level, the standards specify what students are expected to learn each year, rather than by the end of three or four years. This structure helps teachers design instructional programs that enable students to meet those expectations and helps schools design

coherent programs that enable students to progress from grade to grade. Also, Indiana parents and students now will know what students are expected to learn in every grade.

The effort to clarify and clean up the language in the standards has made them more understandable and much more useful to students, teachers, parents and policymakers. By replacing unnecessary educational jargon with plain-English terms, the new version helps ensure that all Indiana citizens know what students are expected to know and be able to do at every grade level. Indeed, other states could learn from Indiana's example in this area.

Finally, the standards for both English and mathematics are presented together in separate grade-level (or high school course) books. This presentation has made the documents more user-friendly for both parents and teachers. These standards are not too voluminous to be displayed in classrooms or checked regularly by parents as a reference for what their children should be learning.

2. The mathematics standards are stronger in some respects than the English standards, particularly with regard to the treatment of important content.

The mathematics standards cover the basic skills fairly well when compared with the benchmark standards. Number concepts are for the most part addressed in Indiana's standards, with some notable exceptions, and the development of computational and arithmetic skills is addressed adequately in the elementary school standards. Also, important process standards for reasoning (where patterns are dealt with adequately), problem solving and communication are represented throughout the standards.

Areas Needing Improvement

In spite of these strengths, Indiana's mathematics standards are not as rigorous as they could be, particularly when compared with the benchmark standards from Arizona and Japan.

Four elements contribute to Indiana's low level of rigor:

1. A clear progression of content knowledge and skills is not always evident from grade to grade.
2. There is too much repetition within the standards for a given grade level.
3. The standards often underestimate what students are capable of learning and achieving.
4. Important content is missing or inadequately covered, particularly in the expectations for algebra and geometry.

Following is a detailed discussion of each of these issues.

1. A clear progression of content knowledge and skills is not always evident from grade to grade.

As noted above, Indiana recently took the laudable step of restating its standards to move from grade clusters to grade-by-grade expectations. This grade-by-grade format allows Indiana to make clear choices about when to introduce and emphasize important content and when that content ought to be mastered, so students can take on new, more challenging material.

Rather than effectively delineating this kind of progression, however, the state appears in many cases to have simply spread out expectations over several years, rather than build in a coherent progression for student learning. This spreading out has created another problem: repetition of language and content

both *between* grade levels and *within* grade levels. As a result, the expectations for students sometimes stagnate, which contributes to the low level of rigor when compared with other states' standards.

As in English, many math standards vary only slightly, if at all, from grade to grade. This problem of lack of focus and mastery caused by repetition was first highlighted in the findings from the Third International Mathematics and Science Study (TIMSS) about U.S. academic standards in general, and it characterizes much of Indiana's mathematics standards. For example, compare the following "Statistics and Probability" standards:

Grade 5: Interpret bar, line, picture and circle graphs. Draw bar, line and picture graphs. Find the mean (average) of a set of numbers. Find probabilities by listing possible results.

Grade 6: Interpret bar, line, picture and circle graphs. Draw bar, line and picture graphs. Find the mean (average) of a set of numbers. Make predictions from data. Find probabilities by listing possible results.

Grade 7: Interpret bar, line, picture and circle graphs. Draw bar, line and picture graphs. Find the mean, median and mode of a set of numbers. Draw scatter diagrams. Make predictions from data. Find numbers of possible arrangements.

Or consider the following "Measurement" standards:

Grade 3: Measure and add lengths. Find perimeters and areas. Estimate weight and capacity. Tell the time. Know the value of money.

Grade 4: Measure and add lengths. Find perimeters and areas using formulas. Add time intervals. Make change.

Grade 5: Choose suitable units to measure length, area and volume. Measure to a given accuracy. Make estimates relating to size, quantity, capacity, temperature and time.

Grade 6: Choose suitable units to measure lengths. Measure to a given precision. Make estimates relating to size, quantity, capacity, temperature and time.

These examples show that the Indiana standards often do not introduce new content; rather, they repeat the same content year after year.

Compare the following Japanese standards for quantities and measurement with the Indiana standards. Each year, Japanese students are exposed to more challenging content that is clearly different from the content outlined in the previous year. Note also that, as a result of this growth over time, the Japanese standards are more rigorous (and these expectations are for younger students than the Indiana standards).

Grade 2

- (1) Understand the concepts of length and volume, and measure these quantities in simple cases.
 - a. Understand the meaning of the units and the measurements of length and volume.
 - b. Know about the units (millimeter, centimeter and meter) used in measuring length.
 - c. Know about the units (milliliter, deciliter, and liter) used in measuring volume.

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- (2) Understand the concept of time and use it.
- a. Know about day, hour and minute, and understand their mutual relations.

Grade 3

- (1) Understand the concept of weight and measure it.
- a. Understand the meaning of unit of measure for weight and of measurement in weight.
 - b. Know about the units (gram and kilogram) used in measuring weight.
- (2) Measure length through appropriately choosing units and tools according to their purposes.
- a. Know about the unit (kilometer) used in measuring distance (length).
 - b. Estimate length and concisely represent it by using appropriate units.
- (3) Deepen understanding of the concept of time, and in simple cases, get necessary time and number of hours by computation.

Grade 4

- (1) Gradually understand the concept of area, and measure the area in simple cases.
- a. Understand the meaning of unit and measurement in area.
 - b. Know about the units (square centimeter, square meter, square kilometer, acre and hectare) used in measuring area.
 - c. Know how to measure the area of squares and rectangles.
- (2) Deepen understanding of the concept of angle and measure it.
- a. Know the unit degree used in measuring angle.
 - b. Understand the meanings of half rotation, full rotation, etc.

Grade 5

- (1) Deepen understanding that the area of fundamental geometrical plane figures may be found by computation, and develop abilities to measure area.
- a. Know how to find the area of triangles, parallelograms, trapezoids, etc.
 - b. Find the area of a polygon by decomposing it into triangles or others.
 - c. Know about the area of a circle.
- (2) Understand the concept of volume, and measure volume in simple cases.
- a. Understand the meaning of unit of volume and of measurement,
 - b. Know about the units (cubic centimeter and cubic meter) used in measuring volume.
 - c. Know how to measure volume of a cube and a rectangular parallelepiped
 - d. Understand the meaning of capacity.
- (3) Deepen understanding of estimating the sizes of quantities by rough measurement and of the meaning of measured values.
- a. Approximate a given figure by fundamental figures, and roughly estimate their length, area or volume from such approximation.
- (4) Understand how to compare and express the quantity, which may be represented as the ratio of two different kind of quantities, and use it.
- a. Use the idea of “per unit.”
 - b. Understand the meaning of speed and its way of representation, and calculate speed.

2. There is too much repetition within the standards for a given grade level.

Although Achieve’s experts agree that the format, structure and style of the restated Indiana standards is useful, they also agree that the substance of the standards often does not provide sufficient guidance to teachers or test developers.

Each content standard is made up of a set of broad statements with a bulleted list of more specific objectives that students must meet to master the overall standard. Each objective has a corresponding example of an activity a student may complete to reach the objective. There is one set of broad statements per grade, with the number of objectives per standard ranging from 1 to more than 10.

In theory, this form of organization could be quite useful: Teachers could use the objectives and examples to develop instructional plans to help students master the standard, and parents could practice the activities at home with their children. However, in practice, the Indiana standards do not take advantage of their structure. Throughout the standards, the objectives essentially repeat the standards statements, adding some clarifying detail but not enough. The result: Teachers have few additional clues to understand the milestones students should reach on their way toward meeting the standards.

For example, in grade 1, the “Computation and Estimation” standard states clearly: “Add and subtract with numbers up to 10.” This straightforward expectation is not clarified further by the objective “Use objects to develop the concepts of addition and subtraction, as well as addition and subtraction facts.”

Moreover, the examples given to explain the objectives are often impractical, nonacademic or too simple for the given grade level. In some cases, the overly easy examples detract from the important mathematical content described in the objectives.

While we encourage the use of examples to illustrate how classroom activities can help students meet the standards, such examples must be chosen carefully and judiciously. And they should be related clearly to measurable content and skills.

3. When compared with the benchmark standards, the Indiana standards often underestimate what students are capable of at particular grade levels.

Expectations for students are set low from the early grades on in mathematics. As a result, the expectations underestimate what students ought to know and be able to do at any particular grade level. This is true of many of the content and process standards and is sometimes amplified by the poorly chosen examples meant to illuminate the standards.

For example, students in Arizona are introduced to the circle in grade 2 and are asked to make and name three-dimensional figures. At grade 3, they also must “identify three-dimensional figures by name and/or attribute.” Students in Indiana, in contrast, are asked only to “describ[e] two-dimensional shapes,” “divide a shape into smaller shapes,” “make cubes, prisms and cylinders,” and “describe what a triangle looks like and how you know it’s a triangle.” In Japan, at grade 3, students must “know about isosceles and equilateral triangles” in addition to knowing about the center, diameter and radius of a circle.

Indiana’s “Place Value” standard demonstrates how repetition of content leads to stagnation and low overall expectations. The “Place Value” standard is included in every grade from kindergarten through grade 8, with little development from year to year of what students are expected to know about place value.

It might make more sense to incorporate place value in the larger study of numbers in a few grades to allow students focused time to master this and related concepts. For example, in Japan, students are expected to know place value to ten thousands in grade 3 and “know about units such as hundred million, trillion, billion, etc.” in grade 4. In two years, Japanese students accomplish what is described over at least six years in Indiana. And separating place value from important number sense concepts such as whole and real number sense, ratios, proportions, and percents in the Indiana standards unintentionally de-emphasizes the connections among these concepts.

Finally, because expectations are low throughout the elementary and middle school standards, the high school standards are often less rigorous than they should be.

4. Important content is missing or inadequately covered, particularly in the expectations for algebra and geometry.

The mathematics standards, while in many ways more specific than the English standards, omit some important content and are, in some cases, incomplete, leaving out concepts and skills deemed critical by other states and nations. In other cases, the vague wording of the standards makes it unclear which concepts and skills students are expected to demonstrate.

Following are the key gaps or weaknesses our review uncovered.

The development of computational and arithmetic skills is fairly complete in the elementary grades. However, “Whole Number Sense” changes to “Real Number Sense” in grade 5, but only rational numbers are dealt with through grade 7. More attention to irrational numbers may be warranted.

Some math standards, such as “Place Value,” “Spatial Sense,” and “Ratios, Proportions and Percents,” are overemphasized throughout the grades, essentially getting equal footing with important standards such as “Algebra” and “Geometry.” Separating standards for “Place Value,” “Real Number Sense,” “Whole Number Sense,” etc. de-emphasizes the natural connections among number concepts.

“Algebra” standards are not included in Indiana until grade 5, while Japan introduces Quantitative Relations in grade 3, and Arizona includes algebra standards in the Patterns, Algebra and Functions strand beginning with grades 1–3. As a result, Indiana students are not expected to begin developing an understanding of variables or relationships among quantities until the middle grades, well after their counterparts in Arizona and Japan. Thus, the middle school standards for algebra may not provide a strong enough foundation to support challenging algebra courses in high school.

The algebra I course also could be strengthened. For example, it does not include such key concepts as determining the slope of a line given two points and slope as a rate of change. On the plus side, the level of expertise expected in simplifying polynomial and rational expressions is commendable, and students are asked to solve quadratic equations.

Algebra II is largely a review of algebra I. This course introduces the students to standard non-linear functions but omits step, trigonometric, exponential and logarithmic functions, and it contains

nothing about geometric series or other useful concepts needed in preparation for calculus. Also, in algebra II, the graph of a cubic polynomial is called for as an example, but while “using a computer or graphing calculator.” This inadvertently may send the message that students do not need to learn to graph rational functions and polynomials by hand and eye.

Important content in geometry also is missing when compared with the Arizona and Japanese standards. In grade 8, for example, Indiana requires students to:

Grade 8: Describe and compare two- and three-dimensional shapes. Solve problems using similarity. Apply the Pythagorean theorem. Relate geometric transformations to the real world.

Consider, in contrast, the grade 8 expectations for geometry in the Japanese document:

Grade 8

- (1) Find the properties of a figure in a plane and confirm them by using the properties of parallel lines and the conditions for congruence of triangles.
 - a. The properties of parallel lines.
 - b. The conditions for congruence of triangles.
 - c. The properties of triangles and parallelograms.
- (2) Clarify the concepts of similarity of figures and develop the ability to find the properties of figures by using the conditions for congruence or similarity of triangles, and confirm them.
 - a. The meaning of similarity and the conditions for similarity of triangles.
 - b. The properties of the ratio of segments of parallel lines.
 - c. The applications of similarity.

Terms/Symbols: opposite angle, interior angle, exterior angle, definition, proof, center of gravity

Nowhere do the middle or high school Indiana standards contain explicit expectations for understanding inductive and deductive reasoning, for understanding the foundation of geometries as axiomatic systems, or for formal proofs and constructions.

Furthermore, the Indiana standards de-emphasize coordinate geometry. The following standard for “Points, Lines, Angles and Planes” appears to contain the sum of Indiana’s expectations for this important content in the high school geometry course:

Find coordinates of points. Find lengths and midpoints of lines. Use special angle names (e.g., acute and right). Measure angles in degrees. Describe and use parallel and perpendicular lines. Find slopes and equations of lines.

Some of these skills already should have been mastered before the formal geometry course in high school. In contrast, the Arizona standards for grades 9–12 demand much more:

Grades 9–12

4M-P2. Represent problem situations with geometric models and apply properties of figures.

-
6. Calculate a distance and midpoint between points within a coordinate system representative of a practical application.
- 4M-P3. Deduce properties of figures using transformations in coordinate systems, identifying congruence and similarity.
1. Give the new coordinates of a transformed geometric figure.
 2. Determine the effects of a transformation on linear and area measurements of the original figure.
- 4M-P5. Translate between synthetic and coordinate representations (e.g., a straight line is represented by the algebraic equation $Ax + By = C$).
1. Determine the relative placement of two lines on a coordinate plane by examining the algebraic equations representing them.
 2. Verify characteristics of a given geometric figure using coordinate formulas such as distance, midpoint and slope to confirm parallelism, perpendicularity and congruency.
 3. Determine whether a given pair of figures on a coordinate plane represents a translation, reflection, rotation and/or dilation.

If the courses for algebra I, geometry and algebra II are to be taught in this sequence, a greater emphasis on coordinate geometry, including transformations, will provide better groundwork for algebra II.

The technology standards may lead inadvertently to lower expectations for Indiana students. While the inclusion of a separate standard for technology is laudable, and may help emphasize the importance of this resource across the state, the standards should be careful to ensure that students develop proficiency with operations and “mental math” techniques without the use of calculators or computers. Calculator exploration is permitted as early as kindergarten in these standards, without any caveats about use or overuse.

In contrast to the Japanese standards, the Indiana document does not specify whether students must “accurately compute” operations. For example, in grade 8, Indiana illustrates the following “Computation and Estimation” standard with several sample problems:

Add, subtract, multiply and divide fractions and decimals. Solve problems involving integers. Estimate answers to decide if they are reasonable.

- Add, subtract, multiply and divide fractions and decimals.

Example: Compute: $23.9 + 7.08 = ?$, ... $98.4/3.14 = ?$

A technology standard for the same grade may inadvertently send the message that students do not need to learn arithmetic operations. The standard asks students to recognize if answers obtained with a calculator are reasonable, using the following example:

Example: After dividing two decimals with a calculator, use mental math to estimate what the answer should be, and then check that the calculator answer is close.

The Japanese document calls for these operations to have been mastered in grades 5, 6 and 7. Students in grade 5 in Japan are expected to:

Deepen understanding of the meaning of multiplication and division in decimal fraction and develop the ability to use them.

- (1) Summarize the meaning of multiplication and division, including the case in which the multiplier and divisor are decimal fractions.
- (2) Carry out multiplication and division of decimal fractions.
- (3) Understand that the same relations and rules for multiplication and division of whole numbers also apply to decimal fractions.

The emphasis in the Japanese document is clearly on conceptual understanding and the correct application of important operations, beginning in earlier grades than in Indiana. In general, it is unclear from the way in which the Indiana standards are worded whether students must become proficient in operations without the aid of technology.

The standards separate the development of important skills and conceptual understanding from the study and mastery of specific content. From kindergarten through grade 9, the Indiana standards include five separate standards for “Problem Solving,” “Reasoning,” “Communication,” “Connections” and “Technology.” These standards comprise roughly half of the mathematics expectations for each grade — often they have two or more pages of content and two or more pages of process skills. Such standards are not included in the high school courses. While these are valuable skills and concepts for students to develop, our experts believe that worthwhile problem-solving skills and mathematical reasoning cannot be cultivated in the absence of specific content.

Instead, standards should emphasize the development of skills and conceptual understanding within the study of mathematical content. We encourage the state to choose which skills are essential to each content strand and find a way to incorporate them specifically in that strand. For example, if “making and testing conjectures” under the Reasoning Standard conveys part of an important methodology within “Statistics and Probability,” it might be better to build in some content, as in the example given for standard 10 in grade 6, and move it to the “Statistics and Probability” content standards. Some examples for the process standards do include specific references to content standards, which should make the task of integrating content knowledge and skills easier in some cases.

MAJOR FINDINGS: INDIANA'S ASSESSMENTS

The Indiana Statewide Testing for Educational Progress (ISTEP+) exams for English and mathematics consist of two components: multiple-choice and open-ended items that measure students' mastery of the state standards and multiple-choice items that compare Indiana students' performance with that of students nationwide. The Achieve review examined only the section designed to measure students' mastery of the state standards. Furthermore, because Indiana's assessments are given in the fall of each school year, Achieve compared the assessments for each grade with the standards from the preceding grade (e.g., the grade 3 test was compared with the standards for grade 2).

Achieve's analysis of the alignment and quality of Indiana's assessments is designed to answer three important questions:

- Does each assessment only measure content and skills reflected in the standards? Or put differently, can everything on the test be found in the standards?
- Does each assessment measure the full range of the content and skills in the standards? Or, is everything in the standards measured by the assessment?
- Overall, is each assessment sufficiently challenging for students?

The major findings for Indiana's assessments are framed according to these three questions. Achieve's review found that, on the whole, the assessments measure content and skills found in the standards. However, the tests measure some of the knowledge and skills found in the standards better than others, and in many cases, the assessments are not as rigorous as they could be. Because we know that the state is planning to revise the tests once new standards have been written and adopted, the findings below should prove valuable in ensuring that the new tests are aligned closely to the standards.

1. Overall, the ISTEP+ assessments in English and mathematics measure content and skills that are found in the Indiana Academic Standards. The tests measure some knowledge and skills particularly well and include a large proportion of well-crafted items.

The Indiana assessments for grades 3, 8 and 10 consistently measure the standards. On average, over 95 percent of test items strongly match the content of the standards. As a result, the state can feel confident that nearly everything covered on the tests can be found in the standards, and schools and students who have used the standards to guide curriculum and instruction should not be surprised by material on the tests. This finding is commendable; some other states' assessments are aligned less closely to the content and skills in their standards.

The English assessments: All three reading assessments focus on content and skills laid out the standards. Overall, less than 5 percent of test items measure content not found in the standards. The assessment items in both reading and writing also were well crafted. In most cases, the challenge students faced in answering the questions stemmed from the difficulty of the content being assessed, rather than from extraneous factors such as the language of the item or unnecessary information.

Assessment of writing is a particular strength — all grades have appropriate prompts supported by substantive scoring rubrics and anchor papers. In fact, Achieve’s reviewers commented that the rubrics could be used to reframe the writing standards.

The grade 8 exam is especially strong. Assessment items provide a good balance between literal and inferential comprehension. The two writing prompts are well constructed — one calls for a story, the other a narrative, and both identify the intended audience.

The mathematics assessments: Overall, the mathematics assessments are aligned closely to the content and skills laid out in the standards. On average, over 90 percent of items on the three tests clearly are consistent with the *content* of the standards, and the remaining items are somewhat consistent with the content. Across the three tests, over 85 percent of items consistently measure the *skills* demanded by the standards; this is a very high percentage given that the majority of items are multiple choice. Importantly, over 95 percent of items on the grade 10 exam clearly measure the standards.

Moreover, the mathematics tests are of sound technical quality. Approximately 95 percent of all items are well constructed.

2. The assessments measure some of the objectives specified in the standards better than others, thus covering the standards unevenly.

The English assessments: Although the tests measure only content found in the standards, they do not measure all of it evenly. Some objectives are assessed heavily, while others are not assessed sufficiently, particularly in reading.

- In the grade 3 reading test, for example, most reading comprehension items assess recall of facts and literal meaning, at the expense of items about story characters, problem solving, or cause and effect.
- Almost 50 percent of the grade 8 assessment, for example, measures one objective from the reading comprehension standard, “make inferences and draw conclusions.” While this objective is worthwhile, the state should consider whether this heavy emphasis is necessary or feasible, given the time limitations of a statewide assessment. Additionally, the standards for word recognition and vocabulary are not well represented on this test.
- The same pattern holds true for grade 10, which has an overabundance of items dedicated to inferring or concluding, with insufficient attention given to items that ask students to understand cause and effect or evaluate information. Moreover, the analysis of literature is missing completely from this assessment. The items assessing word recognition and vocabulary measure the least-important aspects of this standard (and are likely too easy for grade 10 students).
- One factor that contributes to the lack of balance in the assessments is the inefficient use of test formats. Multiple-choice items measure some concepts and skills well, while others are most appropriately assessed through the use of open-ended items. The ISTEP+ commendably includes a substantial number of open-ended items, yet the tests do not always use them advantageously. For example, some of the tests measure writing conventions through the use of multiple-choice items, rather than open-ended items, which would enable students to demonstrate their understanding of conventions through their use in writing.

-
- The writing prompts, on the other hand, more effectively sample the types of writing students should produce, including stories and informational narratives.

The mathematics assessments: Overall, the mathematics tests are balanced poorly. Some objectives are overassessed, while others are not assessed sufficiently. No single pattern emerges across grades, except that algebra is represented weakly at grades 8 and 10 (nor are any algebra items included in the grade 3 test, as these are not part of the elementary school standards).

- The grade 3 mathematics test includes too few items to assess measurement and estimation, while the grade 10 test includes too many. These standards are more significant in elementary school, when the number of corresponding objectives in the standards is appropriately higher.
- At grade 3, for a significant number of standards, including “Number Sense,” “Computation and Estimation,” “Problem Solving,” and “Connections,” the less-demanding objectives or less-demanding part of a compound objective is assessed. At grade 10, the “Algebra” and “Geometry” standards are under-represented. For example, while transformations are included in the geometry standards, they are not assessed.

3. The assessments are not rigorous enough for the given grade levels, and in many cases are less rigorous than the standards.

The English assessments: The writing assessments for grades 3, 8 and 10 are appropriately challenging. As noted above, the writing prompts and scoring rubrics are substantive and targeted at the right level of difficulty for the given grade level. The prompts call for students to produce varied types of writing and encourage students to use the writing process.

However, also as noted above, the Indiana standards are not as rigorous as those of other states and nations. Therefore, because the tests measure the standards, the tests may not be as challenging as they could be. Achieve’s reviewers commented that the low level of rigor on all three reading tests is attributable, in part, to how the standards and objectives are formulated. Many standards are not articulated sufficiently to delineate the expected progression of knowledge and skills that is needed to construct aligned assessments with appropriate levels of challenge.

- In contrast to the appropriate level of rigor in the writing tests, the reading tests for grades 3, 8 and 10 uniformly are less rigorous because the standards themselves are not rigorous enough and because the tests place insufficient demands on students.
- The reading passages used to measure comprehension, particularly in grades 3 and 10, are relatively simple and too brief. They do not provide an opportunity for students to show much depth of understanding. In grade 8, where the passages are more complex, the texts could have yielded more demanding items. In all grades, increasing the amount of extended text and the number of literary passages would assist in generating items with greater depth.
- The grade 3 test may be too easy for students beginning grade 3. Similarly, the grade 8 assessment is less challenging than it should be for students at the start of grade 8.
- A special strength of the grade 10 assessment is the use of open-ended items to assess both writing and reading. The open-ended reading items on the grade 10 English assessment are appropriately demanding. These items should be used as exemplars when the assessments are revised. Unfortunately, the remainder of the grade 10 items are substantially less challenging

than they should be for students beginning grade 10. While the standards ask students to compare and contrast and analyze literature, test items rarely demand as much.

The mathematics assessments: In mathematics, as in English, the tests are not as challenging as they could be. This can be attributed, in part, to the low expectations set out in the standards. As with the standards, the tests lack a steady progression in the level of knowledge and skills demanded of students in going from the grade 3 to the grade 10 assessment; in fact, in some cases, the level of rigor actually diminishes.

Problems with the rigor of the test items include providing too much “scaffolding,” or support, such as definitions of mathematical terms, to enable students to answer questions on their own. The assistance helped give the answers away in several cases. In addition, items involving formulas often asked students simply to plug in numbers rather than demonstrate an understanding of the concept behind the formula.

- Based on a reading of the grade 2 standards, our review found that the level of challenge on the grade 3 test is too low for items that assess the following standards: “Whole Number Sense,” “Place Value,” “Fractions and Decimals,” “Computation and Estimation,” “Geometry,” and “Problem Solving.” However, items measuring “Spatial Sense,” “Measurement and Estimation,” and “Statistics and Probability” are acceptably challenging.
- The grade 8 test also is less challenging than what the standards suggest is expected of students beginning their grade 8 year. For example, many of the items chosen to assess “Computation and Estimation” are more appropriate for students in earlier grades.
- Similarly, Achieve’s reviewers found the level of challenge on the grade 10 exam to be uniformly low, with the possible exception of items measuring “Functions.” And reviewers commented that many items are more appropriate for students just beginning to learn a concept than for students beginning grade 10, when fluency with a concept is expected. Finally, some grade 10 items actually are less challenging than corresponding items from the grade 8 tests.

RECOMMENDATIONS FOR MOVING FORWARD

Indiana has made significant strides in developing a standards-based education system. The state recently clarified existing English language arts (English) and mathematics standards to define grade-by-grade learning goals for students statewide. Assessments at key grades (3, 6, 8 and 10) measure student and school performance. High school graduation requirements include the grade 10 exam and a set of rigorous course requirements. Clearly, Indiana’s government, education and business leaders are committed to putting in place the key elements needed to dramatically increase expectations and raise student performance.

We understand that Indiana officials are preparing to undertake a thorough process to revise and upgrade the state’s standards and assessments. As the state develops the next generation of standards and assessments, Achieve recommends that the state:

1. REVISE THE ACADEMIC STANDARDS TO PROVIDE MORE CLARITY AND COHERENCE, REDUCING REPETITION ACROSS AND WITHIN GRADES.

The new standards should build off the recently issued grade-by-grade format and make some structural changes to this format to provide more clarity and specificity and to ensure that content is not repeated over time.

Grade-by-grade standards are an excellent framework for providing sufficient guidance to schools about what content the state considers most important for students at each level. However, within each grade level, the bulleted objectives typically repeat the expectations described in the overarching standards statements. Repetition also occurs across grade levels. Content should not be repeated year after year without going into further depth and expecting more of students. And some content — such as standards for word recognition or basic arithmetic — should disappear in later grades once students are expected to master these concepts. With expectations that grow and change over time, students will have the opportunity to be exposed to richer and more rigorous content by the time they graduate.

In some cases, fleshing out the objectives may require greater detail. For example, clarifying the expectations for “Write for different purposes and audiences” means indicating what genres students need to master and how they will demonstrate competency. In addition, as Massachusetts and California do, the state should specify the kind of books, stories, plays and informational texts that represent Indiana’s concept of age-appropriate material at key grade levels. Such specificity does not have to reduce local control of curriculum; rather, it can help teachers, parents and students understand the level of performance that the state expects all students to achieve.

Furthermore, some standards probably should be reorganized. In English, our experts noted that some important content should be described independently, such as systematic strategies for reading different kinds of texts, vocabulary development and research skills. On the other hand, some standards in mathematics, such as “Place Value,” “Whole Number Sense,” “Real Number Sense,” “Fractions and Decimals,” “Spatial Sense,” “Measurement,” and “Geometry,” should be combined under overarching strands that emphasize the relationships among topics and concepts. This will lead to less fragmentation of teaching and learning, and less repetition.

2. INCREASE THE LEVEL OF RIGOR THROUGHOUT THE STANDARDS, PAYING SPECIAL ATTENTION TO EARLY LITERACY, ALGEBRA AND GEOMETRY.

Our experts found many instances in which Indiana appears to underestimate what students are capable of learning. Students often are asked to demonstrate knowledge and skills at much later grade levels than students in other states and nations. In part, this is caused by the repetition of content throughout the Indiana standards, but in some cases, the standards simply are not challenging enough. In revising the standards, Indiana would do well to consider the level of expectations the benchmark states and nations hold for their students.

While the state should ratchet up the expectations for all students, the literacy standards for grades K–3 deserve special attention. Ideally, they should represent the foundation standards for the ability to read and understand text and communicate — vital skills for all subject areas. Yet Achieve’s review found that the Indiana standards for these crucial grade levels are missing key elements and are not rigorous enough. In revising the standards, Indiana has much to draw on, including recent research on early literacy and the standards for school children in North Carolina and Texas.

Likewise, a solid foundation in algebra and geometry in middle school is essential for later success in high school and beyond. The Achieve review, however, found significant gaps in the standards for these crucial subjects throughout the grades. Algebra and functions are absent entirely in the early grades, and the geometry expectations for students underestimate students’ abilities. To improve students’ preparation in these key subjects, the state should increase the level of rigor in elementary and middle school mathematics to ensure that all students master the foundations of algebra and geometry. Indiana’s participation in Achieve’s Mathematics Achievement Partnership should complement state efforts to move all students into algebra and geometry in middle and high school.

3. ONCE THE NEW STANDARDS ARE ADOPTED, REVISE THE ASSESSMENTS TO ENSURE THAT THEY MEASURE THE FULL RANGE OF THE STANDARDS AND THAT THEY ARE SUFFICIENTLY CHALLENGING.

Indiana’s current assessments measure only knowledge and skills laid out in the standards, which is commendable. However, the standards currently do not provide enough guidance to test developers about what content should be emphasized at particular grade levels. As a result, some standards are assessed more than others. Most significantly, our reviewers determined that none of the tests are as challenging as they should be, in part because the standards are not rigorous enough and in part because the tests tend to focus on less-challenging content.

When the new assessments are developed, the tight alignment to the standards found in the current generation of the tests should continue. Test developers should take cues from the content choices made by the revised standards in deciding what each test should focus on, and the standards’ increased rigor also should be reflected in the assessments.

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APPENDIX

SELECTING BENCHMARK STANDARDS

In preparing to benchmark Indiana's standards, Achieve asked 10 respected experts to examine several sets of exemplary standards documents. The original sets of standards the experts examined in English language arts (English) and mathematics were:

ENGLISH LANGUAGE ARTS

California content standards
Massachusetts curriculum framework
NAEP* reading framework
NAEP writing framework
New Standards performance standards

MATHEMATICS

Arizona content standards
Delaware content standards
Japan curriculum framework
NAEP framework

From these documents, Achieve benchmarked Indiana's standards against those of California and Massachusetts in English and Arizona and Japan in mathematics. In later stages of this work, Achieve acted on additional expert advice and used the K–3 early literacy standards from North Carolina and Texas as well.

The content and standards experts who participated in the analysis of these documents were:

ENGLISH LANGUAGE ARTS

- Sheila Byrd, education consultant
- Carol Jago, high school English teacher, Santa Monica High School; director, California Reading and Literature Project, UCLA
- Louisa Moats, project director, NICHD Project; Clinical Association professor of pediatrics, University of Texas–Houston
- Sandra Stotsky, deputy commissioner of academic affairs, Massachusetts Department of Education
- Karen Wixson, dean and professor of education, University of Michigan

MATHEMATICS

- Lawrence Braden, mathematics teacher, St. Paul's School
- Susan K. Eddins, curriculum and assessment leader, Illinois Mathematics and Science Academy
- Ed Silver, senior scientist, Learning Research and Development Center, University of Pittsburgh
- Harold Stevenson, professor of psychology, University of Michigan
- Lucy West, director of mathematics K–12, Community School District Two, New York City Public Schools

Achieve also asked 15 experts in science, history, geography and civics to review several sets of exemplary science and history/social science standards. More information about these experts and standards is available upon request.

* National Assessment of Educational Progress

ACHIEVE'S BENCHMARKING CONSULTANTS AND EXPERTS

Achieve relied on nationally respected experts in academic content, standards, curriculum and assessment design to inform and conduct the standards benchmarking and alignment of assessments to standards.*

The experts and consultants who provided feedback on the Indiana standards were:

ENGLISH LANGUAGE ARTS

- Sheila Byrd, education consultant
- Louisa Moats, project director, NICHD Project; Clinical Association professor of pediatrics, University of Texas–Houston
- Susan Pimentel, co-founder, StandardsWork
- Sandra Stotsky, deputy commissioner of academic affairs, Massachusetts Department of Education
- Karen Wixson, dean and professor of education, University of Michigan
- Dennis Palmer Wolf, Hiatt Professor of Education, Clark University; senior researcher, Harvard Graduate School of Education

MATHEMATICS

- Diane Briars, assistant director of mathematics, Pittsburgh City Schools
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- Curtis McKnight, professor of mathematics, University of Oklahoma
- Ralph Raimi, professor emeritus of mathematics, University of Rochester
- Harold Stevenson, professor of psychology, University of Michigan
- Norman Webb, senior research scientist, Wisconsin Center for Education Research, University of Wisconsin–Madison

Achieve's assessment-to-standards experts and consultants who led and participated in the July 1999 summer training institute and the analysis of state assessments were:

ENGLISH LANGUAGE ARTS

- Sheila Byrd, education consultant
- Ellen Clark, education consultant
- Sue Craig, education consultant
- JoAnne Eresh, education consultant
- Eunice Greer, associate superintendent, Illinois State Board of Education
- Laura McGiffert, senior project associate, Achieve

MATHEMATICS

- Pam Beck, director, mathematics examinations, New Standards
- Diane Briars, assistant director of mathematics, Pittsburgh City Schools
- Kay Forgione, director of academic standards programs, Council for Basic Education
- John Nicholson, vice principal of instruction, Frederick Douglass Middle School, Rochester City Schools
- Norman Webb, senior research scientist, Wisconsin Center for Education Research, University of Wisconsin–Madison
- Lucy West, director of mathematics K–12, Community School District Two, New York City Public Schools

* Detailed biographical information about Achieve's experts and consultants is available upon request.

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