A Review and Assessment of the Department of Education's Development of Educational Standards

A Report to the Governor and the Legislature of the State of Hawaii

Report No. 01-15
October 2001

THE AUDITOR
STATE OF HAWAII

Office of the Auditor

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OVERVIEW

A Review and Assessment of the Department of Education's Development of Educational Standards

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Summary

Senate Concurrent Resolution No. 57 of the 2000 legislative session requested the State Auditor to review and assess the Department of Education's (DOE) development of educational standards for public schools statewide to ensure that Hawaii's standards for competency in the basic educational skills are on par with the standards of other states. The resolution cited a Fordham Foundation report that gave poor marks to Hawaii's educational standards in English, history, geography, science, and math.

The DOE has developed two types of standards that collectively identify learning expectations for students. **Content** standards are statements that clearly define what students should know and be able to do in various subject areas and at different points in their education. **Performance** standards provide concrete examples and explicit definitions of how well students must learn the material presented by content standards. In 1999, the DOE completed the development of content standards for ten subject areas and published a separate content standards document for each area.

The Office of the Auditor contracted with Mid-Continent Research for Education and Learning (McREL) to assess the DOE's **content** standards for language arts, mathematics, science, and social studies and to compare the department's standards with core subject standards in selected states. McREL assessed each content standard for coherence, clarity, and comprehensiveness. *Coherence* refers to how well each standards document is organized so that the material will make sense to the reader and will be easy to use. *Clarity* refers to how clearly the standards describe the concepts and skills that students should learn and can demonstrate. *Comprehensiveness* refers to whether the standards address significant concepts and skills for each subject area, whether the concepts and skills are presented at the appropriate level of difficulty, and whether the content and skills described are specific enough to be meaningful.

Generally, the DOE's content standards for language arts, mathematics, science, and social studies are coherent and well organized. However, the level of specificity of some benchmarks is inconsistent. Furthermore, in the language arts content standards, two strands (categories of standards) differ in character and scope from the other language arts strands, which makes them less effective as content organizers. With some minor revisions, the standards for language arts, math, science, and social studies would be more coherent and user-friendly.

The content standards for language arts, mathematics, science, and social studies are generally measurable and clearly describe the concepts and skills students

should learn. However, the glossaries in each subject area appear incomplete and benchmarks are written too broadly in some subject areas. Revisions are needed in each of the standards to improve clarity.

In general, content standards for language arts, mathematics, science, and social studies cover significant concepts and skills. However, all of the subject areas would benefit from the inclusion of skills and concepts found in highly regarded state and national documents. Overall, the documents reflect an appropriate level of rigor, although issues concerning specificity of language in some of the subject areas make the level of rigor difficult to determine.

Recommendations and Response

We recommended that the DOE make a number of changes to the content standards to improve their coherence, clarity and comprehensiveness. Recommendations for improving the content standards include removing two strands from the language arts content standards and revising a number of mathematics and science benchmarks to establish a common level of specificity.

We recommended that the clarity of the language arts, mathematics, science, and social studies contents standards be improved through the use of expanded and more comprehensive glossaries. Broadly stated language arts and social studies benchmarks also should be revised. The language arts contents standards can also be improved by removing standards that resemble general curriculum goals and statements about student dispositions.

With respect to the comprehensiveness of the standards, we recommended that the language arts benchmarks be made more specific; the mathematics standards be revised to include content related to problem-solving skills and strategies; and the science contents standards be expanded to include several additional important concepts and skills. The social studies contents standards should be improved by: including missing topics and benchmarks, clarifying expectations regarding student knowledge and skills, and establishing clearer distinctions on what students should have learned at different grade clusters.

The DOE stated that it is in agreement with the recommendations regarding the content standards and benchmarks, and reported that a comprehensive review is currently underway as part of a legislatively mandated review of the standards. It also concurs that there is a need for additional work to ensure that the content and performance standards clearly define what is expected of students at each stage of their education. The department also reported on its efforts to develop K-12 grade level objectives aligned to the content standards and benchmarks.

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Conducted by

The Auditor
State of Hawaii
and
Mid-Continent Research for Education and Learning (McREL)

Submitted by

THE AUDITOR
STATE OF HAWAII

Report No. 01-15
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Foreword

Senate Concurrent Resolution No. 57 of the 2000 legislative session requested the State Auditor to review and assess the Department of Education's development of educational standards for public schools statewide. This is a report on our review of Hawaii's standards for competency in the basic educational skills and whether they are on par with the standards of other states.

We wish to express our appreciation for the cooperation and assistance extended to us by the officials and staff of the Department of Education and the Board of Education during the course of this study.

Marion M. Higa
State Auditor

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Chapter 1
Introduction

Senate Concurrent Resolution No. 57 of the 2000 legislative session requested the State Auditor to review and assess the Department of Education's development of educational standards for public schools statewide to ensure that Hawaii's standards for competency in the basic educational skills are on par with the standards of other states. The resolution cited a Fordham Foundation report that gave poor marks to Hawaii's educational standards in English, history, geography, science, and math. In light of the Fordham report and to ensure that the department's public education reform standards are on track, the Legislature felt that it was necessary to review the department's progress in developing a comprehensive assessment program.

The Department Developed a Strategic Plan for Standards-based Reform

In September 1999, the Department of Education published a strategic plan for standards-based reform. The plan centers on the implementation of content and performance standards. It also includes steps to implement an assessment and accountability system that is designed to measure and report on student attainment of the standards. The plan notes that beyond the standards themselves, providing support to teachers is needed. According to the department's plan, this support includes but is not limited to access to high quality curricular and instructional materials and professional development programs.

The department asserts that adopting challenging standards is only the first step in moving to a standards-based educational system. In addition, four other components are required:

- system-wide implementation of content and performance standards;
- quality curriculum;
- quality instruction; and
- quality assessment and evaluation.

The plan includes the development of content and performance standards

The Department of Education has developed two types of standards that collectively identify learning expectations for students. The Education Commission of the States defines these two standards:

> "Content standards are statements that clearly define what students should know and be able to do in various subject areas and at different points in their education."[1]
>
> "Performance standards provide concrete examples and explicit definitions of how well students must learn the material presented by content standards. Performance 'levels' may also be used to define students' demonstrated proficiency at various points as they progress toward a standard."[2]

The Department of Education asserts that content standards define what students should know, be able to do, and care about. Thus, its content standards address the development of students' knowledge, skills, and attitudes or dispositions. The department also distinguishes standards from curriculum. "Standards tell what students should know and be able to do and how well they should do it. Standards define what is to be learned at certain points in time, and from a broad perspective, what performances will be accepted as evidence that the learning has occurred. Curriculum consists of activities and lessons, instructional materials, and instructional strategies—the activities that are carried out on a day-to-day basis in the classroom."[3]

The development of the current content and performance standards traces back to Act 334, Session Laws of Hawaii (SLH) 1991 that established the Hawaii Commission on Performance Standards to set performance standards for public school students and the means to assess achievement of those standards. In June 1994, the commission published a final report and standards in eight content areas. The report and standards were accepted by the Board of Education in October 1994. In October 1995, the Board of Education adopted a policy to implement the commission's Hawaii Content and Performance Standards.

This commission's report and standards document, known as the "Blue Book," delineated a set of content standards for the schools although it was labeled as a set of performance standards. Hawaii's current content standards replace those found in the "Blue Book."

In 1994 the Legislature required the Board of Education to appoint a Performance Standards Review Commission to assess the effectiveness of the performance standards. The commission was to convene at the beginning of the 1997-98 school year and every four years thereafter and report to the Board of Education and to the 1999 Legislature. The Performance Standards Review Commission published a report in 1999 that recommended the standards in the "Blue Book" be refined because the standards were confusing, redundant, and vague. Terminology in the book suffered from a variety of interpretations.

In 1999, the Department of Education also published a comprehensive needs assessment of the public school system. The department's comprehensive needs assessment found that the "Blue Book" did not adequately reflect some important dispositions, attitudes, and skills that students should achieve. It also found that the "Blue Book" consisted of content standards only, not performance standards. The department used these two 1999 reports as the basis for developing its current set of content standards to replace the 1994 standards.

Development of the 1999 standards

The development of the current version of the content standards started in early 1999. The process included the establishment of local standards writing teams for each content area. Generally, these teams were comprised of teachers, curriculum specialists, university professors, and community content experts.

In June 1999 final drafts of the standards were completed. Two months later in August 1999 the Board of Education adopted the content standards. In August 1999 work began on developing the performance standards.

Although the department completed the development of the content standards in ten areas, it has not yet finalized the performance standards. A portion of the performance standards is on the department's website. The department is still working on developing the performance standards, using teams of teachers to identify quality student work and provide commentary on that work.

Criteria for the development of the content standards included those created by the Council for Basic Education. The department also used guidelines developed for the U.S. Department of Education and the Council of Chief State School Officers. National standards documents were also reviewed and incorporated as feasible into Hawaii's standards. Both department staff and the revised content standards refer to the current version as a refinement of the standards in the 1994 "Blue Book." Refinements include but are not limited to a reduction in the number of standards—from over 1,000 to 139, and the publication of 10 separate standards documents—one for each content area. In addition, the department sought to make the current standards measurable and put the standards into grade clusters rather than grade levels.

Hawaii's content standards

The department completed the development of content standards for each of the following 10 areas and published a separate content standards document for each area.

1. Career and Life Skills
2. Educational Technology
3. Fine Arts
4. Health
5. Language Arts
6. Mathematics
7. Physical Education
8. Science
9. Social Studies
10. World Languages

Collectively, these ten content area documents represent the most current version of educational standards for Hawaii's public schools.

Hawaii's performance standards

National experts point to the need to develop performance standards. Performance standards include examples of student work that show what accomplishment of the content standards looks like. Marc Tucker and Judy Codding, in *Standards For Our Schools: How to Set Them, Measure Them, and Reach Them*, indicate that "The idea of including examples of student work in the standards is the key to making the standards usable by teachers, students, and parents."[4] Performance standards give meaning to content standards by indicating what students must demonstrate in order to show that they have achieved the goals.[5] These standards also guide classroom strategies.

A handbook on developing performance standards provides the following checklist for these standards.

- Performance standards should be understandable and useful for all stakeholders. The system should describe to stakeholders what is expected of students who perform at a given level.

- Performance standards clearly differentiate among levels. Performance descriptors should be easy to apply to collections of student work…teachers, parents, and students should clearly see why certain sets of student exemplars or student profiles are assigned to one performance level and not to another.

- Performance standards are grounded in student work but not tied to the status quo.

- Performance standards are built by consensus. The system of standards must be arrived at by the constituency who will use them.

- Performance standards are focused on learning. Performance descriptors should provide a clear sense of increased knowledge and sophistication of skills.[6]

According to the department, performance standards include three elements:

- Clear descriptions, called performance indicators, describing quality products or performances.

- Concrete examples, such as student work.

- Commentary of how well students must learn or demonstrate the content.

The department has created a website for its performance standards in the ten content areas but the full complement of the standards is not yet available. Two of the three elements of the performance standards—examples of student work and commentary on that work—are not yet completed. Student work and commentary for a few performance standards in language arts, science, and social studies were placed on the website after our office's review.

Department staff report that the department has experienced technical difficulties in placing the student work on the website. In addition, the necessity of obtaining copyright permissions from students, parents, and teachers has delayed placement of such work on the website.

Other elements were also included in the plan

The department's strategic plan calls for the provision of standards-based curricular support as well as meaningful job-based professional development. Support is to include resource documents that show how standards-based schools and classrooms operate, curriculum and instructional materials that support implementing the standards, professional development programs, and a standards website.

With regard to student assessment, the strategic plan includes the development and implementation of a statewide standards-based Hawaii Assessment Program. This program contains statewide student assessments based upon the reading, writing, and math standards.

The plan called for the provision of support to schools and teachers

In his message to the August 2000 Annual Leadership Conference for principals and other departmental administrators, the superintendent of education promised more attention would be given to professional development that supports standards implementation. He noted that the system is responsible for adequate support to the schools, notably funding to enable access to instructional, curricular, and assessment support.

Some professional development and curricular and instructional support systems are being implemented. For example, the department's new standards alliance team addresses the ongoing need to provide support to the schools. The alliance team, comprised of state resource teachers, provides workshops for school teachers on developing lessons that address the standards. Workshops in the 2000-2001 school year were school-wide as well as district-wide. District specialists and private consultants have also assisted schools with linking curriculum to the standards. In addition, the department's website is a tool for teachers to access standards-based instructional materials. This site also links with content and performance standards from other states.

The plan called for the development of a testing program

The student assessments in reading, writing, and math were field tested on 51,000 students in May 2000 and were scheduled for statewide implementation in Spring 2001. The department plans to augment the standards-based state accountability assessments with a portion of the Stanford Achievement Tests, 9th Edition.

The department asserts that special education students will also be tested. In some cases, accommodations in the testing situation or modifications to the tests will be needed.

Implementation of the testing program was originally scheduled for April 2001 for students in grades 3, 5, 8, and 10 on seven separate days. However, due to the statewide teachers strike at that time, the department has rescheduled the tests to Spring 2002. In addition, numerous other teacher and student activities were postponed or cancelled such as staff development workshops and student field trips. Due to the strike the department gave priority to classroom instruction and classroom assessments over statewide tests and other activities.

Objectives

1. Describe and assess the Department of Education's content and performance standards.

2. Describe and assess the department's strategic plan for standards-based reform.

3. Make recommendations as appropriate.

Scope and Methodology

The principal period of review was FY1989-90 to the present. The Office of the Auditor and Mid-continent Research for Education and Learning (McREL), our consultant, conducted the work of this review.

Work conducted by Office of the Auditor staff

Office of the Auditor staff reviewed the Department of Education's core subject content standards, the development of the current standards, plans and procedures that the Department of Education developed to implement those standards, and departmental efforts to link student and school assessments to the standards. We did not review the development of curriculum or curriculum materials.

We conducted interviews with state legislators, the superintendent of education, a former chairperson of the Board of Education, individuals involved in the development of Hawaii's content and performance standards, individuals charged with developing appropriate student and school-level assessments, and selected school principals.

We reviewed Hawaii's content standards for language arts, mathematics, science, and social studies, content standards in other selected states, Department of Education publications and materials regarding the need to establish standards, Hawaii's strategic implementation plan for standards-based reform, needs assessments conducted by the Department of Education, performance standards reports, and relevant session laws and state statutes. We collected and reviewed assessments of Hawaii's core subject standards performed by individuals and organizations outside of Hawaii's public school system.

We also collected relevant criteria for assessing the development of standards, and for linking student and school-level assessments to the standards. In addition, we contracted with Mid-continent Research for Education and Learning to assess Hawaii's current core subject standards and to compare Hawaii's standards with core subject standards in selected states.

Work conducted by McREL

McREL used criteria it had already developed in reviewing content standards in other school systems for assessing the Department of Education's content standards and benchmarks. McREL compared the subject-area content in these standards to the subject-area content

identified in three recently published McREL technical studies. Appendix A provides more detail on the methodology McREL used to review the Department of Education's content standards.

Work on the review and assessment was performed from May 2000 to April 2001 in accordance with generally accepted government auditing standards.

Chapter 2

The Department of Education's Content Standards

This chapter assesses the Department of Education's content standards for language arts, mathematics, science, and social studies. McREL assessed each of the content standards documents for coherence, clarity, and comprehensiveness.

- **Coherence** refers to how well each standards document is organized so that the material will make sense to the reader and will be easy to use.
- **Clarity** refers to how clearly the standards describe the concepts and skills that students should learn and can demonstrate.
- **Comprehensiveness** refers to whether the standards address significant concepts and skills for each subject area, whether the concepts and skills are presented at the appropriate level of difficulty, and whether the content and skills described are specific enough to be meaningful.

The following definitions of terms are used in the assessment and are provided among others in Appendix B.

- **Benchmark** – a statement about what students are expected to know and be able to do at the end of each grade cluster.
- **Grain size** – the amount of content that is addressed in the benchmark. Each benchmark needs to have a generally uniform level of detail.
- **Strands** – the organization of content standards into major categories.

Summary of Findings

1. **Coherence:** Generally, the Department of Education's content standards for language arts, mathematics, science, and social studies are coherent and well organized. However, the level of specificity of some of the benchmarks is inconsistent. Furthermore, in the language arts content standards, two strands (categories of standards) differ in character and scope from the other language arts strands, which makes them less effective as content organizers. Minor revisions to the standards for language arts, math, science, and social studies would make them more coherent and user-friendly.

2. **Clarity:** The content standards for language arts, mathematics, science, and social studies are generally measurable and clearly describe the concepts and skills students should learn. However, the glossaries in each subject area appear incomplete, and benchmarks are written too broadly in some subject areas. Revisions are needed in each standards document to improve clarity.

3. **Comprehensiveness:** In general, content standards for language arts, mathematics, science, and social studies cover significant concepts and skills. However, all of the subject areas would benefit from the inclusion of skills and concepts found in highly regarded state and national documents. Overall, the documents reflect an appropriate level of rigor, although issues concerning specificity of language in some of the subject areas make the level of rigor difficult to determine.

Content Standards Are Generally Coherent and Organized But Some Revisions Are Necessary

A review of the content standards for language arts, mathematics, science, and social studies shows that the content is fairly well organized and therefore coherent. The language arts standards document contains two strands that do not appear to address student knowledge and skill, but the document is still useful. The mathematics and social studies standards are generally well organized. The overall organization of the science standards is good, but the descriptive language for strands and the number and type of standards are confusing.

In terms of the consistency of all content—how uniform and predictable the "grain size" is for content addressed in any one benchmark—there were no significant problems.

Criteria for assessing the coherence of the standards

Criteria related to the coherence of the organization and content of standards include the following:

Organization: Do the standards organize the content of the subject area that will make sense to the reader and help to make the document easy to use?

Content: Are the benchmarks of approximately the same size; that is, do the benchmarks make approximately equal demands on teaching?

Standards should organize the subject-matter effectively; they should be clear and have distinct categories. Benchmarks should be logically organized beneath their appropriate standards. When the standards are organized poorly, either through uninformative headings or overlapping categories, users may be compelled to review all of the standards to

locate specific content or will find that some concepts or skills are addressed in more than one standard.

The content described in the benchmarks should be of a consistent or similar "grain size." Readers should be able to anticipate how large or small a scope of content will be addressed in any one benchmark. If one benchmark describes knowledge and skill that would take a student weeks to master and another benchmark just minutes, the document becomes unwieldy.

The language arts standards document is somewhat unusual but generally coherent

The language arts content standards document has a slightly unusual organization but is for the most part effective. However, two strands in the language arts—Attitudes and Engagement, and Diversity—do not address student knowledge and skills. As to the consistency within the standards themselves, the language arts benchmarks generally describe content at a uniform level of detail.

The language arts standards are organized into three major components, (1) Reading and Literature, (2) Writing, and (3) Oral Communication. Each component contains six broad strands: (1) Range, (2) Processes, (3) Conventions and Skills, (4) Response and Rhetoric, (5) Attitudes and Engagement, and (6) Diversity. The document has a standard for each strand in each component for a total of 18 standards. The structure of this document and each of the 18 standards is depicted in Appendix C. Each standard has one to six benchmarks that specify the necessary knowledge or skills making up the standard. These benchmarks are articulated at five grade clusters: K-1, 2-3, 4-5, 6-8, and 9-12.

The inclusion of two strands (Attitudes and Engagement, and Diversity) creates some problems. For example, the following benchmark for grade cluster 4-5 in the Range strand says:

> "Write using forms appropriate to purpose and topic."

In the same grade cluster under the Attitudes and Engagement strand, the following benchmark says:

> "Write readily for a variety of purposes on a range of topics."

The difference between these two benchmarks is that one requires students to "readily" undertake the work expected of them in the other benchmark. Aside from the difficulty of assessing whether or not a student "readily" undertakes a writing project, the role of the Attitudes and Engagement strand is confusing. It seems clear that attitudes and engagement are important parts of every subject, not only language arts. This suggests that students' attitudes and engagement are better addressed across all subjects and grade levels, and not be embedded only

within the language arts strands. Perhaps a discussion or set of illustrative examples that appear separately from the actual content standards would be more appropriate than the development of actual standards.

The Diversity strand suffers from the same blurred focus. If a student's behavior and disposition towards cultures other than his or her own are of significant concern, then this issue should be discussed in an introduction or overview to language arts issues, rather than be incorporated into the standards themselves. The content standards would then exclusively describe the knowledge and skills expected of students.

With the exception of these issues, the document as a whole is relatively coherent. The standards are generally clear, distinct, and comprehensible. With just a few exceptions, the benchmarks are arranged appropriately within the document's structure, and are generally not duplicated in other standards. However, in the Oral Communication component, there are repeated references to adjusting to audience, purpose, and/or situation that could be consolidated into one benchmark or grouped together in the appropriate standard.

The mathematics standards document is generally well organized

The mathematics standards document is generally well organized and should prove useful for the reader. However, one strand has only one content standard, while the other strands contain several standards. As to the consistent level of content description, with some minor exceptions, the mathematics benchmarks appear to be of a similar "grain size."

The mathematics document has five strands: (1) Number and Operation; (2) Measurement; (3) Geometry and Spatial Sense; (4) Patterns, Functions, and Algebra; and (5) Data Analysis, Statistics, and Probability. In each strand there are one to four standards, with a total of 14 standards. The strands and 14 content standards are depicted in Appendix D.

The five strands are clear and succinct and appear to divide up the discipline fairly well. The standards within each strand do not appear to overlap. Each standard appears to address a distinct set of material. The Measurement strand could be further organized into more standards. For example, content standards under the Measurement strand might address such topics as basic measurement, estimation, formulas, and precision and accuracy.

Many of the benchmarks describe content at the same level of specificity. However, there are a number of benchmarks that appear to be overly specific. In addition, some benchmarks cover considerably more content than do others, such as the following measurement benchmark for grade cluster 9-12:

> "Determine precision, accuracy, and measurement errors; identify sources and magnitudes of possible errors in a measurement setting; describe how errors can propagate within computations; and determine how much imprecision is reasonable in various measurements."

In this case, a single benchmark addresses precision, accuracy, errors in computations, reasonable measurements, sources of errors, and magnitude of errors.

The overall structure of the science standards document is good but revisions are necessary

The department classified the science content standards into two categories to match the goals of science education: (1) a tool for problem solving and producing knowledge, and (2) an assortment of accumulated knowledge. The science standards document separates inquiry-based content from knowledge-based content. This is not typical of other state standards documents and is somewhat confusing and cumbersome. The first category, entitled "How Humans Think While Understanding the Natural World," would be clearer if it were titled "Science As a Way of Thinking and Knowing" or "The Scientific Process." Likewise, the second category, "What We Know Today About the World Around Us," would be better titled as "Science as Cumulative Knowledge" or, simply, "Scientific Knowledge." Each of the two broad categories is subdivided into either four or five strands each. Each science strand contains content standards, with anywhere from one to seven standards per strand for a total of 24 standards. The standards are displayed in Appendix E. Under each content standard, individual benchmarks are provided for four grade clusters K-3, 4-5, 6-8, and 9-12.

As for the content itself, there are some minor problems in the organization; but overall, the material is appropriately placed. There are a few minor cases in which benchmarks address too narrow a concept or too many concepts. Generally, the strands are clearly defined. The notable exception is the strand entitled "Understanding Ourselves and the World Around Us," which is a vague description and is not consistent with the language and clarity of the other strands. In addition, the location of standards within strands is clear and logical.

While the majority of the content standards are clearly defined and do not overlap, some benchmarks could be more appropriately placed under other standards. Benchmarks addressing structure and function in organisms are located in the standard "Unity and Diversity." However, these benchmarks seem better located in the standard "Cells, Tissues, and Organs." Some benchmarks under the heading "Human Body Functions" in the standard "Wellness" are worded such that they apply to non-humans as well; in fact, one benchmark actually duplicates content found in the "Cells, Tissues, and Organs" standard.

There is some crossover between standards as well. Though it seems obvious to look in the "Forces, Motion, Sound, and Light" standard for content related to sound and light, sound and light are forms of energy and so could just as easily be found in the "Energy, Its Transformation and Matter" standard. Similarly, content related to waves can be found in both standards. These standards and the benchmarks under them should be revised as necessary to clearly distinguish between concepts; there should be no ambiguity in the location of content so it is clear to the reader where specific content can be found. The "Forces that Shape the Earth" standard has a related problem. As worded and described, it technically would exclude simple features of the earth (e.g., earth materials, rock characteristics) but these features are included within the standard.

Occasionally, benchmarks within a grade cluster are divided into sections with short titles that represent single aspects of the content standard. Although this usually does not pose a problem, in the "Living the Values, Attitudes, and Commitments of the Inquiring Mind" standard there are so many of these sections that they distract from the content. In addition, the sections are not clearly differentiated, resulting in content overlap among sections.

Most science benchmarks describe about the same amount of content regardless of the standard or strand under which they are found. There are, however, a few cases in which benchmarks cover too many concepts or cover too narrow a concept. The following benchmark for grade cluster 6-8 is worded too specifically.

> "Calculate very large or very small numbers using exponential numbers (e.g., distances to other planets.)"

On the other hand, other benchmarks such as the following for grade cluster K-3 cover a considerable number of concepts.

> "Describe the similarities and differences of plants and animals in their appearances, behaviors and habitats" (Unity and Diversity standard).
>
> "Observe and describe the properties, locations, and movements of celestial objects in the sky" (Universe standard).

The social studies standards document organizes the subject areas well

The social studies document is well organized. The subject areas and the standards beneath them are structured in a straightforward way and should not pose problems for the general reader. Benchmarks have a generally consistent grain size.

The social studies standards are organized into the subject areas of history, political science/civics, cultural anthropology, geography, and economics. Under each subject area are five standards (four in the case of cultural anthropology) for a total of 24 standards. These are displayed in Appendix F.

The standards within each area are well chosen; the content is organized so a reader should be able to locate information relatively easily. The standards do not overlap in their coverage of knowledge and skills either within or between the subject areas. Under each separate standard, individual benchmarks are provided in grade clusters K-3, 4-5, 6-8, and 9-12. For each grade cluster under each standard, there are typically one or two benchmarks. Overall, the benchmarks for history, political science/civics, cultural anthropology, geography, and economics have a common level of specificity.

Content Standards Are Generally Clear and Measurable But Some Revisions Are Necessary

The content standards for language arts, mathematics, science, and social studies for the most part clearly describe the concepts and skills that students should learn and can demonstrate. An exception is found in language arts, in which some benchmarks describe the attitudes towards learning that students should display or general goals of a language arts curriculum. There are a few vague benchmarks in each subject area. Finally, each area would benefit from the addition or expansion of a glossary in order to provide the non-technical reader with a better understanding of what is expected of students.

Criteria for assessing the clarity of the standards

Criteria related to clarity of expression include the following:

- Measurability—Do the standards describe knowledge and skills that can be demonstrated by students?
- Vocabulary—Do the standards avoid jargon and provide definitions for unfamiliar or special terms?

The standards should describe measurable content. Generally stated curriculum goals may introduce standards, but ultimately teachers must have a clear sense of what is expected of students, and students should be capable of demonstrating this knowledge and skill. Overly generalized benchmarks are not measurable.

The language used in standards documents should be clear and free of jargon. Technical terms typically should be avoided, however if technical terms are needed, a glossary should be provided.

Language arts standards are generally measurable but the clarity can be improved

Some language arts benchmarks address student attitudes towards learning which should be addressed elsewhere, rather than in the content standards. Similarly, some benchmarks address desired goals for the language arts curriculum, and are addressed to the teacher, rather than the student. Other benchmarks, while clearly describing knowledge and skills that could be measured, are broad or vaguely worded and do not communicate what specific knowledge or skill is to be expected of students in a given grade cluster.

Measurability of the language arts standards

For the most part, the standards and benchmarks describe language arts content that can be taught and assessed. In a few cases, however, the benchmarks fail to clarify what students should learn or be able to demonstrate. For example, the following benchmarks describe goals of the curriculum, classroom experiences that should be made available to all students, or the dispositions towards learning that should be inculcated in students. Including these benchmarks side by side with the other benchmarks detracts from the clarity and usefulness of the standards.

Grade Cluster	Benchmark
K-1:	Experience diverse cultures through the sharing of ideas with others.
K-1:	Enjoy sharing writing with others.
K-1:	Share reading experiences with others.
2-3:	Demonstrate a positive attitude toward speaking that enables one to become an active participant.
2-3:	Willing to show what one knows about writing.
2-3:	Share in the experiences of others from different cultures through reading and discussion.

A number of other benchmarks are written at such a general level of detail that readers may have difficulty discerning what content should be taught, such as the following for grade cluster 6-8:

> "Demonstrate a good grasp of conventions in increasingly complex writing."

The vagueness of this benchmark creates two problems: first, the teacher at the given grade cluster does not know what conventions are expected of students and, second, teachers in the grade clusters before and after this cluster cannot know what it is that will have been addressed, and so cannot plan accordingly. This lack of clarity undermines one of the central purposes of standards: to make clear to students and teachers what is expected and to inform everyone in the system of these expectations.

Other benchmarks are also vague, such as the following from grade cluster 4-5:

> "Read for literary experience and to develop aesthetic appreciation."

Developing aesthetic appreciation could mean any number of different things, depending on the reader's interpretation—evaluating literary merit, developing personal preferences, recognizing figurative language, learning why particular works are considered "good," and so on. In order for the document to be useful, readers must be able to clearly understand what each phrase is intended to mean.

Vocabulary of the language arts standards

The language arts standards contain some unclear terms. These terms should either be defined or clarified with explanations or examples. The following list contains most of the terms needing definition:

Component	Terms to be Defined
Reading:	Phonemic awareness
	Letter knowledge
	Spelling-sound word recognition strategies
	Meaning-based word recognition stragegies
	Author's craft
	Literary devices
Writing:	Print conventions
	Sentence sense
Oral communication:	Choral reading
	Reader's theater
	Vocal variety
	Forum
	Symposium

Mathematics standards generally communicate concepts and skills students need to learn

With a few noted exceptions, the mathematics benchmarks describe clear and specific student knowledge and skills. However, the mathematics standards glossary should be expanded.

Measurability of the mathematics standards

The mathematics benchmarks are descriptive, specific, and communicate concepts well. One or two benchmarks contain language that is vague and too general. An example of this is found in grade cluster 4-5 in the Data Analysis, Statistics, and Probability strand:

> "Compare related data sets."

Even within the context of the content standard, it is unclear what students are expected to learn by comparing related data sets. The point might be that they should learn to identify unusual or anomalous data points or discover common numeric patterns as a basis for understanding correlations. Another example of a benchmark is from grade cluster 9-12 in the Geometry strand:

> "Solve problems using two- and three-dimensional figures."

Given the otherwise careful treatment of content regarding two- and three-dimensional figures throughout the standard, this benchmark is comparatively general and non-informative.

Vocabulary of the mathematics standards

A glossary is provided for mathematics. Although a number of general terms are defined, only one mathematics term is addressed. Users would benefit from a glossary that distinguishes words with similar meanings that can often be confused (e.g., *accurate* and *precise*). Users would also benefit from understanding what is intended by certain umbrella terms, such as *properties of operations*, and *types of functions*. Finally, certain special terms or theories should be provided with a definition (e.g., *Fibonacci number*, *Pascal's Triangle*). The following words or terms in Exhibit 2.1 should be added to the glossary.

Exhibit 2.1
Terms That Should Be Added to the Mathematics Glossary

• Algorithm	• Disjoint	• Rational numbers
• Array	• Distributive property	• Real numbers
• Associative property	• Fairness	• Recursive
• Cartesian product	• Fibonacci number	• Reflection
• Certainty	• Function	• Reflectional symmetry
• Commulative property	• Identity property	• Rotation
• Complementary events	• Inclusion	• Rotational symmetry
• Complex numbers	• Independent events	• Similar
• Composition	• Inverse property	• Spread
• Congruent	• Limit	• Square number
• Decomposition	• Pascal's Triangle	• Step function
• Dependent events	• Piece-wise defined	• Translation
• Dilation	• Quartile	• Triangular number
• Discriminant	• Range	• Truncation

Science standards describe content students need to learn

The science benchmarks communicate measurable student knowledge and skills; however, a few benchmarks are too vague. A glossary accompanies the science standards, but the glossary is incomplete and a number of terms should be defined.

Measurability of the science standards

In general, the science standards have measurable benchmarks. The benchmarks are not generalized and do not address student dispositions or feelings. However, a small number of benchmarks are vague, such as the following benchmark for grade cluster 9-12 under the Unity and Diversity standard:

> "Explain and justify the scientific classification system."

The benchmark suggests that there is only one classification system, thus it does not make clear which one of many classification systems are of interest (e.g., anatomical-based taxonomy, DNA-based phylogeny). Similarly, the following benchmarks from the Forces, Motion, Sound, and Light standard and the Universe standard respectively are so sweeping that the actual content that students should learn is unclear:

> "Use time to describe motion." (grade cluster 4-5)
> "Describe what constitutes the universe." (grade cluster 6-8)

Vocabulary of the science standards

The science standards are generally free of jargon and are accompanied by a glossary. However, many key terms and concepts are not defined in the glossary. The science glossary should be expanded to include essential science terms such as *hypothesis, producer*, and *refraction*; concepts such as *Darwin's Theory of Evolution*, and *the water cycle*; and distinctions between similar or often confused terms such as *rotation/ revolution, weather/climate*, and p*hysical/chemical*. The following is a list of terms in Exhibit 2.2 that need definitions.

Exhibit 2.2
Terms That Should Be Added to the Science Glossary

• Atmospheric subsystem	• Embryonic development	• Niche
• Biological evolution (Darwin's Theory of Evolution)	• Empirical evidence (empirical data)	• Nuclear reaction
• Biotic/abiotic	• Energy levels of atoms/molecules	• Physical and chemical properties
• Carrying capacity	• Energy transfer	• Producer
• Configuration of atoms/molecules	• Energy transformation	• Refraction
• Consumer	• Force	• Rotation, revolution
• Degree of relatedness	• Gestation period	• Selective breeding
• Earth materials	• Gravitational force	• Simple machine
• Earth's subsystems	• Hypothesis	• Sustainability
• Electric force	• Laws of conservation of energy	• Theory of plate tectonics
• Electrolysis	• Laws of heredity	• Water cycle
• Element	• Magnetic force	• Weather, climate

Social studies standards generally describe what students need to learn, but a number of benchmarks are too broad or need examples

The social studies standards address a range of material that students should know and be able to do; however, there are a number of unclear benchmarks. Also, some benchmarks would be improved if they contained examples. Although a glossary is found for each subject area, each glossary should be expanded.

Measurability of the social studies standards

Most of the benchmarks in the social studies standards describe knowledge and skills that are measurable and can be demonstrated. However, the geography section contains benchmarks that are so vague it is not clear just what content is important. For example, the following benchmarks cover so much content that it is unclear what students should be learning:

- "Analyze how demographic patterns, cultural landscapes, cultural diffusion, economic activities, territoriality, and urbanization affect places." (grade cluster 6-8)

- "Use physical and human characteristics to compare and analyze major world regions, countries, and cities." (grade cluster 6-8)

- "Evaluate how political, social, and economic factors impact settlement, development, and territorial cooperation and conflict." (grade cluster 9-12)

This problem is not found in other subject areas of social studies. Of all the subject-area benchmarks covered in the social studies standards, the benchmarks found in the economics section are the most clearly and specifically stated and provide a good model.

Occasionally, benchmarks would benefit from illustrative detail as is lacking in the following political science/civics benchmark from grade cluster 6-8:

> "Analyze different interpretations of key documents across time, places, and national moods and evaluate, take, and defend a position on competing ideas."

It is not clear what key documents are appropriate for study at the 6-8 grade cluster.

Similarly, the following geography benchmark for grade cluster 4-5 could be improved:

> "Compare and contrast how human events influence settlement patterns in Hawaii, the United States, and other parts of the world."

The benchmark would be greatly clarified if examples were added. For example, students might study the influence of wars on migration, and the impact on settlement patterns of economic agreements, treaties, and policy changes between governments.

Vocabulary of the social studies standards

The department's social studies standards are for the most part free of technical terms, although some standards use a number of terms that may be new to the reader or that are used in a special sense. Although each subject area does include a glossary, its completeness varies. The following words could be defined in the glossary.

Exhibit 2.3
Terms That Should Be Added to the Social Studies Glossary

History
- Causal relationship
- Cause-and-effect relationship
- Chronological order
- Continuity
- Historical narrative
- Historical perspective
- Multiple causation

Political Science/Civics
- Consensus
- Ho'oponopono

Cultural Anthropology
- Cultural assimilation
- Cultural diversity
- E Pluribus Unum
- Ethics
- Stereotype
- Taboo

Geography
- Climate
- Cultural diffusion
- Demographic pattern
- Ecosystem
- Human characteristic
- Physical characteristic
- Qualitative data
- Quantitative data
- Regional system
- Scale
- Stewardship
- Territoriality
- Urbanization

Economics
- Demand
- Economic growth
- Economic interdependence
- Exchange
- Federal Reserve System
- Goods
- Incentive
- Incomve average
- Income distributions
- Indices
- Interest rate
- Investment pattern
- Market price
- Market structure
- Profit
- Public goods & services
- Ratio/percentage
- Redistribution of income
- Services
- Shortage
- Subsidy
- Supply
- Surplus
- Trade

Content Standards Need More Content

The content standards for language arts, mathematics, science, and social studies cover significant concepts and skills associated within each discipline. When content was specific enough to allow for an analysis of rigor, the standards were found at a level that is appropriately challenging for students. However, when compared with highly rated state standards documents, each area appears to lack some important subject-area content. Moreover, a number of benchmarks are too generally stated to be informative.

Criteria for assessing the comprehensiveness of the standards

Criteria related to the content of the standards include the following:

- Comprehensiveness—Do the standards address significant concepts and skills for each subject area?
- Rigor—Are concepts and skills presented at the appropriate level of difficulty?
- Specificity—Are the content and skills described specifically enough to be meaningful?

In order to address these questions, McREL analysts consulted a number of technical studies conducted by McREL and published within the last several years. These studies are termed "reference documents" and are described in detail in Appendix A.

These studies identify the knowledge and skills that are consistently found within and across highly rated state standards documents and significant national documents in the subject areas. Therefore, these studies were used in the assessment of the comprehensiveness of the Department of Education's standards. The reference documents were also used to determine the appropriate grade level or grade-cluster placement of the benchmarks. If concepts or skills are placed at an earlier grade cluster in the Department of Education's standards than is common within the reference documents, then the department's standards could be said to be more challenging or more rigorous for students. If students in Hawaii are not expected to master content until well after their peers in other states, the department's standards could be said to be less challenging or less rigorous. Finally, the appropriate level of specificity, or detailed description of content, was likewise determined by comparing the content description in the Department of Education's standards against those of the reference documents.

Revisions are needed in the language arts document

The language arts standards cover most of the important content found in exemplary content standards documents. A few concepts and skills, notably in reading, were found to be missing. A number of other topics were present at one grade cluster but should also have been addressed at other grade clusters. Also, some important topics were covered at such a broad level that it was unclear whether students would learn content appropriate for their grade level.

Some important content is absent

Reference documents in the language arts listed in Appendix A expect students to demonstrate competence in reading, writing, speaking, listening, viewing, and research. More specifically, the reading standards expect students to demonstrate competence in reading and applying skills and strategies for reading literary and informational texts. The writing standards expect students to demonstrate competence in the skills and strategies of the writing process and to write with a command of the grammatical and mechanical conventions of composition. Much of the essential knowledge and skills present in the reference documents is at least nominally covered in the Department of Education's language arts content standards. However the following knowledge and skills were missing:

- Reading
  Using text structure (e.g., headings, titles, captions)
  Understanding organizational patterns of text (e.g. compare/contrast, cause/effect)
  Word origins and derivations
  Using word reference materials (e.g., dictionary, thesaurus)
  Theme (e.g., recurring themes, universal themes)
  Point of view
  Archetypes
  Supporting devices (e.g., persuasive techniques, propaganda)

- Writing—Using a variety of sentence structures

- Research—Using graphic organizers (e.g., notes, outlines)

- Listening—Listening to a variety of literary forms

- Speaking—Using visual aids or technology

- Viewing—Understanding techniques used in visual media

In addition, the following concepts or skills were either described so broadly or so briefly that it is uncertain whether teachers and others could interpret them:

- Writing
  Specific writing genres (e.g., expository, narrative, persuasive)
  Development of vocabulary
  Conventions of grammar, spelling, punctuation, and capitalization

- Research
  Specific print, nonprint, and electronic sources
  Research methodology and sources

- Reading
  Evaluating the accuracy and credibility of information
  Literary criticism

Language arts standards are generally rigorous but can be improved

The standards also were reviewed for appropriate grade placement of content. Where it was possible to determine the level of difficulty and to differentiate between grade levels, the content was generally placed within appropriate grade clusters. However, there were cases in which the content was stated so broadly that it was not possible to distinguish appropriate grade-level content for the skills and concepts described.

For example, a benchmark for grade cluster 9-12 addresses the use of grammatical and mechanical conventions in written work:

> "Demonstrate control of standard conventions."

This statement does not make clear what types of conventions are appropriate for an exiting student. This benchmark might be more rigorous if it included examples of the grade-appropriate conventions.

In some standards, the phrasing and language of a benchmark changes somewhat from one grade cluster to another, but the content described does not significantly change. Such is the case for most of the rhetoric benchmarks in the Oral Communication component, as is seen in the following example:

> "Present ideas in an order that is easy to follow." (grade cluster K-1)
> "Organize ideas so listeners can understand them." (grade cluster 2-3)
> "Organize ideas to give clarity to messages." (grade cluster 4-5)
> "Organize ideas logically to reflect reasoning." (grade cluster 6-8)
> "Organize ideas to achieve desired response." (grade cluster 9-12)

In addition, some concepts and skills are covered at only one or two grade clusters in the Department of Education's standards, while the reference documents emphasize them at all levels. For example, concepts such as prewriting encompass a variety of strategies that are integral to the writing process and develop as students progress (e.g., drawing pictures at early elementary levels, developing full outlines at the high school level). If such skills are not clearly described and mastered at given levels, then the case cannot be made that students are challenged appropriately.

A number of benchmarks are too broad

In the department's language arts document, the content standards themselves are written at a broad level, which is consistent with other state content standards documents. Many of the benchmarks, however, are also written at a fairly broad level, which is problematic for several reasons. First, benchmarks that are too broad make it difficult to determine whether the content is comprehensive or appropriately rigorous. In addition, broad benchmarks without examples reduce the effectiveness and usefulness of a document. The document may serve as a general set of education goals, but will not be that helpful for a teacher who wants to know what nonverbal skills are developmentally

appropriate for students to have mastered, or a parent who wants to know what grammatical and mechanical conventions her child should know at a certain grade level.

Some benchmarks need to contain examples. For example, the following oral communication benchmark for grade cluster 6-8 would be clearer if specific communication strategies were identified, such as paraphrasing to confirm understanding, paying attention to verbal and nonverbal cues, or rephrasing own message:

> "Use strategies to prevent or repair communication breakdowns caused by misunderstandings."

Benchmarks that duplicate content at more than one grade would also benefit from the addition of examples. For example, the following oral communication benchmark for grade cluster 4-5 is repeated in slightly different forms at all grade levels:

> "Apply knowledge of verbal and nonverbal language to create and interpret messages."

The addition of clarifying examples would help the reader understand the various types of strategies that might be used or emphasized at different grade levels.

Other benchmarks that would benefit from the addition of examples or more explicit content include types of literary texts and genres that are read at different levels, decoding strategies, genre conventions, writing forms and genres, writing conventions (spelling, grammar, punctuation, capitalization), publishing forms or strategies, citation methods, reference/research sources, pronunciation and grammar in oral language, strategies in oral communication, organization of oral messages, language in oral messages, and delivery.

Mathematics standards generally cover the discipline, are rigorous, and are specific

The mathematics standards, with the exception of problem-solving strategies, address important content found in the standards documents used for comparison. The content appears at the correct grade level, indicating that students are appropriately challenged, and the benchmarks, for the most part, describe specific knowledge and skills.

Standards are generally comprehensive but some content can be added

For the most part, the Department of Education's mathematics content standards clearly met or exceeded the content outlined in the reference documents. However, the mathematics standards lack specific content

related to the area of problem solving. The department's standards document does not identify the strategies that students should use to solve problems and justify their solutions. Reference documents contain the following content for problem solving:

Grades K–2

- Justifies the process he or she used to solve a numerical problem
- Makes organized lists, tables, or charts to solve a problem
- Uses whole number models (e.g., pattern blocks, tiles, or other manipulative materials) to represent problems
- Uses "guess and check" to solve problems

Grades 3–5

- Uses a variety of strategies to solve problems (e.g., generalizes strategies from known solution process, states or restates problems in own words, discusses problem with peers)
- Justifies the methods and reasoning behind a solution

Grades 6–8

- Uses a similar problem type to solve a problem
- Understands how to break a complex problem into simpler parts
- Uses a variety of strategies to understand problem-solving situations and processes (e.g., considers different strategies and approaches to a problem, restates problem from various perspectives)
- Formulates a problem, determines information required to solve the problem, chooses methods for obtaining this information, and sets limits for acceptable solutions
- Generalizes from a pattern of observations made in particular cases, makes conjectures, and provides supporting arguments for these conjectures (i.e., uses inductive reasoning)
- Constructs informal logical arguments to justify reasoning processes and methods of solutions to problems (i.e., uses informal deductive methods)

- Understands the role of written symbols in representing mathematical ideas and the precise use of the special symbols of mathematics

Grades 9–12

- Uses a variety of strategies (e.g., identifies a pattern, uses equivalent representations) to understand new mathematical content and to develop more efficient solution methods or problem extensions
- Understands the concept of a mathematical proof
- Constructs logical verifications or counter examples to test conjectures and to justify algorithms and solutions to problems (i.e., uses deductive reasoning)

Mathematics standards are rigorous

A review of the grade placement of benchmarks against the reference documents determined that the mathematics benchmarks are consistently placed at an appropriate grade cluster, indicating that the concepts and skills expected of students in Hawaii are as rigorous as those reflected in the reference documents. Also, the content described in the mathematics benchmarks is at an appropriate level of specificity.

Science standards need a number of revisions

The science standards cover the content found in the reference documents but a number of concepts are missing in the area of life, physical, and earth sciences. Regarding the level of difficulty, with some noted exceptions, the standards are appropriate when compared to the reference documents. However, many of the science benchmarks are not specific enough to identify what it is that students should learn.

Essential content is missing

The science standards contain a moderate amount of the science content identified in the reference documents, as well as additional content not found in those documents. However, the standards do not address, or address in only a very cursory fashion, more than one-third of the essential content that appears in the reference documents. This missing content, organized by strand and standard, is detailed below.

Organisms and Development Strand

- The Unity and Diversity standard lacks content about the life cycles of organisms (grades K–3), grouping organisms according to various features (grades 4–5), different ways to classify

organisms (grades 6–8), and how variations within a species and diversity among species increase the likelihood that at least some organisms will survive major changes in the environment (grades 9–12).

- The Interdependence standard lacks content about the behavioral response of organisms to internal and environmental stimuli (grades 4–5) and human alteration of ecosystem equilibrium (grades 9–12).

- The Cycle of Matter and Energy Flow standard lacks content on how the amount of life an environment can support is limited by the availability of matter and energy and the ability of the ecosystem to recycle materials (grades 9–12).

- The Heredity standard lacks content on the differences among individuals of the same kind of organism (grades K–3), sexual and asexual reproduction (grades 6–8), the location of hereditary information in genes on chromosomes (grades 6–8), and the increase in genetic variation within a species from DNA mutations in an organism's sex cells (grades 9–12).

- The Cells, Tissues, and Organs standard lacks content on cell theory (grades 6–8), cell division and differentiation (grades 9–12), and the structure of proteins (grades 9–12).

The Physical Environment Strand

- The Nature of Matter standard lacks content on the states of matter in terms of molecular arrangement and motion (grades 6–8), the conservation of matter in physical and chemical change (grades 6–8), the role of the electron configuration of atoms in governing the bonding properties of atoms and the chemical properties of elements (grades 9–12), the bonding of atoms into solids by forming repeating patterns (grades 9–12), and using chemical formulas and balanced equations to quantitatively describe chemical reactions (grades 9–12).

- The Energy, Its Transformation and Matter standard lacks content on electrical circuits (grades 4–5), modes of heat transfer and thermal equilibrium (grades 6–8), and kinetic and potential energy (grades 9–12).

The Earth Systems and the Universe Strand

- The Universe standard lacks content on the characteristics of the sun (grades 6–8), the size of objects in space and astronomical

distance (grades 6–8), and star formation and destruction (grades 9–12).

- The Earth in the Solar System standard lacks content on the use of weather instruments to measure and record changes in weather (grades K–3), night and day as a result of the Earth's rotation (grades 4–5), the composition and structure of Earth's atmosphere and its role in weather patterns (grades 6–8), and factors that affect weather patterns (grades 6–8).

- The Forces that Shape the Earth standard lacks content on how water changes between a liquid and a solid and can disappear (grades K–3), and the properties and composition of soil (grades 3–5).

Benchmarks are generally at the appropriate level of difficulty

The science benchmarks are generally at the appropriate level of difficulty, building on earlier grade level concepts. However, content is covered at a later or earlier grade than in the reference documents in several instances. For example, the content addressed in the benchmark "Compare and contrast the body structures of organisms that contribute to their ability to survive and reproduce" (Unity and Diversity, grades 6–8) is covered in grades 3-5 in the reference documents. Similarly, content from the benchmarks "Compare and contrast ways in which selected cells are specialized to carry out particular life functions" and "Describe and explain the structure and functions of cells" (Cells, Tissues, and Organs, grades 9–12), "Describe waves and means of transmitting energy" (Energy, Its Transformation and Matter, grades 9–12), and "Describe and explain the effects of multiple forces acting on an object" (Forces, Motion, Sound, and Light, grades 9–12) is addressed in grades 6–8 in the reference documents.

There are a number of cases in which the content of the department's science standards appears *at an earlier grade level* than the reference documents: contributions to science and technology throughout history, the water cycle and its relation to weather and climate, the phases of the moon and eclipses, and the causes of earthquakes and volcanoes is covered in grades 4–5 by the department's science document and in grades 6–8 by the reference documents; gravitational force (i.e., every object exerts a gravitational force on every other object) is covered in grades 6–8 by the department's science document, but is addressed in grades 9–12 by the reference document.

Most benchmarks are not clear or specific enough

Most of the science benchmarks are not clear or specific enough to convey the exact content intended to be covered. For example, the benchmark "Analyze the forces and motions of moving objects and simple machines" (Forces, Motion, Sound, and Light, grades 9–12) leaves the reader to decide what aspects of forces and motions are to be considered (e.g., the object is being pushed gently backwards versus a more advanced, mathematical description of the magnitude and direction of the force and its effect on the object).

Many of the science benchmarks could be rewritten to clarify the concepts. For example, the concepts addressed in the benchmark "Explain how organisms respond to a constantly changing environment" (Interdependence standard, grades 4–5) become much more concrete for teachers and students alike by adding examples: "Explain how organisms respond to a constantly changing environment (e.g., some organisms move in, others move out; some organisms survive and reproduce, others die)."

Social studies standards lack important concepts, but standards are generally rigorous

The effective coverage of social studies content varies by the five social studies subject areas. The subject area of history covers the subject of historical perspective and historical inquiry but does not address the significant historical facts, events, and episodes that students should learn. This important and missing content is listed as topics in a "suggested framework," which leaves unclear what, if any, important history content is required of all students. This important missing content is the most significant problem in the history standards. When grade placement of content could be determined, it was found to be appropriate.

Civics standards covered the content well but also omitted some important content. In addition, some civics benchmarks were so broadly stated that it was unclear what students were required to learn. The area of cultural anthropology was covered well, although some concepts were repeated across grades, while others were incompletely defined. The economics benchmarks specified important content, but a few concepts were missing. The geography benchmarks also omitted some significant concepts or were too broad to allow for analysis. Some topics were repeated across grade clusters with insufficient distinctions in levels of difficulty between one grade cluster and the next.

Some historical content is missing

While the history standards do a good job of addressing historical inquiry, much historical content is missing when compared to reference documents. The highly rated documents in McREL's study included

numerous content standards on K–4 History, State History, U.S. History, and World History with each having benchmarks that addressed very specific content that students should be taught.

Because the department's history standards provide a framework entitled "Suggested Historical Framework for Implementing the Standards," the topical framework is only suggested and not mandatory. A student could complete high school without knowing historical facts, events, and episodes. The framework also lacks full coverage of two important periods and developments in world and U.S. history: the antebellum period in U.S. history and post-WWII independence movements. However, content present in the history standards was appropriately placed by grade clusters compared with the reference documents.

History benchmarks are at an appropriate level of specificity

The benchmarks in the history standard are written at an appropriate level of specificity. However, the topical approach to history in the suggested framework is too general when compared to the specific knowledge and skills found in the reference documents. For example, the suggested framework for grades 6-8 lists simply "Slavery in the Americas" as content to be considered for instruction. By contrast, this topic is identified much more thoroughly in the reference documents, as shown below:

> "Understands elements of African slavery during the colonial period in North America (e.g., the introduction and institutionalization of slavery in the colonies; responses of slaves to their condition; African slave culture, including food, shelter, recreation, and education; the impact of slavery on colonial life, including indentured servitude, the slave trade, the Middle Passage, and the Southern Plantation system; how slavery reshaped European and African life in the Americas)."

Civics standards lack important content and concepts

When compared to reference documents, the department's civics standards lack important content and concepts. The following concepts are missing or treated in only a very cursory fashion:

- Purpose and structure of the U.S. Constitution
- Types and systems of governments (e.g. federal, confederal, and unitary systems)
- Relationship of political organizations and groups to the governmental process

- Relationships between local, state, and federal governments
- American constitutional government
- Formation of the public agenda

Civics benchmarks are placed in appropriate grade clusters but some are too broad or duplicative

When content was specific enough in the political science/civics standards that it could be compared to the reference documents, it was found to be placed at an appropriate grade cluster. However, some benchmarks are too broad or appear to duplicate one another, and it is not clear what specific content should be taught at the given grade clusters. For example the following political science/civics benchmarks would benefit from a description of the types of tools and methods that students should be able to apply, and the level of knowledge appropriate at one grade cluster as compared to the next highest cluster:

> "Explain and apply tools and methods drawn from political science to examine political issues and/or problems." (grade cluster 6-8)
>
> "Apply tools and methods drawn from political science to develop and support a position on political issues." (grade cluster 9-12)

Other political science/civics benchmarks could be more specific, such as the following:

> "Argue the influences of America on other nations and organizations and vice versa and take and defend a position on particular interactions both historical and contemporary." (grade cluster 6-8)

If the benchmark were to focus on a particular aspect of America's influence (e.g., it's economic power, it's cultural impact), or on a particular period of history (e.g., the present day, or the early twentieth century), the benchmark would not be so unwieldy. Likewise, if there is a particular goal in mind, for example, to help students understand how the choices made at the executive or legislative branch can impact the perceptions other nations or organizations have of the United States, that aspect should be clearly specified.

Cultural anthropology benchmarks outline major concepts and are appropriately placed

The content standards for cultural anthropology offer a fairly comprehensive outline of the major concepts in the subject that even the most highly rated state standards do not address. When content was compared to the reference documents, it was found to be placed at the appropriate grade cluster.

Some cultural anthropology concepts are repeated across grade clusters

Some cultural anthropology concepts are repeated across grade clusters without clearly discriminating the knowledge and skills appropriate to each grade cluster. For example, the following benchmarks concerning the tools and methods used by anthropologists are written at three different grade clusters:

> "Use the tools and methods of anthropologists to compare, analyze, and interpret patterns of behavior to make informed decisions and solutions." (grade cluster 4-5)
>
> "Use tools, theories, and methods of anthropologists to examine persistent current issues and social problems and use the data to analyze personal and collective decisions." (grade cluster 6-8)
>
> "Use the research tools, procedures, and skills of anthropologists to develop informed positions on issues." (grade cluster 9-12)

It is not clear what the tools of anthropologists are, and what tools or methods would be appropriate for students to learn at grades 4–5 as opposed to 9–12.

Economics standards lack essential content

The economics standards lack essential content when compared to reference documents. Information not addressed or addressed in cursory fashion include the following:

- Competition
- Economic systems
- Money
- Consumption and production
- Government oversight and control

- Scarcity
- Employment/unemployment
- Inflation/deflation
- Export/import

Economics benchmarks are placed at appropriate grade clusters and are generally specific enough

When content was specific enough in the economics standards that it could be meaningfully compared to the reference documents, it was found to be placed at the appropriate grade clusters. The benchmarks generally are specific enough, with the exception of a few items. Some benchmarks would benefit from the addition of examples to clarify what students should know. For example, the following benchmark for grade cluster K-3 would be clearer if it were revised to provide a set of examples:

"Identify and explain a scarcity situation."

Geography standards lack important geographic content

The department's geography standards address important geographic content but lack important concepts and themes when compared to the reference documents. The following topics should be included or provided at a greater level of detail:

- Concept of region
- Cultural identity
- Erosion
- Plate tectonics (and other physical processes)
- Culture
- Cultural landscapes
- Natural hazards
- The impact of technology on the natural environment

Geography standards are placed at appropriate grade clusters but some benchmarks are not specific enough

When content was specific enough in the geography standards that it could be meaningfully compared to the reference documents, it was found to be placed at the appropriate grade clusters. However, some benchmarks are not written at a specific enough level to indicate what a student should learn about the subject matter. One example is the following benchmark for grade cluster 9-12:

> "Evaluate the importance of ecosystems in the environment."

It is not possible to determine from this description whether students should understand fairly basic concepts of ecosystems, how humans change ecosystems, or more advanced concepts regarding biological diversity or biological magnification in ecosystems.

A number of concepts in the geography standards are repeated across grade clusters, with no clear discrimination of the knowledge and skills appropriate to each grade cluster. For example, the following benchmarks address human modifications of the environment:

> "Analyze the consequences of human modifications of the physical environment in Hawaii, the United States and other parts of the world and implement a plan of action to address the consequences." (grade cluster 4-5)

> "Evaluate consequences of human activities on earth and implement a plan of action for the use and stewardship of local and global resources." (grade cluster 9-12)

It is not possible to discern what it is about the impact of human activities upon the physical environment that students should know at grades 9–12 that they would not learn at grades 4–5.

Conclusions

In summary, the content standards for the state of Hawaii are a good beginning but need additional work. Overall, the organization of the standards is good and the documents are easy to use. Some attention to clarifying the language of the documents, especially by the addition or expansion of glossaries and examples would help the average user. The organization and clarity varies by subject area; however, each should be examined and revised on its own merits. A good start has been made in content coverage, and in mathematics the job is nearly complete. However, science and social studies are of concern. Finally, a number of

benchmarks should be revised and made more concrete, providing teachers, students, and interested others a clearer sense of what it is that is expected from students at each stage of their education.

Recommendations

1. The Department of Education should make the following changes to the content standards to improve their coherence:

    a. The language arts content standards should be improved by removing the attitudes and engagement, and diversity strands from the content standards.

    b. The mathematics content standards should be improved by reviewing and revising benchmarks to establish a common level of specificity. In some cases, this might mean combining two or more benchmarks. In other cases, splitting a benchmark into two benchmarks may be needed.

    c. A number of benchmarks in the science standards that are too large or too small should be revised to reflect a consistent grain size for all benchmarks.

2. The Department of Education should make the following changes to the content standards to improve their clarity:

    a. Those strands in the language arts content standards that resemble general curriculum goals or statements about student dispositions should be moved to a different section of the document so that the standards exclusively address the knowledge and skills expected of students, as they do in the other subject areas. Broadly stated or imprecise benchmarks should be revised. Undefined technical terms and phrases should be placed in the glossary or made clear in the text by examples or explanations.

    b. The incomplete mathematics content standards glossary should be expanded to include terms of the discipline.

    c. The science content standards glossary should be expanded.

    d. Broadly stated benchmarks in the social studies content standards should be improved by the addition of examples. The glossary should be reviewed for completeness and appropriate terms should be added.

3. The Department of Education should make the following changes to the content standards to improve their comprehensiveness:

    a. Language arts benchmarks should be more specific. Broadly worded benchmarks and benchmarks that do not differentiate between grade-clusters should be revised and explanations or examples should be added. Some benchmarks (such as the writing conventions benchmarks) would be more appropriate if divided into several benchmarks, each with examples.

    b. The mathematics standards should be strengthened with the addition of content related to problem-solving skills and strategies.

    c. The science content standards should be revised to include important concepts and skills contained in highly regarded state standards documents. In addition, many science benchmarks should be revised to specify or clarify concepts.

    d. The topic listing from the "Suggested Historical Framework" in the social studies content standards should be amended to include missing topics and expanded considerably to address the level of content detail found in the reference documents. The topics, or a significant subset of them, should be part of the content standards themselves.

    e. The standards for political science/civics should be revised to include topics addressed in the reference documents and provide details and examples at the various grade levels.

    f. The content in the cultural anthropology standards should be reviewed for specificity. Expectations for student knowledge and skills should be more clearly defined, and the differences between grade clusters should be made more distinct.

    g. The standards for economics should be revised to include the topics addressed in the reference documents. Some benchmarks should be rewritten for clarity and provided with examples.

    h. The geography standards should be reviewed for missing content, and benchmarks should be rewritten to include examples. Content should also be reviewed to determine whether there are clear distinctions between the knowledge and skills students should learn at one grade cluster as compared with another.

Appendix A
Documents Used in the Assessment of Hawaii's Content Standards

Reference Documents

In order to evaluate the Department of Education's standards for their comprehensiveness, rigor, and level of detail, McREL analysts compared the subject-area content in these standards to the subject-area content identified in three technical studies conducted by McREL and published within the last several years:

John S. Kendall, et al., *A Distillation of Significant Subject-Matter Content from Selected State Standards Documents in the Subject Areas of Language Arts, Mathematics, and Science*, Aurora, Colorado, Mid-continent Research for Education and Learning, December 1999. [Online: http://www.mcrel.org/products/standards/distillation.asp]

John S. Kendall, Sara Young-Reynolds, and Lisa Schoch-Roberts, *A Distillation of Subject-Matter Content for the Subject Areas of Geography and History*, Aurora, Colorado, Mid-continent Research for Education and Learning, September 2000. [Online: http://www.mcrel.org/products/standards/geoghist.asp]

John S. Kendall and Robert J. Marzano, *Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education*, (3rd edition), Alexandria, Virginia, Association for Supervision and Curriculum Development, 2000.

These studies were termed 'reference documents' in the analysis of the Department of Education's standards. The first two studies listed above were designed to identify the knowledge and skills that are deemed most important for students to learn in the subject areas of geography, U.S. history, world history, state history, history for grades K–4, language arts, mathematics, and science. The standards and benchmarks identified in these studies reflect the subject-area content consistently identified in documents from a handful of states that were highly rated by national organizations for the quality of their standards. The purpose of these studies was to identify a reduced set of content that represents what is considered most important for students to learn by those states whose standards have been rated of the highest quality.

Methodology

Five state standards documents were selected to represent the exemplary content in each subject area. In order to select these documents, McREL analyzed the critical reviews of state documents conducted by three national organizations: the American Federation of Teachers, the

Fordham Foundation, and the Council for Basic Education. For each of the subject-areas, analysts ranked the states according to how well they fared in the national reviews.

For a complete discussion of the selection and ranking process, please consult Kendall et al., *A Distillation of Significant Subject-Matter Content from Selected State Standards Documents in the Subject Areas of Language Arts, Mathematics, and Science* (December 1999) and John S. Kendall, Sara Young-Reynolds, and Lisa Schoch-Roberts, *A Distillation of Subject-Matter Content for the Subject Areas of Geography and History* (September 2000). By area, the state documents that were most highly rated are listed below:

Language arts

Arizona Department of Education, "Language Arts Standards," 1999, retrieved from http://www.ade.state.az.us/standards/language-arts/ (18 May 1999).

Board of Education, Commonwealth of Virginia, *"Standards of Learning for Virginia Public Schools*," Richmond, Virginia, Board of Education, Commonwealth of Virginia, June, 1995.

California Department of Education, "English-Language Arts Content Standards for California Public Schools, Kindergarten Through Grade Twelve," 1998, retrieved from http://www.cde.ca.gov/board/standards.html (14 June 1999).

Massachusetts Department of Education, "The English Language Arts Curriculum Framework," February 1997, retrieved from http://www.doe.mass.edu/doedocs/frameworks/englishTOC.html (18 May 1999).

State of Wisconsin, Department of Public Instruction, "Wisconsin's Model Academic Standards for English Language Arts," Department of Public Instruction, 1999, Retrieved from http://www.dpi.state.wi.us/standards/elaintro.html (18 May 1999).

Mathematics

Board of Education, Commonwealth of Virginia, *"Standards of Learning for Virginia Public Schools*," Richmond, Virginia, Board of Education, Commonwealth of Virginia, June, 1995.

California State Board of Education, "The California Mathematics Academic Content Standards," Prepublication Ed., February 2, 1998, retrieved from http://www.cde.ca.gov/board/K12math_standards.html (February 1999).

Ohio Department of Education, Division of Elementary and Secondary Education, *"Model Competency-Based Mathematics Program*," Columbus, Ohio, Ohio Department of Education, Division of Elementary and Secondary Education, November, 1990.

Utah State Office of Education, "Core Curriculum Standards: Mathematics," 1994, retrieved from http://www.uen.org/cgi-bin/websql/lessons/query_lphts?corearea=2&area=1 (18 June 1999).

West Virginia Department of Education, *"West Virginia Programs of Study: Instructional Goals and Objectives*," Charleston, West Virginia, West Virginia Department of Education, June, 1995.

Science

Arizona Department of Education, "Science Standards," August 24, 1998, retrieved from http://www.ade.state.az.us/standards/science/ (17 June 1999).

California State Board of Education, "Science Content Standards Grades K-12," Prepublication Ed., February 2, 1998, retrieved from http://www.cde.ca.gov/board/science.html (17 June 1999).

Connecticut State Department of Education, "Science Curriculum Framework," Connecticut State Department of Education, Division of Teaching and Learning, March, 1998, retrieved from http://www.state.ct.us/sde/brta/framewrk/frame.pdf (17 June 1999).

Delaware Department of Education, "Science Language Arts Curriculum Framework," June, 1995, retrieved from http://www.doe.state.de.us/Standards/Science/ (18 August 1999).

Rhode Island Department of Education, "Rhode Island Science Framework," August 14, 1996, retrieved from http://instruct.ride.ri.net/doehome/scope.html (17 June 1999).

Social studies (geography)

Alabama State Department of Education, "Alabama Course of Study: Social Studies," February, 1998, retrieved from http://www.alsde.edu/default.asp?info=2&toc=2&sSectionID=8&ProjectID=109 (20 June 2000).

Arizona Department of Education, "Social Studies Standards," 2000, retrieved from http://www.ade.state.az.us/standards/sstudies/standard1.html (20 June 2000).

Kansas State Board of Education, “Kansas Curricular Standards for Civics-Government, Economics, Geography, and History,” Kansas State Board of Education, July 1999, retrieved from http://www.ksbe.state.ks.us/outcomes/socialstudies.html (20 June 2000).

Louisiana State Department of Education, “Social Studies Content Standards,” May, 1997, retrieved from http://www.lcet.doe.state.la.us/doe/asps/home.asp?I=CONTENT (20 June 2000).

South Carolina State Department of Education, “Curriculum Standards: Social Studies,” 2000, retrieved from http://www.state.sc.us/sde/educator/standard/socstd/index.html (20 June 2000).

Social studies (history)

Alabama State Department of Education, “Alabama Course of Study: Social Studies,” February, 1998, retrieved from http://www.alsde.edu/default.asp?info=2&toc=2&sSectionID=8&ProjectID=109 (20 June 2000).

Arizona Department of Education, “Social Studies Standards,” 2000, retrieved from http://www.ade.state.az.us/standards/sstudies/standard1.html (20 June 2000).

Board of Education, Commonwealth of Virginia, *"Standards of Learning for Virginia Public Schools*," Richmond, Virginia, Board of Education, Commonwealth of Virginia, June, 1995.

California State Board of Education, *"History-Social Science Content Standards for California Public Schools: Kindergarten Through Grade Twelve*," Sacramento, California, California State Board of Education, 2000.

Kansas State Board of Education, “Kansas Curricular Standards for Civics-Government, Economics, Geography, and History,” July 1999, retrieved from http://www.ksbe.state.ks.us/outcomes/socialstudies.html (20 June 2000).

Once the five state documents were selected for a given subject area, the content was synthesized and reduced to that set of knowledge and skills that was found to be common across a majority of the selected documents. The method employed varied somewhat by subject area; for a complete discussion, readers are invited to consult Kendall et al., *A Distillation of Significant Subject-Matter Content from Selected State Standards Documents in the Subject Areas of Language Arts, Mathematics, and Science* (December 1999) and John S. Kendall, Sara

Young-Reynolds, and Lisa Schoch-Roberts, *A Distillation of Subject-Matter Content for the Subject Areas of Geography and History* (September 2000).

For three subject-areas—cultural anthropology, political science/civics, and economics—similar technical studies as those described were not available for comparison purposes because state standards in these subject areas have not been rated by national organizations. Thus, in order to develop a comparison set of reduced yet significant content, McREL conducted a separate analysis of the common content as it appears in national documents from the subject areas, rather than highly rated state standards documents. McREL conducted an analysis of the knowledge and skills for these subject areas as identified in *Content Knowledge: A Compendium of Standards in K–12 Education, 3rd Edition* (Kendall & Marzano, 2000). The analysis resulted in a set of content, which was used to compare against the Department of Education's standards. By area, the documents that were synthesized for this analysis are listed below:

Social studies (civics)

Charles N. Quigley, Charles F. Bahmmeller, and John Buchanan, Jr. (eds.), *Civitas: A Framework for Civic Education*, Calabasas, California, Center for Civic Education, 1991.

Center for Civic Education, *National Standards for Civics and Government*, Calabasas, California, Center for Civic Education, 1994.

National Assessment of Educational Progress Civics Consensus Project, *Civics Framework for the 1998 National Assessment of Educational Progress*, Washington, DC, National Assessment Governing Board, (n.d.).

National Business Education Association, *National Standards for Business Education: What America's Students Should Know and Be Able To Do in Business*, Reston, Virginia, National Business Education Association, 1995.

Social studies (economics)

Colorado Council on Economic Education, *Economics: Conceptual Content Standards, Grades K-12*, (Draft), Denver, Colorado, Colorado Council on Economic Education, 1994.

EconomicsAmerica: National Council on Economic Education, *Voluntary National Content Standards*, New York, New York, National Council on Economic Education, 1997.

International Baccalaureate, *Economics,* Geneva, Switzerland, International Baccalaureate, 1996.

June Gilliard, et al., *Economics, What and When: Scope and Sequence Guidelines, K-12,* 2nd printing, New York, New York, Joint Council on Economic Education, 1989.

National Business Education Association, *National Standards for Business Education: What America's Students Should Know and Be Able To Do in Business*, Reston, Virginia, National Business Education Association, 1995.

National Council for the Social Studies, *Expectations of Excellence: Curriculum Standards for Social Studies*, Washington, DC, National Council for the Social Studies, 1994.

Phillip Saunders and June Gilliard (eds.), *A Framework for Teaching Basic Economic Concepts with Scope and Sequence Guidelines, K-12,* New York, New York, National Council on Economic Education, 1995.

Social studies (behavioral studies)

International Baccalaureate, *Psychology*. Geneva, Switzerland, International Baccalaureate, 1996.

International Baccalaureate, *Social Anthropology*. Geneva, Switzerland, International Baccalaureate, 1996.

National Council for the Social Studies, *Expectations of Excellence: Curriculum Standards for Social Studies*, Washington, DC, National Council for the Social Studies, 1994.

Project 2061, American Association for the Advancement of Science, *Benchmarks for Science Literacy*, New York, New York, Oxford University Press, 1993.

Summary

The reference documents identify the knowledge and skills that are consistently found within and across highly rated state standards documents or significant national documents in the subject areas. These studies were used as a means of comparison to determine the adequacy of content coverage, that is, the comprehensiveness, of the Department of Education's standards. The studies also provided a means of comparison for grade-cluster placement of curriculum content. Finally, the documents provided a means of comparison regarding the specificity, or detailed description of content, that was common across the selected reference documents.

Appendix B
Glossary of Terms

Benchmarks: statements about what students are expected to know and be able to do at the end of each grade cluster.

Content standards: statements that clearly define what students should know and be able to do in various subject areas and at different points in their education.

Curriculum: activities and lessons, instructional materials, and instructional strategies – the activities that are carried out on a day-to-day basis in the classroom.

Grain size: the amount of content that is addressed in the benchmark. Each benchmark needs to have generally uniform level of detail.

Performance indicator: a description of the product or performance that a student needs to produce to indicate that the student has achieved a content standard.

Performance standards: concrete examples and explicit definitions of how well students must learn the material presented by content standards. Performance 'levels' may also be used to define students' demonstrated proficiency at various points as they progress toward a standard.

Standards: statements that tell what students should know and be able to do and how well they should do it. Standards define what is to be learned at certain points in time, and from a broad perspective, what performances will be accepted as evidence that the learning has occurred.

Strands – the organization of content standards into major categories.

Appendix B
Glossary of Terms

Benchmarks: statements about what students are expected to know and be able to do at the end of each grade cluster.

Content standards: statements that clearly define what students should know and be able to do in various subject areas and at different points in their education.

Curriculum: activities and lessons, instructional materials, and instructional strategies – the activities that are carried out on a day-to-day basis in the classroom.

Grain size: the amount of content that is addressed in the benchmark. Each benchmark needs to have generally uniform level of detail.

Performance indicator: a description of the product or performance that a student needs to produce to indicate that the student has achieved a content standard.

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Standards: statements that tell what students should know and be able to do and how well they should do it. Standards define what is to be learned at certain points in time, and from a broad perspective, what performances will be accepted as evidence that the learning has occurred.

Strands – the organization of content standards into major categories.

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Appendix C
Language Arts Content Standards

STRAND	COMPONENT		
	READING AND LITERATURE	WRITING	ORAL COMMUNICATION
RANGE	Students will read a range of literary and informative texts for a variety of purposes.	Students will write using various forms to communicate for a variety of purposes and audiences.	Students will communicate orally using various forms-inter-personal, group, and public—for a variety of purposes and situations.
PROCESSES	Students will use strategies within the reading processes to construct meaning.	Students will use writing processes and strategies appropriately and as needed to construct meaning and communicate effectively.	Students will use strategies within speaking and listening processes to construct and communicate meaning.
CONVENTIONS AND SKILLS	Students will apply knowledge of the conventions of language and texts to construct meaning.	Students will apply knowledge and understanding of the conventions of language and research when writing.	Students will apply knowledge of verbal and nonverbal language to communicate effectively.
RESPONSE AND RHETORIC	Students will respond to texts from a range of instances: initial understanding, personal, interpretive, and critical.	Students will use rhetorical devices to craft writing appropriate to audience and purpose.	Students will adapt messages appropriate to audience, purpose, and situation.
ATTITUDES AND ENGAGEMENT	Students will demonstrate confidence as readers, and find value and satisfaction in reading and sharing reading experiences with others.	Students will demonstrate confidence as writers, and find value and satisfaction in writing and sharing writing with others.	Students will demonstrate confidence as communicators, and find value and satisfaction in communicating with others.
DIVERSITY	Students will interact thoughtfully and respectfully with texts that represent diversity in language, perspective, and/or culture.	Students will understand diversity in language, perspective, and/or culture in order to craft texts that represent diverse thinking and expression.	Students will understand diversity in language, perspective, and/or culture and use speaking and listening to foster understanding.

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Appendix D
Mathematics Content Standards

NUMBER AND OPERATION	MEASUREMENT	GEOMETRY AND SPATIAL SENSE	PATTERNS, FUNCTIONS, AND ALGEBRA	DATA ANALYSIS, STATISTICS, AND PROBABILITY
Understand numbers, ways of representing numbers, relationships among numbers, and number systems.	Understand attributes, units, and systems of units in measurement, and develop and use techniques, tools, and formulas for measuring.	Analyze properties of objects and relationships among the properties.	Understand various types of patterns and functional relationships.	Pose questions and collect, organize, and represent data to answer those questions.
Understand the meaning of operations and how they relate to each other.		Use transformations and symmetry to analyze mathematical situations.	Use symbolic forms to represent, model, and analyze mathematical situations.	Interpret data using methods of exploratory data analysis.
Use computational tools and strategies fluently and when appropriate, use estimation.		Use visualization and spatial reasoning to solve problems both within and outside of mathematics.		Develop and evaluate inferences, predictions, and arguments that are based on data.
		Select and use different representational systems, including coordinate geometry.		Understand and apply basic notions of chance and probability.

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Appendix E
Science Content Standards

DOMAIN I: HOW HUMANS THINK WHILE UNDERSTANDING THE NATURAL WORLD	
STRAND	**CONTENT STANDARD**
SCIENCE AS INQUIRY	DOING SCIENTIFIC INQUIRY. Students demonstrate the skills necessary to engage in scientific inquiry.
HABITS OF MIND	LIVING THE VALUES, ATTITUDES AND COMMITMENTS OF THE INQUIRING MIND. Students apply the values, attitudes and commitments characteristic of an inquiring mind. USING UNIFYING CONCEPTS AND THEMES. Students use concepts and themes such as system, change, scale, and model to unify the disciplines and help them understand and explain the natural world.
SAFETY	DOING SAFETY. Students demonstrate the importance of safety by applying safety skills in all activities.
SCIENCE AND TECHNOLOGY IN SOCIETY	RELATING THE NATURE OF TECHNOLOGY TO SCIENCE. Students use the problem-solving process to address current issues involving human adaptation in the environment.

Appendix E (continued)
Science Content Standards

DOMAIN II: WHAT WE KNOW TODAY ABOUT THE WORLD AROUND US	
STRAND	**CONTENT STANDARD**
HISTORICAL PERSPECTIVES	UNDERSTANDING SCIENTIFIC INQUIRY AND THE CHARACTER OF SCIENTIFIC KNOWLEDGE. Students explain the process of how scientific knowledge is generated by scientific inquiry, and are able to critique a scientific investigation. INTERDEPENDENCE OF SCIENCE, TECHNOLOGY AND SOCIETY. Students analyze and evaluate the interdependence of science, technology, and society. MALAMA I KA 'AINA: SUSTAINABILITY. Students make decisions needed to sustain life on Earth now and for future generations by considering the limited resources and fragile environmental conditions.
ORGANISMS AND DEVELOPMENT	UNITY AND DIVERSITY. Students examine the unity and diversity of organisms and how they can be compared scientifically. INTERDEPENDENCE. Students describe, analyze, and give examples of how organisms are dependent on one another and their environments. CYCLE OF MATTER AND ENERGY FLOW. Students trace the cycling of matter and the flow of energy through systems of living things. BIOLOGICAL EVOLUTION. Students examine evidence for the evolution of life on Earth and assess the arguments for natural selection as a scientific explanation of biological evolution. HEREDITY. Students describe how variations in biological traits are passed on to successive generations. CELLS, TISSUES AND ORGANS. Students explain the structure, functions, and reproduction of living cells. HUMAN DEVELOPMENT. Students explain the important aspects of human development from fertilization to death and compare it with other organisms.
UNDERSTANDING OURSELVES AND THE WORLD AROUND US	WELLNESS. Students appraise the relationships between their bodily functions and their physical and mental well being. LEARNING AND HUMAN BEHAVIOR. Students explain what influences learning and human behavior.
THE PHYSICAL ENVIRONMENT	THE NATURE OF MATTER. Students examine the scientific view of the nature of matter and how that view evolved. ENERGY, ITS TRANSFORMATION AND MATTER. Students identify the different forms of energy and explain transformation of energy and its significance in understanding the structure of matter and the Universe. FORCES, MOTION, SOUND AND LIGHT. Students explain the relationship between force, mass and motion of objects; they analyze the nature of sound and electromagnetic radiation.
EARTH SYSTEMS AND THE UNIVERSE	UNIVERSE. Students discuss current scientific views of the Universe. FORCES OF THE UNIVERSE. Students explain the major forces in nature: gravitational, electrical and magnetic. EARTH IN THE SOLAR SYSTEM. Students discuss how the earth-moon-sun system causes seasons, moon phases, climate, weather and global changes. FORCES THAT SHAPE THE EARTH. Students analyze the scientific view of how the earth's surface is formed.

Appendix F
Social Studies Content Standards

HISTORY	POLITICAL SCIENCE/ CIVICS	CULTURAL ANTHROPOLOGY	GEOGRAPHY	ECONOMICS
CHANGE, CONTINUITY, CAUSALITY Employ chronology to understand change and/or continuity and cause and/or effect in history.	GOVERNANCE/ POWER/AUTHORITY Understand the ways and reasons people and groups create governments and use this knowledge to make reasoned decisions.	CULTURAL SYSTEMS Understand culture as a system of beliefs, knowledge, and practices shared by a group.	WORLD IN SPATIAL TERMS Use geographic representations to organize, analyze, and present information on people, places, and environments.	LIMITED RESOURCES AND CHOICE Understand costs and benefits of economic choice and use this knowledge to make sound economic decisions.
HISTORICAL EMPATHY Learn to judge the past on its own terms and use that knowledge to understand present day issues, problems, and decision-making.	DEMOCRACY Understand and demonstrate the principles and values underlying American constitutional democracy.	CULTURAL DIVERSITY AND UNITY Understand and respect the myriad of ways that society addresses human needs and wants.	PLACES AND REGIONS Understand how distinct physical and human characteristics shape places and regions.	ROLE AND FUNCTION OF MARKETS Understand how markets function and analyze the role of prices and incentives to realize how economic interactions affect human behavior.
HISTORIC INQUIRY Use the tools and methods of historians to transform learning from memorizing historical data to "doing history."	GLOBAL COOPERATION, CONFLICT, AND INTERDEPENDENCE Understand similarities and differences across cultural perspectives, and evaluate the ways individuals, groups, societies, nations, and organizations change, and interact.	CULTURAL DYNAMICS/ CHANGE AND CONTINUITY Understand culture as dynamic, selective, adaptive, and ever changing.	PHYSICAL SYSTEMS Understand how physical processes shape Earth's surface, and create, sustain, and modify the ecosystems.	ECONOMIC INTERDEPENDENCE Evaluate the costs and benefits of trade among individuals, nations, and organizations to explain why trade results in higher overall levels of production and consumption.
HISTORICAL PERSPECTIVES AND INTERPRETATIONS Explain historical events with multiple interpretations rather than explanations that point to historical linearity or inevitability.	CITIZENSHIP/ PARTICIPATION Understand roles, rights (personal, economic, political), and responsibilities of American citizens and exercise them in civic action.	CULTURAL INQUIRY Use the tools and methodology of social scientists to explain and interpret ideas and events.	HUMAN SYSTEMS Analyze how people organize their activities on earth through their analysis of human populations, cultural mosaic, economic interdependence, settlement, and conflict and cooperation.	ROLE OF GOVERNMENT Understand how the government influences the well being of people and institutions.
HISTORICAL FRAMEWORK See suggested historical framework in Social Studies Content Standards Document.	POLITICAL ANALYSIS Understand and use the tools and methods of the political scientist to explain ideas, events, and behaviors and use this knowledge to make reasoned decisions.		ENVIRONMENT AND SOCIETY Demonstrate stewardship of earth's resources through the understanding of society and the physical environment.	ECONOMIC ANALYSIS Understand and use the tools of the economist to make informed decisions.

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Notes

Chapter 1

1. Education Commission of the States, *So You Have Standards: Now What?* Denver, Colorado, Education Commission of the States, February 1997, p. 2.

2. Ibid., p. 2.

3. Hawaii, Department of Education, *Making Sense of Standards: Moving from the Blue Book to HCPS II*, Honolulu, July 1999, p. 18.

4. Tucker, Marc. S., and Codding, Judy B., *Standards For Our Schools: How to Set Them, Measure Them, and Reach Them,* San Francisco, Jossey-Bass Publishers, 1998, p. 49.

5. Elmore, Richard F., and Rothman, Robert, Ed., *Testing, Teaching, and Learning: A Guide for States and School Districts,* Washington, D.C., 1999, p. 33.

6. Hanshe, Linda N., *Handbook for the Development of Performance Standards: Meeting the Requirements of Title I*, U.S. Department of Education Office of Elementary and Secondary Education and the Council of State School Officers, 1998, p. 16.

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Responses of the Affected Agencies

Comments on Agency Responses

We transmitted drafts of this report to the Board of Education and the Department of Education on September 26, 2001. A copy of the transmittal letter to the Department of Education is included as Attachment 1. The Department of Education's response is included as Attachment 2. The Board of Education did not respond.

The department stated that it is in agreement with the recommendations regarding the content standards and benchmarks. It also concurs that there is a need for additional work to ensure that the content and performance standards clearly define what is expected of students at each stage of their education. The department reported on its commitment to clarify the language of the standards documents, revise the benchmarks, expand the glossaries, strengthen the content, and specify what should be learned within the grade level clusters.

The department intends to conduct a comprehensive review of the recommendations to propose modifications to the standards in preparation for a legislatively required performance standards review. The department also reported on its efforts to develop K-12 grade level objectives aligned to the content standards and benchmarks.

ATTACHMENT 1

STATE OF HAWAII
OFFICE OF THE AUDITOR
465 S. King Street, Room 500
Honolulu, Hawaii 96813-2917

MARION M. HIGA
State Auditor

(808) 587-0800
FAX: (808) 587-0830

September 26, 2001

COPY

The Honorable Paul G. LeMahieu
Superintendent of Education
Department of Education
Queen Liliuokalani Building
1390 Miller Street
Honolulu, Hawaii 96813

Dear Dr. LeMahieu:

Enclosed for your information are three copies, numbered 6 to 8 of our draft report, *A Review and Assessment of the Department of Education's Development of Educational Standards*. We ask that you telephone us by Friday, September 28, 2001, on whether or not you intend to comment on our recommendations. If you wish your comments to be included in the report, please submit them no later than Friday, October 5, 2001.

The Board of Education, Governor, and presiding officers of the two houses of the Legislature have also been provided copies of this draft report.

Since this report is not in final form and changes may be made to it, access to the report should be restricted to those assisting you in preparing your response. Public release of the report will be made solely by our office and only after the report is published in its final form.

Sincerely,

Marion M. Higa
State Auditor

Enclosures

BENJAMIN J. CAYETANO
GOVERNOR

PAUL G. LeMAHIEU, Ph.D.
SUPERINTENDENT

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF THE SUPERINTE

October 5, 2001

Ms. Marion M. Higa
State Auditor
Office of the Auditor
465 South King Street, Room 500
Honolulu, Hawai`i 96813-2917

Dear Ms. Higa:

Thank you for the opportunity to respond to the draft report, *A Review and Assessment of the Department of Education's Development of Educational Standards*. We are in agreement with the recommendations made by Mid-continent Research for Education and Learning (McREL) regarding the content standards and benchmarks in Language Arts, Mathematics, Science and Social Studies. The report recommendations will help with the revision and improvement of our Hawai`i Content and Performance Standards (HCPS), especially during the next monitoring of the standards with the Board of Education.

Currently underway are efforts to support the implementation of the HCPS which include the development of K-12 grade level objectives in a scope and sequence format for the four core areas of Language Arts, Mathematics, Science, and Social Studies. The scope and sequence is aligned to the content standards/benchmarks and provide clearer expectations of what students need to learn in each grade level. The content area objectives were determined by first engaging a representative group of classroom teachers in discussion about what is taught in each grade level for the specific benchmarks. The next step was to bring teachers back from the first group and new teachers to review the first draft of the objectives. Finally, the draft is reviewed by Department of Education content area educational specialists, resource teachers and post secondary educators to ensure that there are no gaps in grade level transition, content area knowledge and alignment to post-secondary educational institution entrance requirements.

The first round of workshops are completed for Math and Language Arts, but further validation in schools may be necessary to refine the document. This will be determined after a final draft is completed. The Social Studies and Science grade level objective development workshop will be held on October 24-25, 2001 and October 29-30, 2001.

We concur with the report's findings that while we have a good beginning, there is need for additional work to ensure that the HCPS clearly define for educators, parents, students and interested others, what is expected of students in each stage of their education. Our commitment is to clarify the language of the document, revise the benchmarks, expand the glossaries, strengthen the content within the standards, and provide specificity to indicate what should be learned within the grade level clusters. From the outset, we have conceived of the standards as "living documents" open to revision and improvement over time. We take your findings, therefore, to be important validation of this disposition. This work has just begun.

The School Renewal Branch of the Division of Learner, Teacher, and School Support (DLTSS) will engage educational specialists, disciplinary scholars, and other professional colleagues assigned to each of the content areas in a comprehensive review of the audit report recommendations. This internal process of modifications to the Hawai`i Content and Performance Standards will begin, based on the findings by McREL. These draft changes will be shared with the Board of Education in preparation of the performance standards review. Should you be interested, we would be pleased also to share them with you.

The periodic review process is required by the provisions of the Hawai`i Revised Statute, HRS 302A-201, Student Performance Standards. The Board of Education is charged with appointing a performance standards review commission "to be convened at the beginning of the 1997-1998 school year and every four years thereafter to assess the effectiveness of the standards." The next commission will be provided a copy of the audit report to use in its review of the HCPS. The recommendations from the review and assessment of the Hawai`i standards will provide a foundation for the development of the report to the Board of Education and the Legislature on any modifications to the current standards document.

We appreciate the thoughtful professionalism of your office staff members throughout the audit process. Please accept and extend to them our respect and gratitude. Should you need any further assistance, please contact Ms. Ann Mahi, Director of the School Renewal Branch at 394-1300.

Very truly yours,

Paul G. LeMahieu, Ph.D.
Superintendent of Education

PLeM:AM

c: Division of Learner, Teacher, and School Support