

Coding Procedures for Curriculum Content Analyses

Materials included in this packet:

Rating Sheet
Comments & Suggestions worksheet
Subject Topic List
Categories of Student Expectations (Cognitive Demand) List

Introduction

Thank you for your participation in this content analysis workshop. Your assistance will assist us in collecting descriptive information about the subject matter content contained in the assessments and standards documents to be analyzed. Our goal is to content analyze several state standards and assessments using a two-dimensional taxonomy for describing subject matter content.

The data collected will be summarized into content maps and graphs that can be used to highlight the relative emphasis of academic content embedded in these curriculum related documents. The resulting content maps and graphs permit graphic comparisons of teacher reports of instructional content with locally relevant assessment instruments or standards. Content analysis will also serve to support alignment analyses into the relationships between instruction, assessment and standards. Results will be used to support the information needs of participating states, districts and schools, and will also be used in analyses associated with several NSF funded studies being conducted in the states and districts represented at this workshop.

Coding Dimensions

Topics

Each assessment item is to be rated on two intersecting dimensions. The first dimension relates to subject topic. Topic lists are organized by grade band and subject. The appropriate topic lists are contained in this packet, covering K-8 and High School curriculum content. The topic lists are organized at two levels. The more general level identifies content areas (e.g. Number Sense, Measurement, Algebraic Concepts in math; or Energy, Biochemistry, Genetics in science, etc.) Within each of these content areas are listed some number of topics associated with that content area. You will note that each topic has a three- or four-digit number listed to its left. This number is the 'topic code' and is to be entered on the rating sheet to identify the particular topic(s) associated with a given assessment item or standard strand or goal. Though each content area also has a number code associated with it, most coding is done at the fine grain, or topic level that most content coding is to be done. Exceptions to this rule are discussed in the coding conventions section below.

Expectations for Students (Cognitive Demand)

In addition, assessment items are coded in terms of the expectations for student performance (or cognitive demand) targeted by a given item or standard. Your packet contains a list of cognitive expectations for the appropriate subject(s), organized into five categories. Each category is defined using a list of descriptors to identify the types of cognitive demand associated with a given category of student expectation. It should be noted that the descriptors listed for each category are not exhaustive, but intended to be illustrative of the types of activities associated with each category. Unlike the topic list, raters are not asked to code at this fine-grain level of cognitive demand descriptors. Cognitive demand is coded only at the broader categorical level of student expectation. Each category is given a letter designation (B-F) to be used for coding purposes.

Procedures

1. *Pre-coding Exercise*

A sample set of assessment items will be content analyzed individually by each rater using the coding procedures described below. These sample items and their related content codes will then be discussed by each rating team in order to establish a common understanding and set of coding conventions for conducting the content analyses of the various documents. Note the coding conventions listed at the end of this handout. Any additional conventions agreed upon by your team should be noted in the “Comments & Suggestions Worksheet” located in you packet.

2. *Rating Form Identification*

Please make sure that you complete the information listed at the top of each rating form. This includes:

- District/State (as applicable)
- Assessment Name (e.g. Terra Nova, SAT-9, or relevant state assessment)
- Rater# (refer to the label on your folder)
- Subject (mathematics, science or language arts)
- Test Form (if applicable)
- Rating form page # (if more than two rating forms are required)

3. *Coding Procedures.*

Below is an excerpted line from the sheet you will record content codes on.

| Item Number | Content Code 1 | | Content Code 2 | | Content Code 3 | |
|-------------|----------------|--------------------|----------------|--------------------|----------------|--------------------|
| | Topic Code 1 | Expectation Code 1 | Topic Code 2 | Expectation Code 2 | Topic Code 3 | Expectation Code 3 |
| 1 | 503 | B | | | | |

The correct way to record a content code (**503B**) is illustrated in the column in the above table labeled **Content Code 1**. Note that the number for the Sub-Topic and the letter for the Student Expectation are placed in separate cells. Every content code should consist of both a topic number and a cognitive demand letter, even if one or the other repeats a previous code for that item.

Every item should be given at least 1 content code. **Up to three separate *topic by expectation combinations*** may be selected for any one assessment item, and up to six ***topic by expectation combinations*** may be coded for standards and/or other curriculum materials. For example, an assessment item might relate to two distinct topic areas, while involving only one student expectation category. In that case, the coder would enter two different topic codes in cells **Topic Code 1** and **Topic Code 2** on the Coding Sheet, but would enter the same expectation code in cells **Expectation Code 1** and **Expectation Code 2**. As another example, an item might be coded with three distinct topic by expectation combinations, with perhaps one topic being associated with two types of expectations, while a second topic is associated with yet a third category of expectation. Such an example might be coded as follows:

| Item Number | Content Code 1 | | Content Code 2 | | Content Code 3 | |
|-------------|----------------|--------------------|----------------|--------------------|----------------|--------------------|
| | Topic Code 1 | Expectation Code 1 | Topic Code 2 | Expectation Code 2 | Topic Code 3 | Expectation Code 3 |
| 1 | 103 | B | 103 | D | 102 | C |

Again, up to 3 topic by expectation combinations may be coded for each assessment item, and six combinations for each standard strand or curriculum materials section. Should an coding item be so complex as to suggest more than these limits, select the most dominant elements of the item to code up to the accepted limit of content codes.

Coding Conventions

Occasionally items are difficult to code with the taxonomy. The following coding conventions have been established to cover most situations.

1. If you determine that an item or standard cannot be associated with a specific topic in the taxonomy, then:

If the content to code fits a general content area, but is *not specific enough to identify a particular topic*, use the code for the major content area, (e.g., "200" for "Measurement" in mathematics, or "500" for "Science & Technology" in science).

If the content pertains to a *specific topic not listed in the taxonomy*, use the code for the most appropriate content area, and add "90" for the last two digits, (e.g., "290" for "Measurement" in mathematics, or "590" for "Science & Technology" in science).

Use the Topic code "000" cases where you determine there is *no appropriate content code whatsoever in the topic list* that fits a given item or standard.

Use the Topic code "999" in cases where you determine the item *refers to content out of subject area* (e.g., science content on a mathematics test).

2. If you determine that an item or standard *cannot be associated with a specific category of cognitive demand*, enter a "Z" in the cognitive demand cell.
3. If you use any of the above conventions, please include a suggestion for an additional content area, topic or cognitive demand descriptor on the *Comments & Suggestions worksheet* in you packet. This will assist us in considering future revisions to the taxonomies. (Please be sure return the "Comments and Suggestions" worksheet to one of the workshop staff before leaving.)
4. **If your coding team establishes additional conventions for coding items, please note these as well on the Comments & Suggestions worksheet.**

Rater:

Subject:

| | Itm. Desig./Nbr. | Content Code 1 | | Content Code 2 | | Content Code 3 | |
|----|------------------|----------------|------|----------------|------|----------------|------|
| | | TPC1 | CGD1 | TPC2 | CGD2 | TPC3 | CGD3 |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |
| 21 | | | | | | | |
| 22 | | | | | | | |
| 23 | | | | | | | |
| 24 | | | | | | | |
| 25 | | | | | | | |
| 26 | | | | | | | |
| 27 | | | | | | | |
| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | | | | | | | |
| 31 | | | | | | | |
| 32 | | | | | | | |
| 33 | | | | | | | |
| 34 | | | | | | | |
| 35 | | | | | | | |
| 36 | | | | | | | |
| 37 | | | | | | | |
| 38 | | | | | | | |
| 39 | | | | | | | |

Form:

Page

of

| | Itm. Desig./Nbr. | Content Code 1 | | Content Code 2 | | Content Code 3 | |
|----|------------------|----------------|------|----------------|------|----------------|------|
| | | TPC1 | CGD1 | TPC2 | CGD2 | TPC3 | CGD3 |
| 40 | | | | | | | |
| 41 | | | | | | | |
| 42 | | | | | | | |
| 43 | | | | | | | |
| 44 | | | | | | | |
| 45 | | | | | | | |
| 46 | | | | | | | |
| 47 | | | | | | | |
| 48 | | | | | | | |
| 49 | | | | | | | |
| 50 | | | | | | | |
| 51 | | | | | | | |
| 52 | | | | | | | |
| 53 | | | | | | | |
| 54 | | | | | | | |
| 55 | | | | | | | |
| 56 | | | | | | | |
| 57 | | | | | | | |
| 58 | | | | | | | |
| 59 | | | | | | | |
| 60 | | | | | | | |
| 61 | | | | | | | |
| 62 | | | | | | | |
| 63 | | | | | | | |
| 64 | | | | | | | |
| 65 | | | | | | | |
| 66 | | | | | | | |
| 67 | | | | | | | |
| 68 | | | | | | | |
| 69 | | | | | | | |
| 70 | | | | | | | |
| 71 | | | | | | | |
| 72 | | | | | | | |
| 73 | | | | | | | |
| 74 | | | | | | | |
| 75 | | | | | | | |
| 76 | | | | | | | |
| 77 | | | | | | | |
| 78 | | | | | | | |

K-12 Mathematics Content Areas

| | |
|--|--------------------------------------|
| 100 Nbr. sense /Properties/ Relationships | 900 Data Displays |
| 200 Operations | 1000 Statistics |
| 300 Measurement | 1100 Probability |
| 400 Consumer Applications | 1200 Analysis |
| 500 Basic Algebra | 1300 Trigonometry |
| 600 Advanced Algebra | 1400 Special Topics |
| 700 Geometric Concepts | 1500 Functions |
| 800 Advanced Geometry | 1600 Instructional Technology |

| | |
|------------|--|
| 100 | Nbr. sense /Properties/ Relationships |
| 101 | Place value |
| 102 | Whole numbers |
| 103 | Operations |
| 104 | Fractions |
| 105 | Decimals |
| 106 | Percents |
| 107 | Ratio, proportion |
| 108 | Patterns |
| 109 | Real numbers |
| 110 | Exponents, scientific notation |
| 111 | Factors, multiples, divisibility |
| 112 | Odds/evens/primes/composites/square nbrs. |
| 113 | Estimation |
| 114 | Nbr. Comparisons (order, relative size, inverse, opposites, equivalent forms, scale) |
| 115 | Order of operations |
| 116 | Computational Algorithms |
| 117 | Relationships between operations |
| 118 | Number Theory, non base-ten systems |
| 119 | Mathematical properties (e.g., distr. property) |
| 190 | Other |
| 200 | Operations |
| 201 | Add, subtract whole numbers |
| 202 | Multiplication whole numbers |
| 203 | Division whole numbers |
| 204 | Combinations of operations on whole numbers |
| 205 | Equivalent/non-equivalent fractions |
| 206 | Add, subtract fractions |
| 207 | Multiply fractions |
| 208 | Divide fractions |
| 209 | Combinations of operations on fractions |
| 210 | Ratio, proportion |
| 211 | Representations of fractions |
| 212 | Equivalence of decimals, fractions, % |
| 213 | Add, subtract decimals |
| 214 | Multiply decimals |
| 215 | Divide decimals |
| 216 | Combinations of operations on decimals |
| 217 | Computing with percents |
| 218 | Computation with exponents, radicals |
| 290 | Other |

| | |
|------------|---|
| 300 | Measurement |
| 301 | Use of measuring instruments |
| 302 | Theory (arbitrary, standard units, unit size) |
| 303 | Conversions |
| 304 | Metric (SI) system |
| 305 | Length, perimeter |
| 306 | Area, volume |
| 307 | Surface Area |
| 308 | Direction, Location, Navigation |
| 309 | Angles |
| 310 | Circles (e.g., pi, radius, area) |
| 311 | Mass (weight) |
| 312 | Time, temperature |
| 313 | Money |
| 314 | Derived measures (e.g. rate/speed) |
| 315 | Calendar |
| 390 | Accuracy, Precision |
| 400 | Consumer Applications |
| 401 | Simple interest |
| 402 | Compound interest |
| 403 | Rates (e.g., discount, commission) |
| 404 | Spreadsheets |
| 490 | Other: _____ |
| 500 | Basic Algebra |
| 501 | Absolute value |
| 502 | Use of variables |
| 503 | Eval. of formulas, expressions, equations |
| 504 | One-step equations |
| 505 | Coordinate Plane |
| 506 | Patterns |
| 507 | Multi-step equations |
| 508 | Inequalities |
| 509 | Linear, non-linear relations |
| 510 | Rate of change/slope/line |
| 511 | Operations on polynomials |
| 512 | Factoring |
| 513 | Square roots & radicals |
| 514 | Operations on radicals |
| 515 | Rational expressions |
| 515 | Multiple representations |
| 590 | Other: _____ |

| | |
|------------|---|
| 600 | Advanced Algebra |
| 601 | Quadratic equations |
| 602 | Systems of equations |
| 603 | Systems of inequalities |
| 604 | Compound Inequalities |
| 605 | Matrices, determinants |
| 606 | Conic sections |
| 607 | Rational, negative exponents/radicals |
| 608 | Rules for exponents |
| 609 | Complex numbers |
| 610 | Binomial theorem |
| 611 | Factor / remainder theorem |
| 612 | Field properties of real number system |
| 613 | Multiple representations |
| 690 | Other |
| 700 | Geometric Concepts |
| 701 | Basic terminology |
| 702 | Points, lines, rays, segments and vectors |
| 703 | Patterns |
| 704 | Congruence |
| 705 | Similarity |
| 706 | Parallels |
| 707 | Triangles |
| 708 | Quadrilaterals |
| 709 | Circles |
| 710 | Angles |
| 711 | Polygons |
| 712 | Polyhedra |
| 713 | Models |
| 714 | 3-D relationships |
| 715 | Symmetry |
| 716 | Transformations (e.g., flips, turns) |
| 717 | Pythagorean Theorem |
| 790 | Other |
| 800 | Advanced Geometry |
| 801 | Logic, reasoning, proof |
| 802 | Loci |
| 803 | Spheres, cones, cylinders |
| 804 | Coordinate Geometry |
| 805 | Vectors |
| 806 | Analytic Geometry |
| 807 | Non-Euclidean Geometry |
| 808 | Topology |
| 890 | Other: |

| | |
|-------------|------------------------------------|
| 900 | Data Displays |
| 901 | Summarize data in a table or graph |
| 902 | Bar graph, histogram |
| 903 | Pie charts, circle graphs |
| 904 | Pictographs |
| 905 | Line graphs |
| 906 | Stem and Leaf plots |
| 907 | Scatter plots |
| 908 | Box plots |
| 909 | Line Plots |
| 910 | Classification, venn diagrams |
| 911 | Tree Diagrams |
| 990 | Other |
| 1000 | Statistics |
| 1001 | Mean, median, mode |
| 1002 | Variability, standard deviation |
| 1003 | Line of best fit |
| 1004 | Quartiles, percentiles |
| 1005 | Bivariate distribution |
| 1006 | Confidence intervals |
| 1007 | Correlation |
| 1008 | Hypothesis testing |
| 1009 | Chi Square |
| 1010 | Data Transformation |
| 1011 | Central Limit Theorem |
| 1090 | Other |
| 1100 | Probability |
| 1101 | Simple probability |
| 1102 | Compound probability |
| 1103 | Conditional probability |
| 1104 | Empirical probability |
| 1105 | Sampling, Sample spaces |
| 1106 | Independent/dependent events |
| 1107 | Expected value |
| 1108 | Binomial distribution |
| 1109 | Normal curve |
| 1190 | Other |

| |
|----------------------------------|
| 1200 Analysis |
| 1201 Sequences and series |
| 1202 Limits |
| 1203 Continuity |
| 1204 Rates of change |
| 1205 Maxima, minima |
| 1206 Differentiation |
| 1207 Integration |
| 1290 Other: _____ |
| 1300 Trigonometry |
| 1301 Basic ratios |
| 1302 Radian measure |
| 1303 Right triangle trigonometry |
| 1304 Law of Sines, Cosines |
| 1305 Identities |
| 1306 Trigonometric equations |
| 1307 Polar coordinates |
| 1308 Periodicity |
| 1309 Amplitude |
| 1390 Other: _____ |
| 1400 Special Topics |
| 1401 Sets |
| 1402 Logic |
| 1403 Mathematical induction |
| 1404 Linear programming |
| 1405 Networks |
| 1406 Iteration, recursion |
| 1407 Permutations combinations |
| 1408 Simulations |
| 1409 Fractals |
| 1490 Other |

| |
|--------------------------------------|
| 1500 Functions |
| 1501 Notation |
| 1502 Relations |
| 1503 Linear |
| 1504 Quadratic |
| 1505 Polynomial |
| 1506 Rational |
| 1507 Logarithmic |
| 1508 Exponential |
| 1509 Trigonometric / circular |
| 1510 Inverse |
| 1511 Composition |
| 1590 Other: _____ |
| 1600 Instructional Technology |
| 1601 Use of calculators |
| 1602 Use of graphing calculators |
| 1603 Use of computers & internet |
| 1604 Computer programming |
| 1690 Other |

Cognitive Demand Categories for Mathematics

| B | C | D | E | F |
|---|--|--|--|--|
| Memorize | Perform Procedures | Demonstrate Understanding | Conjecture, generalize, prove | Solve non-routine problems, make connections |
| <u>Recite basic mathematics facts</u> | <u>Use numbers to count, order or denote</u> | <u>Communicate mathematical ideas</u> | <u>Determine the truth of a mathematical pattern or proposition</u> | <u>Apply & adapt a variety of appropriate strategies to solve problems</u> |
| <u>Recall mathematics terms and definitions</u> | <u>Do computational procedures or algorithms</u> | <u>Use representations to model mathematical ideas</u> | <u>Write formal or informal proofs</u> | <u>Apply mathematics in contexts outside of mathematics</u> |
| <u>Recall formulas and computational procedures</u> | <u>Follow procedures/instructions</u> | <u>Explain findings and results from data analysis</u> | <u>Analyze data</u> | <u>Recognize, generate or create patterns</u> |
| _____ | <u>Make measurements, do computations</u> | <u>Develop/explain relationships between concepts</u> | <u>Find a mathematical rule to generate a pattern or number sequence</u> | <u>Synthesize content and ideas from several sources</u> |
| _____ | <u>Solve equations/formulas, routine word problems</u> | <u>Explain relationships btwn. models, diagrams, & other representations</u> | <u>Identify faulty arguments or misrepresentations of data</u> | _____ |
| _____ | <u>Organize or display data</u> | _____ | <u>Reason inductively or deductively</u> | _____ |
| _____ | <u>Read or produce graphs and tables</u> | _____ | _____ | _____ |
| _____ | <u>Execute geometric constructions</u> | _____ | <u>Use spatial reasoning</u> | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |

K-12 Science Content Areas

| |
|---|
| 100 Nature of Science |
| 200 Science & Technology |
| 300 Science, Health & Environment |
| 400 Measurement & Calculation in Science |
| 500 Components of Living Systems |
| 600 Biochemistry |
| 700 Botany |
| 800 Animal Biology |
| 900 Human Biology |
| 1000 Genetics |
| 1100 Evolution |
| 1200 Reproduction & Development |
| 1300 Ecology |
| 1400 Energy |

| |
|--|
| 1500 Motion & Forces |
| 1600 Electricity |
| 1700 Waves |
| 1800 Kinetics and Equilibrium |
| 1900 Properties of Matter |
| 2000 Earth Systems |
| 2100 Astronomy |
| 2200 Meteorology |
| 2300 Elements & The Periodic System |
| 2400 Chemical Formulas & Reactions |
| 2500 Acids, Bases, & Salts |
| 2600 Organic Chemistry |
| 2700 Nuclear Chemistry |
| |

| | |
|------------|---|
| 100 | Nature of Science |
| 101 | Nature and Structure of Science |
| 102 | Nature of Scientific Inquiry/Method |
| 103 | Scientific habits of mind, logic and reasoning |
| 104 | Issues of diversity, culture, gender in science |
| 105 | History of scientific innovations |
| 106 | Ethical Issues/Critiques of Science |
| 190 | Other |
| 200 | Science & Technology |
| 201 | Tech. benefits, trade-offs and consequences |
| 202 | Relationship btwn. sci. inquiry & tech. design |
| 203 | Science tools, lab safety |
| 204 | Design or implement a solution or product |
| 290 | Other |
| 300 | Science, Health & Environment |
| 301 | Personal health, behavior, disease, nutrition |
| 302 | Envrn. health, pollution, waste disposal |
| 303 | Acid rain |
| 304 | Ozone depletion |
| 305 | Resources, conservation |
| 306 | Toxic & nuclear waste |
| 307 | Greenhouse effect |
| 308 | Natural and Human-caused hazards |
| 390 | Other |
| 400 | Measurement & Calculation in Science |
| 401 | The International System |
| 402 | Mass & Weight |
| 403 | Length |
| 404 | Volume |
| 405 | Time |
| 406 | Temperature |
| 407 | Accuracy & Precision/Estimation |
| 408 | Significant Digits |
| 409 | Derived Units |
| 410 | Conversion Factors |
| 411 | Density |
| 490 | Other |
| 500 | Components of Living Systems |
| 501 | Cell structure/function |
| 502 | Cell Theory |
| 503 | Transport of cellular material |
| 504 | Cell metabolism |
| 505 | Cell response |
| 506 | Cellular respiration |
| 507 | Cell Specialization |
| 508 | Organs |
| 509 | Organ Systems |
| 510 | Microbiology |
| 590 | Other |
| 600 | Biochemistry |
| 601 | Living Elements (C, H, O, N, P) |
| 602 | Atomic Structure & Bonding |
| 603 | Synthesis Reactions (Proteins) |
| 604 | Hydrolysis |
| 605 | Organic Compounds: Carbon, Proteins, Nucleic/Amino Acids, Enzymes |
| 690 | Other |

| | |
|-------------|---------------------------------------|
| 700 | Botany |
| 701 | Nutrition/Photosynthesis |
| 702 | Circulation |
| 703 | Respiration |
| 704 | Growth/development/behavior |
| 705 | Health & disease |
| 706 | Structure & Function |
| 790 | Other |
| 800 | Animal Biology |
| 801 | Nutrition |
| 802 | Circulation |
| 803 | Excretion |
| 804 | Respiration |
| 805 | Growth/development/behavior |
| 806 | Health & disease |
| 807 | Structure & Function |
| 808 | Skeletal & muscular system |
| 809 | Nervous & endocrine system |
| 810 | Habitat |
| 890 | Other |
| 900 | Human Biology |
| 901 | Nutrition/Digestive System |
| 902 | Circulatory System (Blood) |
| 903 | Excretory System |
| 904 | Respiration & Respiratory System |
| 905 | Growth/development/behavior |
| 906 | Health & disease/immune system |
| 907 | Skeletal & muscular system |
| 908 | Nervous & endocrine system |
| 990 | Other |
| 1000 | Genetics |
| 1001 | Mendelian Genetics |
| 1002 | Modern Genetics |
| 1003 | Inherited diseases |
| 1004 | Biotechnology |
| 1005 | Human Genetics |
| 1006 | Transcription/translation |
| 1007 | Mutation |
| 1090 | Other |
| 1100 | Evolution |
| 1101 | Evidence for Evolution |
| 1102 | Lamarckian Theories |
| 1103 | Modern Evolutionary Theory |
| 1104 | Life Origin Theories |
| 1105 | Human Evolution |
| 1106 | Classification |
| 1107 | Causes |
| 1108 | Natural Selection |
| 1190 | Other |
| 1200 | Reproduction & Development |
| 1201 | Mitotic/Meiotic Cell Division |
| 1202 | Asexual Reproduction |
| 1203 | Inherited Traits |
| 1204 | Reproduction & Development in Plants |
| 1205 | Reproduction & Development in Animals |
| 1206 | Reproduction & Development in Humans |
| 1290 | Other |

| 1300 | Ecology |
|-------------|--|
| 1301 | Food Webs / Chains |
| 1302 | Competition & Cooperation |
| 1303 | Energy Flow Relationships |
| 1304 | Biotic & Abiotic Factors |
| 1305 | Ecological Succession |
| 1306 | Ecosystems |
| 1307 | Population Dynamics |
| 1308 | Environmental Chemistry |
| 1309 | Adaptation & Variation / Niche |
| 1310 | Populations |
| 1390 | Other |
| 1400 | Energy |
| 1401 | Potential Energy |
| 1402 | Kinetic Energy |
| 1403 | Conservation of Mass/Energy |
| 1404 | Heat Energy & Transfer |
| 1405 | Light Energy |
| 1406 | Sound Energy |
| 1407 | Laws of thermodynamics & entropy |
| 1408 | Work & Energy |
| 1409 | Mechanical Energy & Machines |
| 1410 | Nuclear Energy |
| 1490 | Other |
| 1500 | Motion & Forces |
| 1501 | Vector & Scalar Quantities |
| 1502 | Displacement as a vector quantity |
| 1503 | Velocity as a vector quantity |
| 1504 | Relative position & velocity |
| 1505 | Acceleration |
| 1506 | Newton's First Law |
| 1507 | Newton's Second Law |
| 1508 | Newton's Third Law |
| 1509 | Momentum, Impulse and Conservation |
| 1510 | Equilibrium |
| 1511 | Friction |
| 1512 | Universal Gravitation |
| 1590 | Other |
| 1600 | Electricity |
| 1601 | Static Electr.(production/transfer/distribution) |
| 1602 | Coulomb's law |
| 1603 | Electric fields |
| 1604 | Current electricity |
| 1605 | Current, Voltage, & Resistance |
| 1606 | Series & Parallel Circuits |
| 1607 | Magnetism |
| 1608 | Effects of interacting fields |
| 1609 | Conductors, insulators |
| 1690 | Other |
| 1700 | Waves |
| 1701 | Characteristics and behavior |
| 1702 | Visible Light (direction/speed/transformation) |
| 1703 | Non-visible Light/Electromagnetic Spectrum (e.g. ultraviolet, infrared) |
| 1704 | Sound (e.g. direction, speed, transformation) |
| 1705 | Earthquakes, Tsunamis, Ocean Waves |
| 1790 | Other |

| 1800 | Kinetics and Equilibrium |
|-------------|--|
| 1801 | Molecular motion |
| 1802 | Pressure |
| 1803 | Kinetics and temperature |
| 1804 | Equilibrium |
| 1805 | Reaction Rates |
| 1890 | Other |
| 1900 | Properties of Matter |
| 1901 | Characteristics & composition |
| 1902 | Elements, molecules & compounds |
| 1903 | States of matter (S-L-G-P) |
| 1904 | Solutions & Mixtures |
| 1905 | Physical & Chemical Changes |
| 1906 | Physical & Chemical Properties |
| 1907 | Isotopes/Atomic Nbr./Atomic Mass |
| 1908 | Photons & Spectra |
| 1909 | Atomic Theory |
| 1910 | Quantum Theory & Electron Clouds |
| 1990 | Other |
| 2000 | Earth Systems |
| 2001 | Earth's shape, dimension & composition |
| 2002 | Earth's origins and history |
| 2003 | Maps, locations and scales |
| 2004 | Measuring using relative and absolute time |
| 2005 | Mineral & Rock Formations & Types |
| 2006 | Erosion & Weathering |
| 2007 | Plate Tectonics |
| 2008 | Formation of volcanoes, earthquakes, mtns. |
| 2009 | Topography |
| 2010 | Dynamics & Energy Transfer |
| 2011 | Oceanography |
| 2090 | Other |
| 2100 | Astronomy |
| 2101 | Stars, Sun |
| 2102 | Galaxies |
| 2103 | Origins of the universe |
| 2104 | Asteroids and comets |
| 2105 | The Solar System |
| 2106 | The Moon |
| 2107 | The Earth's motion: rotation & revolution |
| 2108 | Earth, moon, sun relationship |
| 2109 | Location, Navigation, & Time |
| 2190 | Other |
| 2200 | Meteorology |
| 2201 | The Earth's Atmosphere |
| 2202 | Air Pressure & Winds |
| 2203 | Evaporation / Condensation / Precipitation |
| 2204 | Weather |
| 2205 | Climate |
| 2290 | Other |
| 2300 | Elements & The Periodic System |
| 2301 | Early Classification System(s) |
| 2302 | Modern Periodic Table |
| 2303 | Interaction of elements |
| 2304 | Element char. (families & periods) |
| 2390 | Other |

| | |
|-------------|--|
| 2400 | Chemical Formulas & Reactions |
| 2401 | Names, Symbols, & Formulas |
| 2402 | Molecular & Empirical formulas |
| 2403 | Representing chemical change |
| 2404 | Balancing chemical equations |
| 2405 | Stoichiometric Relationships |
| 2406 | Oxidation/Reduction Reactions |
| 2407 | Chemical Bonds |
| 2408 | Electrochemistry |
| 2409 | The Mole |
| 2410 | Types of reactions |
| 2490 | Other |
| 2500 | Acids, Bases, & Salts |
| 2501 | Arrhenius/Bronsted-Lowry/Lewis Theories |
| 2502 | Naming Acids |
| 2503 | Acid-Base behavior/strengths |
| 2504 | Salts |
| 2505 | pH |
| 2506 | Hydrolysis |
| 2507 | Buffers |
| 2508 | Indicators |
| 2509 | Titration |
| 2590 | Other |
| 2600 | Organic Chemistry |
| 2601 | Hydrocarbons, Alkenes, Alkanes, & Alkynes |
| 2602 | Aromatic Hydrocarbons |
| 2603 | Isomers & Polymers |
| 2604 | Aldehydes, Ether, Ketones, Esters, Alcohols, & Organic Acids |
| 2605 | Organic Reactions |
| 2606 | Carbohydrates, Proteins, Lipids |
| 2690 | Other |
| 2700 | Nuclear Chemistry |
| 2701 | Nuclear Structure |
| 2702 | Nuclear Equations |
| 2703 | Fission |
| 2704 | Radioactivity |
| 2705 | Half-life |
| 2706 | Fusion |
| 2790 | Other |

Cognitive Demand Categories for Science

| B | C | D | E | F |
|---|---|--|--|---|
| Memorize | Perform Procedures | Communicate Understanding | Analyze Information | Apply Concepts / Make Connections |
| <u>Recite basic science facts</u> | <u>Make observations Collect and record data</u> | <u>Explain concepts</u> | <u>Classify and compare data</u> | <u>Apply and adapt science information to real-world situations</u> |
| <u>Recall science terms and definitions</u> | <u>Use appropriate tools Make measurements, do computations</u> | <u>Observe & explain teacher/student demonstrations</u> | <u>Analyze data, recognize patterns</u> | <u>Apply science ideas outside the context of science</u> |
| <u>Recall scientific formula</u> | <u>Organize and display data in tables or charts</u> | <u>Explain procedures & methods of science & inquiry</u> | <u>Reason inductively or deductively</u> | <u>Build or revise theory/plan and design experiments</u> |
| | <u>Execute procedures Conduct experiments</u> | <u>Organize & display data in tables or charts</u> | <u>Draw conclusions</u> | <u>Synthesize content and ideas from several sources</u> |
| | <u>Generate questions, make predictions</u> | <u>Student presentations of science information</u> | <u>Identify faulty arguments or misrepresentations of data</u> | <u>Use and integrate science concepts</u> |
| | <u>Test effects of different variables</u> | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

K-12 English Language Arts & Reading Content Areas

| | |
|------------|---|
| 100 | Phonemic awareness |
| 200 | Phonics |
| 300 | Vocabulary |
| 400 | Awareness of text and print features |
| 500 | Fluency |
| 600 | Comprehension |
| 700 | Critical Reading |

| | |
|-------------|--------------------------------|
| 800 | Author's Craft |
| 900 | Writing Processes |
| 1000 | Writing Components |
| 1100 | Writing Applications |
| 1200 | Language Study |
| 1300 | Listening and Viewing |
| 1400 | Speaking and Presenting |

| | |
|--|--|
| 100 Phonemic awareness | 600 Comprehension |
| 101 Phoneme isolation | 601 Word meaning from context |
| 102 Phoneme blending | 602 Phrase |
| 103 Phoneme segmentation | 603 Sentence |
| 104 Onset-rime | 604 Paragraph |
| 105 Sound patterns | 605 Main idea(s), key concepts |
| 106 Rhyme recognition | 606 Narrative elements (e.g., events, characters, setting, plot) |
| 107 Phoneme deletion/substitution | 607 Persuasive elements (e.g., propaganda, advertisement, emotional appeal) |
| 190 Other | 608 Expository elements (e.g., description, explanation, lists) |
| 200 Phonics | 609 Technical elements (e.g., bullets, instruction, form, sidebars) |
| 201 Alphabet recognition | 610 Electronic elements (e.g., hypertext links, animations) |
| 202 Consonants | 611 Strategies (e.g. prior knowledge, prediction, inference, imagery, summarization) |
| 203 Consonant blends | 612 Metacognitive process (i.e. reflecting about one's thinking process) |
| 204 Consonant digraphs (e.g., ch, sh, th) | 613 Self-correction strategies (e.g. monitoring, cueing systems, and fix-up) |
| 205 Diphthongs (e.g., oi, ou, ow, oy) | 690 Other |
| 206 R-controlled vowels (e.g., farm, torn, turn) | 700 Critical Reading |
| 207 Patterns within words | 701 Fact and opinion |
| 208 Vowel letters (a, e, i, o, u, y) | 702 Appeals to authority, reason, emotion |
| 209 Vowel phonemes (15 sounds) | 703 Validity and significance of assertion or argument |
| 290 Other | 704 Relationships among purpose, organization, format, and meaning of text |
| 300 Vocabulary | 705 Author's assumptions |
| 301 Compound words and contractions | 706 Comparison of topic, theme, treatment, scope, or organization across texts |
| 302 Inflectional forms (e.g., -s, -ed, -ing) | 707 Inductive/deductive approaches to comprehension |
| 303 Suffixes, prefixes, and root words | 708 Logical and faulty reasoning in text |
| 304 Word definitions (including new vocabulary) | 709 Textual evidence |
| 305 Word origins | 790 Other |
| 306 Synonyms and antonyms | |
| 307 Word or phrase meaning from context | |
| 308 Denotation and connotation | |
| 309 Analogies | |
| 390 Other | |
| 400 Awareness of text and print features | |
| 401 Book handling | |
| 402 Directionality | |
| 403 Parts of a book (e.g., cover, title, front, back) | |
| 404 Letter and word distinctions | |
| 405 Punctuation | |
| 406 Text features (e.g., index, glossary, table of contents, subtitles, headings, fonts) | |
| 407 Graphics (e.g., images, illustrations) | |
| 490 Other | |
| 500 Fluency | |
| 501 Prosody (e.g., phrasing, intonation, inflection) | |
| 502 Automaticity of words and phrases (e.g. site and decodable words) | |
| 503 Speed/Pace | |
| 504 Accuracy | |
| 590 Other | |

| | |
|---|---|
| 800 Author's Craft | 1200 Language Study |
| 801 Theme | 1201 Syllabication |
| 802 Purpose (e.g., inform, perform, critique, appreciation) | 1202 Spelling |
| 803 Characteristics of genres | 1203 Capitalization and punctuation |
| 804 Point of view (i.e., first or third person, multiple perspectives) | 1204 Signs and symbols (i.e., semiotics) |
| 805 Literary devices (e.g., simile, metaphor, hyperbole, flashbacks, structure, archetypes) | 1205 Syntax and sentence structure |
| 806 Literary analysis (e.g. symbolism, voice, style, tone, mood) | 1206 Grammatical analysis |
| 807 Influence of time and place on authors and texts | 1207 Standard and non-standard language usage |
| 890 Other | 1208 Linguistic knowledge (including dialects and diverse forms) |
| 900 Writing Processes | 1209 History of language |
| 901 Printing, cursive writing, penmanship | 1210 Relationship of language forms, contexts, and purposes (e.g., rhetoric, semantics) |
| 902 Pre-writing (e.g., topic selection, brainstorming) | 1211 Aesthetic aspects of language |
| 903 Drafting | 1290 Other |
| 904 Editing for conventions (e.g., usage, spelling, structure) | 1300 Listening and Viewing |
| 905 Manuscript conventions (e.g., indenting, margins, citations, references, etc.) | 1301 Listening |
| 906 Final draft, publishing | 1302 Viewing |
| 907 Use of technology (e.g., word processing, multimedia) | 1303 Nonverbal communication |
| 990 Other | 1304 Consideration of others' ideas |
| 1000 Writing Components | 1305 Similarities/differences of print, graphic, and nonprint communications |
| 1001 Purpose, audience, context | 1306 Literal and connotative meanings |
| 1002 Main ideas | 1307 Diction, tone, syntax, convention, rhetorical structure in speech |
| 1003 Organization | 1308 Media-supported communication |
| 1004 Word choice | 1390 Other |
| 1005 Support and elaboration | 1400 Speaking and Presenting |
| 1006 Style, voice, technique | 1401 Speaking and conversation |
| 1090 Other | 1402 Public speaking, oral presentation |
| 1100 Writing Applications | 1403 Demonstrating confidence |
| 1101 Narrative (e.g., stories, fiction, plays) | 1404 Effective nonverbal skills (e.g., gesture, eye contact) |
| 1102 Poetry | 1405 Knowledge of situational and cultural norms for expression |
| 1103 Expository (e.g., report, theme) | 1406 Conversation and discussion (e.g. Socratic seminars) |
| 1104 Critical/evaluative (e.g. reviews) | 1407 Debate and structure of argument |
| 1105 Expressive (e.g., journals, reflections) | 1408 Dramatics, creative interpretation |
| 1106 Persuasive (e.g., editorial, advertisement, argumentative) | 1409 Media-supported communication |
| 1107 Procedural (e.g., instructions, brochure) | 1490 Other |
| 1108 Technical (e.g., manual, specifications) | |
| 1109 Real world applications of writing | |
| 1190 Other | |

Cognitive Demand Categories for Language Arts / Reading

| B | C | D | E | F |
|---|--|---|--|---|
| Recall | Demonstrate / Explain | Analyze/Investigate | Evaluate | Generate / Create |
| <u>Provide facts, terms, definitions, conventions</u> | <u>Follow instructions</u> | <u>Categorize, schematize</u> | <u>Determine relevance, coherence, logical, internal consistency</u> | <u>Integrate</u> <u>Dramatize</u> |
| <u>Describe</u> | <u>Give examples</u> | <u>Distinguish fact and opinion</u> | <u>Test conclusions or hypotheses</u> | <u>Predict probable consequences</u> |
| <u>Locate literal answers in a text</u> | <u>Summarize</u> | <u>Make inferences, draw conclusions</u> | <u>Critique</u> | <u>Express ideas through writing, speaking, drawing</u> |
| <u>Identify relevant information</u> | <u>Identify purpose, main ideas, organizational patterns</u> | <u>Generalize</u> | <u>Assess adequacy, appropriateness, credibility</u> | <u>Integrate with other topics and subjects</u> |
| <u>Reproduce sounds or words</u> | <u>Check Consistency</u> | <u>Order, group, outline, organize ideas</u> | | <u>Create/ develop connections with text, self, world</u> |
| | <u>Recognize relationships</u> | <u>Interpret information from diagrams, charts and graphs</u> | | <u>Synthesize content and ideas from several sources</u> |
| | | <u>Gather information</u> | | <u>Develop reasonable alternatives</u> |
| | | <u>Compare and contrast</u> | | |
| | | <u>Identify w/ another's point of view</u> | | |
| | | | | |
| | | | | |
| | | | | |