

EXECUTIVE SUMMARY

POLICY 2520 INSTRUCTIONAL GOALS AND OBJECTIVES FOR WEST VIRGINIA SCHOOLS

Background

Policy 2520 defines the instructional goals and objectives for the programs of study required by Policy 2510 and establishes a standardized format for such. The original effective date of the policy was July 1, 1997; the most recent revision was effective June 16, 2000.

Purpose

The purpose of this Board item is to seek the approval of the West Virginia Board of Education to place the attached instructional goals and objectives on public comment for 30 days.

Speech I, Journalism, and Foreign Languages

Instructional goals and objectives (IGOs) for the elective areas of Speech, Journalism and Foreign Languages (both Exploratory and Levels I-IV) were presented to the Board in August 2000 and placed on comment for 60 days. After comments are received during the additional comment period, the IGOs for these areas will be revised as appropriate and presented for approval.

Robert C. Beach Vocational Agriculture Credit

West Virginia Board of Education Policy 2510, Section 5.54 defines the Robert C. Beach Vocational Agriculture Credit as follows: "Only students with a declared entry or skilled level major in vocational agriculture (i.e., those whose 5-year plan indicates entry directly into the workforce upon graduation from high school) will, upon their successful completion of a unit of credit in an approved vocational agriculture course above grade 10, be exempt from the third required unit of science credit required for graduation (i.e., the unit above CATS 9 and 10). All other students, including those with declared majors in vocational agriculture at the professional level or who anticipate two-year or four-year college education, are required to take three units of science as defined by this policy and Policy 2520 for graduation."

A committee of teachers in the fields of Agricultural Education and Science were chosen to work together to develop and review instructional goals and objectives for selected vocational agricultural courses that will meet the following criteria set forth in Policy 2510, Section 5.54: "To be eligible as a required unit for graduation, the vocational agriculture education course must: (1) build on the concepts and skills taught in grades 9 and 10; (2) be taught at a level of greater complexity and depth than that of vocational agriculture courses in grades 9 and 10; (3) have West Virginia Board of Education approved Instructional Goals and Objectives; and (4) receive West Virginia Board of Education approval as a vocational agriculture course that qualifies as a Robert C. Beach Vocational Agriculture Credit.

Instructional goals and objectives are being presented for the following vocational agriculture courses to be approved as courses qualifying for Robert C. Beach Vocational Agriculture Credit: Agricultural Biotechnology, Agriscience 11, Animal and Veterinary Science-Small Animals, Animal and Veterinary Science-Large Animals, Aquaculture, Environmental Technology, Greenhouse Technology, Horticulture, and Soil and Plant Science.

Science

The attached Science Instructional Goals and Objectives document represents revisions to the 1996 printing of Policy 2520 Instructional Goals and Objectives. The predominately editorial revisions were needed to reflect the 2000 changes impacting science in Policy 2510 and alignment to the 1998 Science Instructional Materials Criteria (Policy 2445.40).

The Biology – Technical Conceptual Instructional Goals and Objectives represent a new required elective course offering beginning 2002-2003. A team of teachers, county administrators, college faculty, and Department of Education staff collaborated in the production of the instructional goals and objectives.

Impact:

The instructional goals and objectives will bring Policy 2520 into alignment with the current West Virginia Board of Education Policy 2510, establish approved courses and instructional goals and objectives for the Robert C. Beach Vocational Agriculture Credit, and provide a basis for designing instructional materials selection criteria.

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**TITLE 126
LEGISLATIVE RULE
BOARD OF EDUCATION**

OFFICE OF THE SECRETARY OF STATE
WEST VIRGINIA

**SERIES 44
INSTRUCTIONAL GOALS AND OBJECTIVES FOR
WEST VIRGINIA SCHOOLS (2520)**

§126.44.1. General.

1.1. Scope. – West Virginia Board of Education Policy 2510 provides a definition of a delivery system for, and an assessment and accountability system for, a thorough and efficient education for West Virginia public school students. Policy 2520 defines the instructional goals and objectives for the programs of study required by Policy 2510.

1.2. Authority. – W.Va. Constitution, Article XII, §2, and W. Va. Code §18-2-5.

1.3. Filing Date. – ~~May 16, 2000.~~

1.4. Effective Date - ~~June 16, 2000.~~

1.5. Repeal of former rule - This legislative rule amends WV 126CSR44 (Policy 2520).

§126-44-2. Purpose

2.1. This policy defines the instructional goals and objectives for the programs of study required by Policy 2510 in English language arts, mathematics, science, social studies, health, dance, music, theatre, visual art, geography, foreign languages, driver education, and physical education, and the Robert C. Beach Vocational Agriculture Credit.

§126-44-3. Incorporation by Reference.

3.1. A copy of 126CSR44, Instructional Goals and Objectives for West Virginia Schools (Policy 2520), is attached. Copies may be obtained in the Office of the Secretary of State and in the West Virginia Department of Education, Office of Instructional Services.

§126-44-4. Summary of the Instructional Goals and Objectives

4.1 The West Virginia Board of Education has the responsibility for establishing high quality standards pertaining to all educational standards pertaining to all education programs (W.Va. Code §18-9A-22). The instructional goals and objectives provide a focus for teachers to teach and students to learn those skills and competencies essential for future success in the workplace and further education. The document includes: instructional goals for English language arts, mathematics, social studies, science, health, dance, music, theatre, visual art, geography, foreign languages, driver education, and physical education, and the Robert C. Beach Vocational Agriculture Credit. Also included are program charts for K-2, 3-4, 5-8, and 9-12; instructional practices for K-12; a document guide; instructional objectives that reflect a rigorous and challenging curriculum, the objectives assessed on the state standardized test, process/workplace objectives and computer/technology objectives for each grade level in each program of study. Process/workplace skills are noted for grades 7-12 with the ◇ symbol.

Speech I

As an elective course, Speech I, taught by a certified speech instructor, enhances the English Language Arts curriculum. Oral communication is fundamental to all other learning and all students benefit from speech instruction. A student who communicates well succeeds in social, economic, and academic environments. Listening, an essential element of oral communication, is necessary for success in life and learning. Oral communication is a learned process that enhances educational, occupational, and personal endeavors, and students who actively participate in a variety of speaking activities will gain confidence and skills to overcome communication anxiety. Effective oral communication provides readiness for the workplace and/or post-secondary education and, as such, should be considered as a *recommended elective or required course* in all career majors. As the global community becomes more connected, incorporation of technology in communication becomes more vital. In order to ensure literacy and life-long learning, all students must understand and practice the communicative process.

Speech I fulfills and exceeds the minimum requirements for both of the following courses:

Advanced Communications and
Applied Communication

The following Instructional Goals and Objectives are **minimum** requirements for a **Speech I** course.

COMMUNICATION PROCESS

- SP.1 define speech communication process including the following terms: source, encode, message, channel, decode, receiver, and feedback
- SP.2 explain the importance of speech communication in everyday life
- SP.3 list and give examples of types of speech communication (e.g., informal vs. formal)
- SP.4 describe the characteristics of an effective speech
- SP.5 define and demonstrate non-verbal communication
- SP.6 explain the importance of non-verbal communication
- SP.7 explain the difference between hearing and listening
- SP.8 identify and demonstrate the vocalization process including the following terms: generators, resonators, and articulators of sound
- SP.9 identify and demonstrate the four characteristics of the vocalization process: rate, volume, pitch, quality

INTERPERSONAL COMMUNICATION

- SP.10 recognize situations where the use of colloquialisms, dialects, and slang are appropriate (e.g., peer conversations vs. formal discussion)◊
- SP.11 recognize situations and demonstrate the use of appropriate formal standard English (e.g., public speeches, interviews, workplace)◊
- SP.12 ask questions in the proper form and tone at the appropriate time (e.g., classroom, conversation, panel discussion)◊
- SP.13 recognize types of one-to-one communication (e.g., family, friends, educational and business environments, telephone etiquette, asking and receiving directions)◊
- SP.14 use appropriate and effective nonverbal communication skills
- SP.15 demonstrate the ability to mediate and resolve personal conflict
- SP.16 identify and practice principles and techniques for various types of interview situations
- SP.17 use interviewing skills of questioning, note taking, and summarizing
- SP.18 compare and contrast shared personal cultural experiences
- SP.19 demonstrate an understanding of cultural diversity◊

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LISTENING

- SP.20 compare and contrast the hearing and listening process
- SP.21 identify the relationship between effective listening skills and success
- SP.22 identify the barriers to listening and generate methods to overcome them
- SP.23 identify the common errors in standard American speech usage (e.g., articulation, dialect)
- SP.24 identify the factors that influence the listening process in a variety of communication settings
- SP.25 identify the skills and behaviors for critical and active listening
- SP.26 judge the reliability of sources for bias, credibility, and expertise
- SP.27 identify the various speaking techniques used to influence an audience (e.g., propaganda, card stacking, distortion, and bandwagon)
- SP.28 identify the purpose, make predictions, distinguish fact from opinions, and construct meaning in and beyond the text (e.g., lecture, speech, and media)
- SP.29 understand the value of critical listening in evaluating speeches
- SP.30 understand and demonstrate the importance of listening for the purpose of asking questions to foster comprehension (e.g., lecture, discussion, conversation, directions)
- SP.31 practice various ways to improve listening skills◇

RESEARCH

- SP.32 use technology to research materials for presentation◇
- SP.33 use library resources to research material needed to prepare presentations, identify and record main ideas, link details, and summarize (e.g., lecture, speeches, media)
- SP.34 use note taking skills to gather information
- SP.35 define and identify types of faulty reasoning
- SP.36 define and identify a variety of propaganda devices

WRITING

- SP.37 collect and organize information through systematic note taking and outlining◇
- SP.38 recognize and choose organizational patterns appropriate to the purpose of the presentation (e.g., chronological, problem-solution, spatial, logical)◇
- SP.39 develop a thesis statement
- SP.40 recognize and use effective strategies to develop introductions and conclusions (e.g., quotations, startling statements, rhetorical questions, anecdote, interesting facts)
- SP.41 recognize and use an effective variety of transitional devices
- SP.42 use outlining to organize speech material by selecting and identifying main points and supporting details
- SP.43 demonstrate the use of standard American English usage in written work◇
- SP.44 recognize differences between written and spoken language (e.g., spoken is concrete, repetitious, and simply structured)

PUBLIC SPEAKING

- SP.45 practice a variety of informal speaking experiences (e.g., giving and receiving directions, making business calls, introducing people)
- SP.46 discuss and identify the steps for preparing a formal speech
- SP.47 explore and demonstrate an understanding of the different purposes of speaking (e.g., inform, persuade, entertain)
- SP.48 demonstrate an understanding of audience analysis as a component of preparing a speech
- SP.49 demonstrate the use of good diction, vocal control, articulation, and pronunciation◇
- SP.50 explore the various criteria for topic selection (e.g., audience analysis, purpose, occasion, and

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personal interest)

- SP.51 use a speaking prompt to develop an oral presentation that has a beginning, a middle, and an end
- SP.52 develop an oral presentation with clearly worded and well-placed thesis statement that addresses a selected topic
- SP.53 recognize and use different transitional devices in an oral presentation
- SP.54 develop a focused and coherent oral presentation that has a clear, logical progression of ideas (e.g., chronological order in a process speech)◇
- SP.55 use a variety of methods in speech presentation (e.g., impromptu, extemporaneous, manuscript, memorization)
- SP.56 develop and deliver oral presentations that use complete sentences and appropriate word choice that reflect standard American English usage◇
- SP.57 present appropriate introductions, conclusions, and transitions
- SP.58 participate in a variety of speaking activities (e.g., class discussion, interviews, speeches, group work)
- SP.59 deliver to an audience of peers a presentation that exhibits effective verbal and non-verbal speaking skills
- SP.60 use visual aids appropriately in an oral presentation

GROUP DISCUSSION/TEAMWORK

- SP.61 explore and demonstrate an understanding of the different types of groups, purposes, and the procedures used in each◇
- SP.62 recognize the various roles and responsibilities of members of a group◇
- SP.63 recognize the characteristics of an effective team member◇
- SP.64 participate as a responsible group member◇
- SP.65 participate in a variety of formal and informal group activities (e.g., panel, meeting, symposium, and forum)◇
- SP.66 participate in group problem-solving activities◇

TECHNOLOGY

Where appropriate technology is available, students will be given opportunities to:

- SP.67 use word processing, database, spreadsheet, and graphic presentation programs to prepare and edit text and information for written, visual and oral communication (e.g., public speaking, classroom projects)◇
- SP.68 use graphic presentation software appropriately in oral presentations◇
- SP.69 analyze advantages and disadvantages of the widespread use of and the reliance on technology in the workplace and in society as a whole◇
- SP.70 demonstrate legal and ethical behaviors regarding the use of technology and information◇
- SP.71 routinely and efficiently use online information resources to meet needs for collaboration, research, publications and communication◇
- SP.72 select and apply technology tools for research, information analysis, problem solving, and decision-making in lifelong learning◇
- SP.73 use appropriate technology to record presentations for self-assessment◇

Journalism

Journalism expands and enhances English Language Arts in the areas of reading, writing, speaking, listening, and viewing. Emphasis will be on the use of oral, written, and visual communication skills for educational, occupational, and personal endeavors. These instructional goals and objectives can be adapted for various levels of study from introductory to advanced courses, allowing students in grades 9-12 to earn multiple credits. To further enhance students' journalism skills and provide leadership opportunities, continued enrollment in the journalism program is highly recommended. Students working at two or more levels may be accommodated in a single class. Students at different course levels should demonstrate improvement in work quality and increase in complexity of skill.

Courses that encompass a thorough study of the field of journalism and mass communication cover a broad spectrum of important skills that reach across the curriculum. These curriculum areas include: language arts (interviewing, writing and editing stories); fine arts (page design, photography, advertising design); social studies (First Amendment, press laws and Supreme Court cases, censorship, journalism history); math and business (preparing a budget, advertising sales, billing and invoicing, record keeping); and workplace skills (planning, teamwork, leadership, meeting deadlines).

Electives can include courses such as basic journalism, newspaper, yearbook, broadcasting, public relations, photojournalism, and desktop publishing. Other related electives may be developed and approved at the county level by selecting applicable instructional goals and objectives presented here as well as creating additional ones to address the focus of the class. Courses in journalism should be included as recommended electives for all of the following career clusters: Business and Marketing, Fine Arts and Humanities, Human Resources, Engineering and Technical, Health Services, and Science and Natural Resources.

Journalism Electives:

Basic Journalism

Newspaper

Yearbook

Broadcasting

Public Relations

Photojournalism

Desktop Publishing

Course descriptions for these electives must include the Journalism IGOs (JN.1-JN.60) along with specific IGOs applicable to each speciality.

ORAL COMMUNICATION

- JN.1 review appropriate speaking and listening skills (e.g., ask and answer questions; follow directions; adapt to speaker's purpose; make eye contact, speak clearly and correctly, use telephone skills and etiquette, and engage in group discussion)
- JN.2 take proper steps to prepare and conduct an interview (e.g., identify self and publication/affiliation, state purpose of interview, ask open-ended questions and structured questions)◇
- JN.3 listen for bias and/or authority to evaluate the reliability of sources
- JN.4 listen to, identify, and interpret a source's message and intent◇
- JN.5 listen to sources and accurately record direct and indirect quotations◇

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WRITTEN COMMUNICATION

Writing Skills and Language Usage

- JN.6 understand and utilize various methods of news gathering (e.g., interviewing, polls, surveys, archives, questionnaires)
- JN.7 use the writing process (prewriting, drafting, revising, editing, and publishing) to address specific writing purposes (e.g., news, editorial, feature, sports, column, advertising and multiple audiences (e.g., peers, teachers, parents, the community)◇
- JN.8 understand and demonstrate news judgement (e.g., prioritizing, gate keeping)
- JN.9 use the five Ws and the H (who, what, when, where, why and how) concept to organize information
- JN.10 use an appropriate journalistic writing model to draft writing that is focused and coherent (e.g., the inverted pyramid to write a news story, the hourglass and lead-quote-transition formula to write a sports and/or feature story, various audio and video scripting formats)
- JN.11 identify and write the various types of leads (e.g., narrative, direct quotation, question, summary)
- JN.12 use resources such as a style book, a dictionary, and a thesaurus to select vocabulary that is vivid, precise, and economical◇
- JN.13 identify and use various transitional devices◇
- JN.14 produce writing in which facts, quotations, attributions, paraphrases and interpretations are accurate (e.g., names, titles, proper nouns)◇
- JN.15 vary syntax and sentence structure
- JN.16 write creative and accurate headlines and captions
- JN.17 use editing strategies and journalistic style rules to recognize and correct grammatical spelling and style errors (e.g., punctuation, capitalization, sentence structure)

Reading and Research

- JN.18 read professional and scholastic publications for models and research
- JN.19 develop news judgment through the study of the elements of news (e.g., timeliness, proximity, accuracy, human interest, balance, objectivity, consequence, conflict, prominence)
- JN.20 learn, apply and utilize specialized vocabulary (e.g., ladder diagram, colophon, captions, pica, masthead and sound bite)
- JN.21 read and comprehend professional and student writing to edit, critique, and utilize information
- JN.22 identify and evaluate various kinds (types) of writing (e.g., broadcast, scripts, editorials, news, sports)
- JN.23 identify and evaluate the parts of a story (lead, body, conclusion, quotes)
- JN.24 use graphic organizers to analyze printed or broadcast material using standard models of journalistic writing (e.g., the inverted pyramid, the hourglass model, the Lead-Quote-Transition formula, the five Ws and the H)
- JN.25 recognize persuasive language and techniques (e.g., identify authority of speaker, special interest bias, propaganda in advertising, distinguish between fact and opinion)
- JN.26 recognize and understand specialized jargon (e.g., sports, technology)
- JN.27 follow written directions to accomplish a task◇
- JN.28 discover how the history of journalism parallels the social and political history of the country

VISUAL COMMUNICATION

- JN.29 know and understand the principles of layout and design (e.g., harmony, balance, contrast, proportion)
- JN.30 know and understand specialized vocabulary related to layout and design (e.g., blue screen, story board, framing, column format, grid design)

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- JN.31 properly prepare a rough layout for newspaper, yearbook, magazine, broadcast story board, and/or advertisement
- JN.32 identify and use contemporary graphic elements in design (e.g., spot color, four color, rule lines, initials, quotes, typography)
- JN.33 learn terminology associated with photojournalism (e.g., aperture, F-stop, depth of field, shutter speed, film speed)
- JN.34 understand and use the elements of photo composition (e.g., dominance, texture, angle of view, contrast, rule of thirds, leading lines, framing devices)
- JN.35 understand and explain the storytelling ability of photography (photo editing)
- JN.36 learn how to crop and size photographs (manually or digitally)

TECHNOLOGY

- JN.37 use word processing programs to prepare and edit written text for publication, broadcast and/or classroom assignments◇
- JN.38 retrieve information from electronic media for research (e.g., stories, reports, career exploration)◇
- JN.39 use desktop publishing software for page design◇
- JN.40 learn how technology is changing mass communications (e.g., digital photography, desktop publishing, scanners, online publishing, e-mail, electronic transfer, videography)◇
- JN.41 use technology to prepare classroom projects (e.g., multi media presentation, data bases, spread sheets, school publications)◇
- JN.42 analyze advantages and disadvantages of widespread use and reliance on technology in journalism and society as a whole◇
- JN.43 demonstrate and advocate legal and ethical behaviors in the use of technology◇
- JN.44 collaborate with peers, experts, and others to contribute to a journalism knowledge base by using technology to compile, synthesize, produce, and disseminate information◇

BUSINESS ASPECTS

- JN.45 understand the role of business and advertising in journalism
- JN.46 recognize the importance of market research
- JN.47 write and design effective advertisements
- JN.48 understand and demonstrate how an ad is prepared
- JN.49 understand various circulation and record keeping methods
- JN.50 learn the proper way to sell advertising (e.g., dress and act professionally, develop a plan of action, role play selling advertising and/or actually sell advertising)◇

LEGAL AND ETHICAL ASPECTS

- JN.51 understand the role of journalism and its impact on society
- JN.52 understand key press law issues (e.g., censorship, prior restraint, freedom of the press, libel, slander, privacy, major court cases)
- JN.53 understand the rights and responsibilities of journalists (e.g., fair and balanced reporting, accuracy)
- JN.54 define ethics and its role in professional and scholastic journalism (e.g., The Society of Professional Journalists Code of Ethics, school and publication policies, AP Style book)
- JN.55 understand the concept of intellectual property (e.g., copyright, plagiarism)
- JN.56 recognize and understand various propaganda devices

PROFESSIONAL SKILLS

- JN.57 act responsibly and professionally in the performance of all duties (e.g., dress professionally, check

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sources, show objectivity, report fairly and accurately, complete assignments, meet deadlines)◇

- JN.58 work collaboratively and cooperatively (e.g., teamwork, problem solving, brain storming, editorial boards, staff meetings)
- JN.59 develop organizational skills (individual and group)◇
- JN.60 develop leadership and management skills (e.g., editors, section editors, business managers, photo editors, production managers, news directors)◇
- JN.61 explore career opportunities and the required training in the field of journalism◇

SPECIALITY COURSES IN JOURNALISM

NEWSPAPER

The newspaper curriculum will focus on the hands-on approach to planning and publishing a school newspaper. The major principles of newspaper production and the higher level thinking skills necessary to go from concept to publication will be a central part of the curriculum and must include applicable instructional goals and objectives listed for basic journalism along with these specific goals and objectives

- NP.1 collaborate as a staff to determine audience and plan publication content, policy, size, design, budget, and circulation◇
- NP.2 understand and perform duties of assigned staff positions (refer to JN.60)◇
- NP.3 establish and cover beats
- NP.4 make photo and story assignments and set deadlines
- NP.5 collect and edit assigned material
- NP.6 plan and design page layouts
- NP.7 prepare and proof camera-ready material for submission to printer (e.g., paste-up, electronic desk submission)
- NP.8 develop, promote, and conduct fund-raising campaign (e.g., advertising, subscriptions)
- NP.9 distribute publication to audience
- NP.10 evaluate finished publication through feedback from staff and audience

YEARBOOK

The yearbook curriculum will focus on the hands-on approach to planing and publishing a school yearbook. The major principles of the yearbook production and the higher level thinking skills necessary to go from concept to publication will be a central part of the curriculum and must include applicable instructional goals and objectives listed for basic journalism along with the specific goals and objectives

- YB.1 collaborate as a staff to determine audience and plan publication content, policy, size, design, budget, and circulation◇
- YB.2 understand and perform duties of assigned staff positions (refer to JN.60)◇
- YB.3 make photo and copy assignments and set deadlines
- YB.4 collect and edit assigned material
- YB.5 plan and design page layouts
- YB.6 prepare and proof material for submission to printer (e.g., paste-up, electronic disk submission, etc.)
- YB.7 correct page proofs from printer for re-submission
- YB.8 develop, promote, and conduct fund-raising campaign (e.g., advertising, subscriptions)

BROADCASTING

The broadcasting curriculum will provide a study which addresses the applicable basic journalism instructional goals and objectives as well as ones specific to electronic media. These courses will engage students in

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productions of various formats and provide opportunities for skill development, advancement, and career exploration

- BC.1 engage in pre-production meetings to plan content, production schedules, staff positions, etc.
- BC.2 perform duties of various staff positions (e.g., director, anchor, technical director, floor manager), in productions of both leadership and non-leadership roles◇
- BC.3 follow various script and log formats to produce projects
- BC.4 explain and practice safety rules for operating broadcasting equipment and studio fixtures◇
- BC.5 use available video and audio equipment properly to create desired product or program
- BC.6 explain and practice proper care of video and audio equipment◇
- BC.7 understand and demonstrate various shooting techniques (e.g., angles, shots, focus, movement, framing)
- BC.8 develop and apply skills related to the role of talent in a production (e.g., camera and microphone consciousness, script use, dress, make-up, speaking skills)
- BC.9 understand and apply proper staging principles for both studio and location shoots
- BC.10 understand the effect of light on video and design basic lighting plans for shoots.

PHOTOJOURNALISM

Photojournalism is designed to help students study the art and techniques of reporting timely events through the use of pictures and words. It exposes students to the world of the photojournalist and to what it takes to become an effective media photographer and designer. Major emphasis is placed on visually communicating with the audience. This course must include applicable instructional goals and objectives listed for basic journalism along with the specific goals and objectives

- PJ.1 understand and demonstrate the processing of black and white film
- PJ.2 understand and demonstrate the printing of black and white pictures and negative contact sheets
- PJ.3 understand the purposes of a contact sheet (e.g., composition, negative damage, cropping, and density)
- PJ.4 understand and demonstrate the use of different focal lenses (e.g., telephoto, wide angle, normal, and zoom)
- PJ.5 analyze and select photographs for their storytelling value and visual quality
- PJ.6 demonstrate a working knowledge of available equipment and software (e.g., digital camera, scanner)
- PJ.7 gather and write information to complete the storytelling effect of the picture

DESKTOP PUBLISHING

Desktop Publishing curriculum will introduce students to a variety of ways people use technology to publish information. Students will explore various applications in desktop publishing through hands-on activities and experiences which may include newspapers, yearbooks, magazines, brochures, pamphlets, newsletters, memo forms, advertisements, banners, business cards, web pages, etc. This course must include applicable instructional goals and objectives listed for basis journalism along with the specific goals and objectives

- DP.1 define and use desktop publishing terminology
- DP.2 identify desktop publishing concepts (e.g., marketing, advertising, audience)
- DP.3 identify and analyze desktop publishing career opportunities
- DP.4 identify publication software, start the program, view the publication software window, open and save a publication, enter text into a frame, view and print a publication and exit the program
- DP.5 understand and use software tools to create a publication (e.g., import and manipulate text and graphics; use guides; define and apply styles; add and delete pages)
- DP.6 insert and resize clip art, copy and move an object, align and group images, layer objects, and rotate objects
- DP.7 use available technology to work with images (e.g., digital cameras, scanners, image manipulation software)◇

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- DP.8 identify copyright and patent laws pertaining to scanned images and documents, electronic clip art, scanned photography, trademarks and information◊
- DP.9 identify licensing agreements associated with desktop publishing software◊

PUBLIC RELATIONS

The Public Relations curriculum will address developing and maintaining positive working relationships within the school and extending into the community. Students will create promotional pieces such as press releases, brochures and newsletters, and serve as sources for disseminating school information. This hands-on course must include applicable instructional goals and objectives listed for basic journalism, along with these specific goals and objectives

- PR.1 use local media to gain experience and promote the school
- PR.2 find the publicity angle in school events, and prepare pieces accordingly
- PR.3 write the school's press releases for the local print and broadcast media
- PR.4 write, design, produce, and disseminate the school's newsletter and/or web page
- PR.5 compile site information for distribution as needed (e.g., event planning, media requests)
- PR.6 function as information source (e.g., file photos, archives)
- PR.7 serve as a liaison between the school and community◊
- PR.8 assist with internal communications (e.g., brochures, calendars, event publicity)

Middle Childhood and Adolescent Foreign Language Education

This section presents requirements set forth in Policy 2510 for foreign language study in grades 5-12 as well as discussion of some curricular issues.

Required elective program of study: Grades 5-8

- Beginning in Fall 1998, all counties are encouraged to offer two years of foreign language in grades seven and eight.
- Beginning in Fall 2002, all counties will be required to offer two years of foreign language for students in grades seven and eight.

The intent of the middle school requirement is to encourage students to take longer sequences of foreign language study. "The best way to learn a foreign language in school is to start early and to study it intensively over many years." (From *What Works: Research About Teaching and Learning*). ~~Just as, If native English speakers are constantly refining English communication skills, students studying another language must study for several years to develop communicative proficiency, must study their own language in grades kindergarten through twelve, then, second language study must be of comparable duration in order to develop optimum proficiency.~~

~~In light of that intent Therefore, it is highly recommended that the two years of foreign language study offered in the middle or junior high school be two full years of study (equal equivalent to one or two years of high school study), and that students have an opportunity to continue study in that language (and/or to add another language) in grade nine. Some junior high and middle schools offer exploratory courses which afford brief introductions to one or more foreign languages. These exploratory courses are not equivalent to level 4 high school courses and often are not part of a sequential skill building foreign language program. This learning sequence would deliver level IA of the language at the seventh grade level and level IB at the eighth. This will provide students with a sound base to continue study in that language in grades nine through twelve.~~

Some junior high or middle schools offer exploratory courses that afford brief introductions to one or more foreign languages. These exploratory courses are not equivalent to level I high school courses, and should be taught only in sixth and/or seventh grades at the middle school level. High school credit is not awarded for exploratory study.

Any student who successfully completes a high school level foreign language course prior to grade nine shall receive full credit for that course toward graduation requirements, provided that course fulfills state-adopted foreign language instructional goals and objectives and is scheduled for no less than 8100 minutes.

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Required elective program of study: Grades 9-12

- A minimum of two levels of one foreign language will be required to be offered.
- All students are strongly encouraged to complete two courses in a foreign language.

The choice of languages(s) to be offered is a county decision. ~~The sequence of courses, how early foreign language study will start and which languages will be offered at what grades also are to be coordinated on the county level. Whether or not foreign language study will be required for some (or all) students at the high school level is an issue which each county and school personnel will discuss as they design programs of study which reflect Jobs Through Education requirements.~~ However, foreign language programs currently in place should be preserved with articulation being built in to provide seamless second language instruction middle school through high school. In order to prepare students for life in an increasingly diverse world, schools should offer students a choice of languages for long-term study.

The minimum requirement of two years is not the optimum educational program for second language acquisition. High school students should be strongly encouraged to study several years of the same language to prepare them to use second language skills in the workplace. As with other programs of study, students who demonstrate mastery of instructional objectives at one level of foreign language study are to be provided with the opportunity to advance to the next level objectives.

Foreign Language Program of Study: Overview

The West Virginia Foreign Language Program of Study sets forth the expectations for foreign language study for all West Virginia students in middle, junior high and high schools. The revised curriculum is designed to address the needs of all students engaged in the study of a second language, regardless of the language they study or the grade level at which they begin that study.

The Foreign Language Instructional Goals and Objectives provide leadership for the local establishment of standards for optimal learning experiences in foreign language for students in West Virginia schools. They are designed to provide guidance for the development of district foreign language curricula, the selection of instructional materials, and inservice and preservice professional development programs. Teachers at local schools are responsible for developing a scope and sequence and for selecting the specific content and learning activities that will lead students to a high level of language proficiency. It is imperative, therefore, that all teachers select learning activities which are appropriate for students of differing ages, interests and experiences. Since teachers are the architects of the instruction which occurs in the classroom and instruction is the vital force in the whole curriculum process, instructional decision making is best left in the hands of classroom teachers.

The instructional objectives are organized around three goals of foreign language learning. The ~~recently released~~ national *Standards for Foreign Language Learning: Preparing for the 21st Century* and the ~~draft~~ *Standards for Classical Language Learning* provide inspiration for the choice of goals. Both national documents present five goals: communication, cultures, connections, comparisons and communities. The foreign language educators who developed and revised West Virginia curriculum felt that three goals, as opposed to five, provide a more manageable framework for organizing the teaching and learning of foreign languages. The three goals of foreign language education in West Virginia are communication, cultures and connections. The third goal also incorporates items contained in the national goals of comparisons and communities.

The state foreign language goals are based on the following beliefs:

- Foreign language study is for all students at all levels and provides a foundation for life-long language learning and for personal enjoyment and enrichment.
- **As stated in Goals 2000, foreign language study belongs in the core curriculum with English Language Arts, Mathematics, Science, Social Studies and Fine Arts.**
- Foreign language study should start at an early age. Because there is a direct correlation between the amount of time devoted to the study of a language and the level of proficiency attained, **the sequence of study of one language should span several years.**
- Foreign language study ~~can~~ leads to an awareness of and an appreciation for cultural diversity.
- Foreign language study ~~can~~ enhances other areas of study through development of higher order thinking skills and a clearer understanding of one's native language.
- Foreign language skills ~~can~~ serves as a complement to specialized training, leading to global communication skills in a technological world.
- Foreign languages can also be used as a means of communication to teach other content areas.

Foreign Language Instructional Goals

✦ **Communication: Communicate in languages other than English**

Communication—using the language—is at the core of foreign language study. The ability to communicate appropriately in at least one language in addition to English is becoming increasingly important in an interdependent world. Language learners use both spoken and written forms to communicate ideas for a variety of purposes and with a variety of audiences.

More specific skills include:

- **Interactive Language Use (Interpersonal)**: Students engage in conversations, provide and obtain information, express feelings and exchange opinions.
- **Non-interactive Language Comprehension (Interpretive)**: Students understand and interpret written and spoken language on a variety of topics.
- **Non-interactive Language Production (Presentational)**: Students convey information to listeners and readers for a variety of purposes.

Because of the unique nature of classical language study, the communication goal for Latin will emphasize the formation of different skills than the communication goal for modern foreign languages.

Specific skills under the Latin communication goal include:

- **Reading Comprehension**: Students will read, understand and interpret Latin.
- **Oral Skills, Listening and Writing**: Students use orally, listen to and write Latin as part of the language learning process.

Separate Latin communication objectives are noted following the modern foreign language communication objectives for all levels. Objectives listed under Cultures and Connections have been renumbered for Latin since the number of communication objectives is less for Latin than for modern languages.

✦ **Cultures: Gain knowledge and understanding of other cultures** Language and culture cannot be separated. Students cannot truly master a language without understanding the authentic cultural contexts which dictate(d) what behaviors and language are (were) appropriate and acceptable. Foreign language study develops an awareness that the viewpoints, practices and contributions of a society, both from historical as well as modern day perspectives, work together to reflect the culture of that society, and that the culture is then reflected in the language. More specific skills include:

- **Daily Life**: Students demonstrate an understanding of the contemporary and historical daily life of the target cultures by examining practices, viewpoints and everyday objects.
- **Contributions**: Students identify significant contributions in the arts, sciences and history that the target cultures have made to the world community.
- **Sociolinguistic Applications**: Students perceive the relationships among language(s), behaviors and viewpoints of the target culture(s) and use this knowledge to interact effectively in cultural contexts.
- **Culture Comparisons**: Students grasp the concept of culture through comparison of the target culture(s) and their native culture.

✦ **Connections: Observe connections between native and target languages, between the target language and other disciplines, and between target language skills and their use beyond the classroom setting**

In addition to developing communication skills and cultural knowledge, students benefit from foreign language study by strengthening skills in their native language, by broadening sources of information available to them, and by enhancing their personal and future professional lives. More specific skills include:

- **Linguistic Connections**: Students demonstrate understanding of the nature of language through comparisons of the target language and their native language.

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- **Interdisciplinary Connections:** Students further their knowledge of other disciplines through foreign language study.
- **Global Connections:** Students apply target language skills and cultural knowledge within and beyond the classroom setting.

Process/Workplace Skills in the Foreign Language Instructional Objectives

In Policy 2520, six key areas of process/workplace skills have been identified. These are essential skills students need for successful entry into work or post-secondary education. The ability to solve problems, communicate effectively, work successfully with others, develop sound personal habits, utilize technology, and establish clear objectives for advancing career interests are the six goal areas which have been identified.

Throughout the foreign language curriculum, the ♦ symbol marks those academic learning objectives that particularly lend themselves to the development of process/workplace skills.

Exploratory Foreign Languages

Foreign Language Exploratory is intended as a preparatory phase for continued foreign language learning through articulation with high school level programs. This program offers an opportunity for students

- to communicate in another language,
- to experience and develop an appreciation of other cultures,
- to enhance their understanding of the English language,
- to continue further foreign language study at both the middle and high school levels, and
- to develop an awareness of the benefits of foreign language skills in the workplace

Therefore, exploratory foreign language study should be considered an essential element of the middle school curriculum. This initial experience should provide real life foreign language experiences which are standards-based and goal-oriented. Exploratory study should be the beginning of a long-term sequence of foreign language study in order to achieve maximum results in the ability to communicate in another language.

"To attain the levels of proficiency indicated in national and many state standards, it is important for students to begin foreign language learning in the early grades and continue for as long as possible." (From *Handbook of Research on Improving Student Achievement*).

In addition, the exploratory is a vital component of foreign language study and of the school curriculum in general, as it promotes success rather than failure. It empowers students to become more active learners. This skill, as well as the study of the language, also results in enhanced success in core subjects. Cognitive benefits in the areas of metalinguistic awareness, creative thinking, and non-verbal reasoning are greater for elementary students who study foreign languages. (Adapted from *Handbook of Research on Improving Student Achievement*).

The following Instructional Goals and Objectives are intended to serve as a minimum curriculum for a six or nine weeks program at the middle school level, grades six and seven. Teachers are encouraged to add appropriate activities for continued skills development for longer programs.

Many of the following Instructional Goals and Objectives are taken from Foreign Language Level I. However, students at the exploratory level are expected to attain a lower level of proficiency due to both the maturity of the younger learner and to the shortened instructional length of most exploratory programs.

COMMUNICATION

Interactive Language Use (Interpersonal)

- FLEX.1 Request and exchange basic information on personal needs, courtesies, feelings, likes and dislikes, and other familiar topics, using the target language (e.g., numbers, colors, etc.).
- FLEX.2 Describe objects in the immediate environment.
- FLEX.3 Follow basic instruction in the target language to participate in classroom and cultural activities.
- FLEX.4 Make requests for personal needs known to teacher in target language.
- FLEX.5 Greet and make introductions to classmates, family members and friends.

Non-Interactive Language Comprehension (Interpretive)

- FLEX.6 Understand and respond to both simple spoken and/or written commands.
- FLEX.7 Comprehend the main idea of short conversations on familiar topics.
- FLEX.8 Recognize words and phrases in songs.
- FLEX.9 Watch culturally relevant films, videos and television shows with supporting activities.
- FLEX.10 Read news reports or current events using targeted vocabulary (e.g., Internet news sites).
- FLEX.11 Read isolated words and phrases in a situational context (e.g., menus, signs, schedules, advertisements).
- FLEX.12 Read language that the student is able to use orally.

Non-Interactive Language Production (Presentational)

- FLEX.13 Give short personal communications to listeners.
- FLEX.14 Sing in the target language.
- FLEX.15 Write familiar words or phrases.
- FLEX.16 Write and present simple guided texts on familiar topics (e.g., short paragraph on family).◇

CULTURES

Daily Life

- FLEX.17 Identify objects, images, products and symbols of the target culture(s).◇

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- FLEX.18 Observe and begin to identify daily routines, cultural viewpoints and practices in the target culture(s).
- FLEX.19 Identify some common generalizations about the target culture(s).
- FLEX.20 Identify social, geographic and historical factors that impact cultural practices.◇

Music and the Arts

- FLEX.21 Explore the variety of crafts and art that is pertinent to the culture to gain greater appreciation.
- FLEX.22 Recognize the various music and dance forms of different cultures.

Contributions

- FLEX.23 Explore artistic, scientific, and philosophical contributions of the target cultures(s).◇

Sociolinguistic Applications

- FLEX.24 Recognize that common words, phrases and idioms reflect the target cultures(s).
- FLEX.25 Recognize language and behaviors that are/were appropriate to the target cultures(s).◇

Culture Comparisons

- FLEX.26 Recognize similarities and differences between native and target cultures, including:
- Contributions
 - Cultural viewpoints
 - Practices◇
- FLEX.27 Identify differences in cultural practices among same-language cultures.

CONNECTIONS

Linguistic Connections

- FLEX.28 Recognize structural similarities and differences, including
- Sound patterns
 - Word formation patterns
 - Connotations and denotations
 - Sentence structure
 - Idiomatic expressions◇
- FLEX.29 Demonstrate an awareness of sociolinguistic conventions in native and target languages.

Interdisciplinary Connections

- FLEX.30 Recognize information and skills common to the foreign language and other disciplines.
- FLEX.31 Identify the general topic of simple print and nonprint sources intended for native speakers of the language, using targeted vocabulary.

Global Connections

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- FLEX.32 Identify opportunities to use the target language outside the classroom.
- FLEX.33 Locate resources in the community that relate to the target culture. (E.g., ethnic heritage societies, ethnic restaurants, etc.)
- FLEX.34 Identify careers that use foreign languages; be aware of how foreign language skills increase marketability.◇
- FLEX.35 Identify careers not requiring a college education in which foreign language skills increase employment marketability.◇
- FLEX.36 Locate resources in the community that utilize the target language in the workplace (e.g., bilingual signs, directions, etc.).◇

Exploratory Foreign Language Technology Objectives

Where appropriate technology is available, students will be given opportunities to

- FLEXT.1** Use the computer and World Wide Web to
- acquire language skills and cultural information
 - access libraries
 - identify job related skills in the target language
 - explore opportunities to live and/or study in a target language country
 - communicate in the target language and inter-school, inner-city, inter-state, and internationally
- FLEXT.2** Use computer software and CD-ROMs to
- retrieve information
 - select materials from other disciplines, supporting special topics in the target language
 - gain access to appropriate programs in the target language to carry out tasks designed to reinforce language skills and/or to help students discern cultural practices
 - record responses for teacher for self-assessment
 - interact with other students studying the target language through games and software◇
 - create level appropriate desktop publishing presentations◇
- FLEXT.3** Use current visual technologies (e.g., including but not limited to TV, VCR, satellite, Internet, cameras, overhead projectors, LCD panels, TV converter, video projector, Smart Board, etc.) to
- view and listen to interactions of native speakers in both simulations and culturally authentic situations and complete assigned tasks
 - prepare and present projects on assigned topics◇
 - retrieve specific information by watching news reports, talk shows, documentaries, soap operas, cartoons and commercials
 - gain cultural information◇
- FLEXT.4** Use current audio technology (e.g., including but not limited to tapes/CD players, etc.) to
- complete listening skills activities
 - record responses for self-assessment
 - gain cultural information◇
- FLEXT.5** Use cameras and camcorders to
- record role plays such as skits, newscasts and interviews for self-assessment
 - develop narratives and other descriptive activities◇

Foreign Languages Level I

The level I course in modern foreign languages allows students to comprehend and produce simple, short sentences and ideas using memorized words and phrases in the target language. Topics of reading and conversation center around immediate concerns and interests. Comprehension is generally more developed than language production. Basic communicative tasks are facilitated by memorized patterns, resulting in fewer errors.

Since the key to communicating with the ancient world is reading, students in a level I classical language course are oriented to the language through simple primary sources and passages which use appropriate levels of vocabulary and structure. Reading comprehension is enhanced by repeating, reading aloud, reciting and writing simple sentences.

During level I study, in both modern and classical languages, students also learn to recognize people, products and viewpoints of the target culture and begin to compare native and target cultures. Students are introduced to ways in which the target language is connected to the native language, to other disciplines and to resources beyond the classroom.

COMMUNICATION

Interactive Language Use (Interpersonal)

- I.1 Request and exchange basic information on personal needs, courtesies, feelings, likes and dislikes and other familiar topics, relying heavily on memorized vocabulary and structures.◊
- I.2 Describe people and things in the immediate environment.
- I.3 Give and follow instructions in order to participate in classroom and cultural activities.◊
- I.4 Make requests in public places, (e.g., stores, ~~post office~~, restaurant, etc.)
- I.5 Greet and make introductions to classmates, family members and friends.

Non-interactive Language Comprehension (Interpretive)

- I.6 Understand and respond to both spoken and written commands.
- I.7 Comprehend the main idea of short conversations and narratives on familiar topics.
- I.8 Recognize words and phrases in songs.
- I.9 ~~Watch culturally relevant films, videos and television shows with supporting activities.~~ Listen and/or watch culturally relevant multi-media sources with supporting activities.
- ~~I.10 Listen to radio programs and news reports in the target language.~~
- I.410 Identify people and objects based on oral and/or written descriptions.
- I.4211 Read isolated words and phrases in a situational context, (e.g., menus, signs, schedules, advertisements, etc.)
- I.4312 Read language that the student is able to ~~use orally~~ speak.

Non-interactive Language Production (Presentational)

- I.4413 Give directions, instructions and short personal communications to listeners and readers.◊
- I.4514 ~~Recite material and/or proverbs, short anecdotes and poetry and/or sing in the target language.~~ Recite songs.
- I.4615 Write familiar words or phrases (e.g., colors, dates, simple autobiographical information, etc.).
- I.4716 Write and present simple guided texts on familiar topics.◊

LATIN COMMUNICATION

Reading Comprehension

- LAT I.1 Read words, phrases and simple sentences, and relate them to pictures and/or other words, phrases and simple sentences.
- LAT I.2 Answer simple questions in Latin or English about short passages.
- LAT 1.3 Use vocabulary, basic inflectional systems and syntax appropriate to the students' reading level.

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Oral Skills, Listening and Writing

- LAT I.4 Recognize and reproduce the sounds of Latin.
LAT I.5 Respond to simple questions, statements, commands or other stimuli.
LAT I.6 ~~Sing songs or recite short passages.~~ Recite material and/or sing in Latin.
LAT I.7 Write simple phrases and sentences.

CULTURES

Daily Life

- ~~I.18/17~~ Identify objects, images, products and symbols of the target culture(s).
LAT I.8

I.19/18 Observe and begin to identify daily routines, cultural viewpoints and practices in the target culture(s).
LAT I.9

I.20/19 Identify some common generalizations about the target culture(s).
LAT I.10

I.21/20 Identify social, geographic and historical factors that impact cultural practices.
LAT I.11

Contributions

- I.22/21 Explore artistic, scientific and philosophical contributions of the target culture(s).
LAT I.12

Sociolinguistic Applications

- I.23/22 Recognize that common words, phrases and idioms reflect the target culture(s).
LAT I.13

I.24/23 Recognize language and behaviors that are/were appropriate to the target culture(s).
LAT I.14

Culture Comparisons

- I.25/24 Recognize similarities and differences between native and target cultures, including
LAT I.15
 - contributions
 - cultural viewpoints
 - practices.◇
I.26/25 Identify differences in cultural practices among same-language cultures.◇
~~LAT I.16~~

CONNECTIONS

Linguistic Connections

- I.27/26 Recognize ~~structural~~ similarities and differences, including
LAT I.16/16
 - sound patterns
 - word formation patterns
 - connotations and denotations
 - sentence structure
 - idiomatic expressions
 - cognates
 - derivatives◇
I.28/27 Demonstrate an awareness of sociolinguistic conventions in native and target languages

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LAT.1.18 (e.g., formal/informal, non-verbal communication, vocabulary choice)

Interdisciplinary Connections

I.29/28 Recognize information and skills common to the foreign language and other disciplines.◇

LAT 1.1917

I.30/29 Identify the general topic of print and nonprint sources intended for native speakers of the
LAT 1.2018 language.(e.g., tombstones, monuments, building inscriptions -- for Latin).

Global Connections

I.31/30 Identify opportunities to use the target language outside the classroom.

LAT 1.2119

I.32/31 Locate resources in the community which relate to the target culture(s) and/or language◇.

LAT.1.2220

Foreign Languages Level II

The level II course in both modern and classical foreign languages expands the students' knowledge of structure and vocabulary so they can understand and produce more complex ideas in the target language. Students become increasingly confident in working with authentic materials. Students identify the products, practices and viewpoints of the target culture and learn to discuss generalizations about that culture. Level II students are more aware of similarities and differences between target and native languages and cultures. They also become more adept at using information and skills common to the target language which could be transferred to other disciplines.

COMMUNICATION

Interactive Language Use (Interpersonal)

- II.1 Exchange information, both orally and in writing, about a variety of topics including school and personal activities.
- II.2 Interact and negotiate in variety of situations to meet personal needs, (e.g., ask permission, ask for or respond to an offer of help, ask for or give directions).◇
- II.3 Elaborate on basic ideas of likes, dislikes, feelings, agreement and disagreement.

Non-interactive Language Comprehension (Interpretive)

- II.4 Comprehend a series of spoken and/or written instructions or commands on familiar topics.
- II.5 Expand understanding of authentic oral and written language by using aural, visual and context clues to derive meaning.
- II.6 Derive the main idea and some supporting details from simple texts on familiar topics.
- II.7 Read, and listen to and reenact folk tales, short stories, poems or songs that are written for native speakers of the target language.

Non-interactive Language Production (Presentational)

- II.8 Write short messages in response to given situations, (e.g., post cards, personal notes, phone messages, directions, etc.).◇
- II.9 Write short paragraphs on topics of personal interest. ◇
- ~~II.10 Present short plays and skits.~~
- ~~II.11 Prepare and present audio or video recorded messages. ◇~~
- II.10 Prepare brief written reports using primary sources. ◇
- II.11 Read aloud a familiar passage with appropriate intonation and comprehensible pronunciation.
- ~~II.4412 Summarize orally or in writing the plot and describe the characters in selected pieces of literature. Summarize, in oral or written form, plot and characterization from selected authentic materials.~~
- II.4513 Relate a simple narrative about a personal experience or event. ◇

LATIN COMMUNICATION

Reading Comprehension

- LAT II.1 Read and understand passages composed for acquisition of content and language.
- LAT II.2 Read and understand passages adapted from the original authors when provided with appropriate assistance.
- LAT II.3 Read and understand short unadapted passages when provided with appropriate assistance.
- LAT II.4 Use vocabulary, inflectional systems and syntax appropriate to the students' reading level.

Oral Skills, Listening and Writing

- LAT II.5 Read aloud with accurate pronunciation and meaningful phrase grouping by ~~imitating the models presented in class~~ imitation.
- LAT II.6 Respond to questions, statements, commands and other stimuli.

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LAT II.7 Write phrases and sentences.

CULTURES

Daily Life

~~II.46/14~~ Describe objects, images, products and symbols of the target culture(s).

LAT II.8

~~II.47/15~~ Identify daily routines, cultural viewpoints and practices in the target culture(s).

LAT II.9

~~II.48/16~~ Identify and discuss generalizations about the target culture(s).

LAT II.10

~~II.49/17~~ Discuss social, geographic, and historical factors that impact cultural practices.

LAT II.11

Contributions

~~II.20/18~~ Identify the development of artistic, scientific and philosophical contributions of the target

LAT II.12 culture(s) and historical factors that impacted those contributions.

Sociolinguistic Applications

~~II.24/19~~ Identify common words, phrases and idioms within a cultural context that reflect the target

LAT II.13 culture(s).

~~II.22/20~~ React to language and behaviors that are/were appropriate to the target culture(s).

LAT II.14

Culture Comparisons

~~II.23/21~~ Discuss similarities and differences between native and target cultures including:

- LAT II.15
- contributions
 - cultural viewpoints
 - practices

~~II.24/22~~ Explain cultural practices among same-language cultures. ◇

LAT II.16

CONNECTIONS

Linguistic Connections

~~II.25/23~~ With guidance, predict structural similarities and differences between native and target

- LAT II.17 languages, including
- sound patterns
 - word formation patterns
 - connotations and denotations
 - sentence structure
 - idiomatic expressions
 - cognates
 - derivatives ◇

~~II.26/24~~ Recognize examples of sociolinguistic conventions in both native and target languages.

LAT II.18

Interdisciplinary Connections

~~II.27/25~~ With guidance, apply information and skills common to the target language ~~and to~~ other

LAT II.19 disciplines. ◇

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II.28/26 Extract the main idea from print and nonprint sources intended for native speakers of the
LAT 11.20 language. (e.g., tombstones, monuments, building inscriptions for Latin)

Global Connections

II.29/27 Pursue opportunities to use the target language outside the classroom.
LAT II.21

~~II.30/28~~ Use resources in the community to explore aspects of the target culture and languages.◇
LAT II.22

Foreign Languages Level III

The level III course in both modern and classical languages prepares students to understand short passages and authentic texts on familiar topics and themes using learned vocabulary, grammatical structures and context clues. In modern language classes, students create short messages, letters and simple conversations from sentence through paragraph length using ~~past, present and future time~~ present time and an increasing use of past and future times. As they develop a more sophisticated understanding of the target culture, level III modern and classical language students discuss, ~~analyze and explain~~ and examine various cultural aspects. They interpret cultural connotations of common linguistic items and, in the modern languages, begin to incorporate appropriate behaviors and gestures in language use. Students transfer information, skills and resources from the target language to other disciplines and vice versa. They seek opportunities to use or apply the target language outside the school environment.

COMMUNICATION

Interactive Language Use (Interpersonal)

- III.1 Exchange information, both orally and in writing, about past, current and future events.◇
- III.2 ~~Initiate, sustain and close conversation on a variety of topics, responding to factual and interpretive questions.~~
- III.32 Support opinions using previously learned vocabulary and grammatical structures.◇

Non-interactive Language Comprehension (Interpretive)

- III.43 Understand the main idea and significant details of live and recorded discussions, narratives and presentation(s).
- III.54 Gain new information and knowledge and derive the main idea and significant details from authentic written materials such as (e.g., personal letter, pamphlets, newspaper and magazine articles, advertisements and selected literary texts.)

Non-interactive Language Production (Presentational)

- ~~III.6 Explain a process based on prior knowledge or experience to listeners and readers.◇~~
- III.75 Give descriptions using more complex grammatical structures.
- III.86 Give oral reports on a given topic.◇
- III.97 Produce formal and informal written communication.◇
- III.408 Complete authentic forms and documents.◇
- III.449 Take notes in ~~some detail~~ on oral presentations ~~of familiar topics.~~◇
- III.4210 Write brief paraphrases ~~and summaries~~ of written material.
- III.4311 Use the language creatively in (e.g., writing and presenting poetry, prose, essays, etc.)

LATIN COMMUNICATION

Reading Comprehension

- LAT III.1 Read and understand prose and/or poetry of selected authors.
- LAT III.2 Read and understand passages containing vocabulary, inflectional systems and syntax appropriate to the student's reading level.
- LAT III.3 Recognize, explain and interpret content and stylistic features and grammatical structures of authors read.

Oral Skills, Listening and Writing

- LAT III.4 Read prose and/or poetry aloud with attention to such features as metrical structure and meaningful phrase grouping.
- LAT III.5 Respond to more complex questions, statements, commands and other stimuli.
- LAT III.6 Write short passages in Latin.

CULTURES

Daily Life

~~III.44/12~~ Explain objects, images, products and symbols of the target culture(s).
LAT III.7

~~III.45/13~~ Explain the significance of daily routines, cultural viewpoints and practices in the target culture(s).
LAT III.8

~~III.46/14~~ Analyze some common generalizations about the target culture(s).
LAT III.9

~~III.47/15~~ Examine social, geographic and historical factors that impact cultural practices.
LAT III.10

Contributions

~~III.48/16~~ Discuss the development of artistic, scientific and philosophical contributions of the target culture(s) and the historical factors that impacted those contributions.
LAT III.11

Sociolinguistic Applications

~~III.49/17~~ Interpret the cultural connotations of common words, phrases and idioms.
LAT III.12

~~III.20/18~~ Produce language and behaviors that are appropriate to the target culture(s).

Culture Comparisons

~~III.24/19~~ With guidance, analyze similarities and differences between native and target cultures including:
LAT III.13

- contributions
- cultural viewpoints
- practices.◊

~~III.22/20~~ Compare and contrast cultural practices among same-language cultures.◊
LAT III.14

CONNECTIONS

Linguistic Connections

~~III.23/21~~ Discuss structural similarities and differences between native and target languages.
LAT III.45/14 including:

- sound patterns
- word formation patterns
- connotations and denotations
- sentence structure
- idiomatic expressions
- derivatives
- cognates

~~III.24/22~~ Independently identify and produce examples of sociolinguistic conventions in both native and target languages.
LAT III.46

Interdisciplinary Connections

~~III.25/23~~ Independently identify and transfer information and skills which can be applied to specific other disciplines.◊
LAT III.47/15

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III.26/24 Extract the main idea and some supporting details from sources intended for native speakers
LAT III.4816 of the language.

Global Connections

III.27/25 Use the target language outside the classroom.

LAT III.4917

III.28/26 Use resources in the community to experience the target culture and language.◇

LAT III.2018

Foreign Languages Level IV

In modern foreign languages, level IV students initiate, sustain and ~~bring to closure~~ close a wide variety of communicative tasks. They begin to solve problems using the language and acquire new knowledge from authentic sources. Students at this level demonstrate an increased ability to express chronology and abstract ideas.

Since Latin students in level III begin to use authentic materials almost exclusively, level IV students continue to use Latin texts to refine skills of comprehension, analysis, interpretation and translation.

As students in both modern and classical languages continue to expand their knowledge of various aspects of the target culture(s), they also apply, evaluate, explain and integrate this information. At the end of four ~~By the fourth~~ years of study, students are able to synthesize and apply information from target language sources to other disciplines and vice versa. They independently locate target language resources and opportunities to expand language use beyond classroom experiences.

COMMUNICATION

Interactive Language Use (Interpersonal)

- IV.4 ~~Initiate and sustain discussions and interviews which include extended descriptions and narrations about a literary or cultural topic and responses to factual as well as interpretive questions.~~◇
- IV.1 Initiate and sustain conversations which may include:
- interviews
 - extended descriptions
 - narrations and
 - responses
- IV.2 Exchange opinions ~~and individual perspectives~~ on a variety of topics dealing with contemporary and historical issues from the target culture(s).◇
- IV.3 Interact in complex social situations; (e.g., expressing regret, stating complaints, ~~etc.~~)◇
- IV.4 Paraphrase what someone else has said.
- IV.5 Substantiate opinions and persuade others, both orally and in writing.◇

Non-interactive Language Comprehension (Interpretive)

- IV.76 Comprehend the main ideas and significant details in selected authentic texts.
- IV.87 Read for comprehension from a variety of longer authentic materials; (e.g., short stories, newspapers, magazines, personal correspondence, ~~etc.~~)
- IV.98 Make judgments about what is read; (e.g., identify cause and effect relationships, predict outcomes).

Non-interactive Language Production (Presentational)

- IV.409 Speak and write spontaneously about present, past and future events using learned vocabulary and grammatical structures.
- IV.4410 Convey pertinent information from authentic materials to an audience. ◇
- IV.4211 Give oral reports on a given topic.◇
- IV.4312 Write a well-organized composition on a given topic.◇
- IV.4413 Use the language creatively (e.g., in writing and presenting poetry, prose, essays, ~~etc.~~)
- IV.4514 Write a letter or an article ~~for a student publication~~ describing and analyzing an issue of importance to them.◇
- IV.4615 Take detailed notes on oral presentations ~~of familiar topics.~~◇
- IV.4716 Write a summary of a short story, newspaper or magazine article.◇

LATIN COMMUNICATION

Reading Comprehension

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- LAT IV.1 Read and understand prose and/or poetry of selected authors.
LAT IV.2 Read and understand passages containing vocabulary, inflectional systems and syntax appropriate to the student's reading level.
LAT IV.3 Recognize, explain and interpret content and stylistic features and grammatical structures of authors read.

Oral Skills, Listening and Writing

- LAT IV.4 Read prose and/or poetry aloud with attention to such features as metrical structure and meaningful phrase grouping.
LAT IV.5 Respond to more complex questions, statements, commands and other stimuli.
LAT IV.6 Write short passages in Latin.

CULTURES

Daily Life

- IV.18/17 Analyze the cultural significance of objects, images, products and symbols of the target culture(s).◇
LAT IV.7

IV.49/18 Analyze the daily routines, cultural viewpoints and practices of the target culture(s).◇
LAT IV.8

IV.26/19 Evaluate some common generalizations about the target culture(s).◇
LAT IV.9

IV.24/20 Analyze the development of different cultural practices.◇
LAT IV.10

Contributions

- IV.22/21 Analyze and evaluate the development of artistic, scientific and philosophical contributions of the target culture(s) and the historical factors that impacted those contributions.
LAT IV.11
Sociolinguistic Applications
IV.23/22 Integrate culturally embedded words, phrases and idioms into everyday communications.
IV.24/23 Apply language and behaviors appropriate to the target culture in an authentic situation.

Culture Comparisons

- IV.25/24 Explain the significance of similarities and differences between native and target cultures, including
LAT IV.12
 - contributions
 - cultural viewpoints
 - practices.◇
IV.26/25 Analyze cultural practices among same-language cultures.◇
LAT IV.13

CONNECTIONS

Linguistic Connections

- IV.27/26 Independently predict how native and target languages are likely to be structured in the areas
LAT IV.14/13 of:
 - sound patterns
 - word formation patterns
 - connotations and denotations
 - sentence structure
 - idiomatic expressions
 - derivatives
 - cognates◇

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IV.28/27 Explain similarities and differences in sociolinguistic conventions between native and
~~LAT-IV.15~~ target languages.◇

Interdisciplinary Connections

IV.29/28 Continue to transfer and apply information gathered through foreign language resources
~~LAT-IV.16~~ for use in other disciplines.◇

IV.30/29 Extract the main idea and most supporting details from sources in other disciplines
~~LAT-IV.17~~ intended for native speakers of the language.

Global Connections

IV.31/30 Continue to use the target language outside the classroom.
LAT IV.1814

IV.32/31 Use resources in the community to internalize aspects of the target culture(s) and
LAT.1915 language.◇

Foreign Language Technology Objectives

Communication opportunities that are available through computers, the Internet and World Wide Web "can provide access to resources that are richer and far more extensive than those available in most school or community libraries." (From *Handbook on Research on Improving Student Achievement*). County boards of education should commit to meet the technology needs of foreign language classrooms, teachers, and students.

Technology based learning in foreign languages can:

- provide immediate access to authentic language
- provide meaningful access to cultural resources
- provide access to unrehearsed, spontaneous discourse in the target language
- provide venues for practice, review, re-teach, and acceleration to meet each student's individual learning pace
- enable students to take increasing responsibility for their own learning
- provide experiences for producing original student projects (e.g., Power Point, word processing programs, digital cameras, etc.)

Where appropriate technology is available, students will be given opportunities to:

- FLT1. use the computer and World Wide Web to
- acquire information
 - access libraries
 - identify job-related skills in the target language
 - explore opportunities to live and/or study in a target language country
 - communicate in the target language intra-school and inter-school, inter-city, inter-state, and internationally
 - correspond with a "key pal"◇
- FLT2. use computer software ~~and CD-ROMs~~ to
- retrieve information
 - select materials from other disciplines supporting special topics in the target language
 - gain access to appropriate programs in the target language to carry out tasks designed to reinforce language skills and/or to help students discern cultural practices
 - record responses for teacher or self-assessment
 - interact with other students studying the target language through games and software◇
- FLT3. use the VCR and laser discs/DVD, to
- view and listen to interactions of native speakers in both simulations and culturally authentic situations, and complete assigned tasks
 - prepare presentations on assigned topics
 - gather information to complete classroom assignments◇
- FLT4. use TV/satellite to
- retrieve specific information by watching news reports, talk shows, documentaries, soap operas, cartoons and commercials
 - glean cultural information◇
- FLT5. use the language laboratory, tape recorder, record player or CD player to

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- complete listening skills activities
- record responses for self-assessment
- gain cultural information◇

FLT6. use cameras and/or camcorders to

- record role plays such as skits, newscasts and interviews for self-assessment
- develop narratives and other descriptive activities◇

FLT7. use various projectors (e.g., overhead, LCD, slide, opaque, filmstrip)

- give presentations on various topics◇

FLT8. use radio/short-wave radio to

- retrieve specific information
- communicate with and report on target language speakers◇

Foreign Language Instructional Practices

1. Identify lesson goals and objectives.
2. Inform students of lesson goals and objectives.
3. Implement activities to accomplish these goals and objectives.
 - Use the target language extensively for classroom communication.
 - Provide frequent opportunities for target language use with peers and teacher.
 - Include realistic applications of language use whenever possible.
 - Provide opportunities to hear native speakers of the target language.
 - Incorporate authentic materials as often as possible.
 - Create a culturally authentic atmosphere through use of art, literature, crafts, music, food, etc.
 - Utilize available technology.
 - Use instructional materials that are as diverse as the teaching strategies.
 - Tap into students' creative talents to enrich classroom activities.
 - Present content through reading and listening first before asking students to use content in writing and speaking.
 - Allow opportunities for students to communicate in a low risk environment.
 - Match error correction with the objective.
 - Reinforce course content through continuous review and application.
 - Assign appropriate homework, including both long and short-term projects.
 - Provide sufficient opportunities for students to demonstrate achievement so that extra credit is not necessary to compensate for unsatisfactory student performance.
 - Match assessment to the format and content of classroom instruction.

Robert C. Beach Vocational Agriculture Credit

The instructional goals and objectives for the courses that meet the criteria for the Robert C. Beach Vocational Agriculture Credit have been linked to the core instructional areas of English Language Arts, Mathematics, Science, and Social Studies. Symbols are used at the end of instructional goals and objectives to show the reinforcement and integration of those areas.

Legend of Symbols:	LA - English Language Arts
	AGP - Algebra and Geometry Prep
	AM 1 - Applied Math I
	AM 2 - Applied Math 2
	G - Geometry
	T - Trigonometry
	PS - Probability and Statistics
	AB - Advanced Biology
	AC - Advanced Chemistry
	C9 - CATS 9
	C10 - CATS 10
	ES - Environmental Earth Science
	HAP - Human Anatomy/Physiology
	AP - Advanced Physics
	PTC - Physics - Technical/Conceptual
	SS - Social Studies

The following courses are approved to be offered for use as Robert C. Beach Vocational Agriculture Credit:

- Agricultural Biotechnology
- Agriscience 11
- Animal and Veterinary Science - Small Animals
- Animal and Veterinary Science - Large Animals
- Aquaculture
- Environmental Technology
- Greenhouse Technology
- Horticulture
- Soil and Plant Science

In order for the approved courses to be used for the Robert C. Beach Vocational Agriculture Credit, the course must:

- 1) be taken at grade 11 or 12,
- 2) taught for 8100 minutes (1 credit), and
- 3) use the state approved instructional goals and objectives.

In counties that offer agricultural education, at least one of the approved courses must be offered for Robert C. Beach Vocational Agriculture Credit.

Agricultural Biotechnology

Course Description: This course is designed to provide knowledge, skills and competencies regarding the application of biotechnology to agriscience. The course establishes a basic understanding of biotechnology, genetics, and agricultural applications and explores related careers.

Orientation to Biotechnology

- AB1 Investigate biotechnology and its applications to agriscience.(LA)
- AB2 Research the biotechnology industry and make predictions regarding future uses in agriscience and the impact on the industry and consumer.(SS)

Genetics and Genetic Engineering

- AB3 Define and exhibit an understanding of basic genetic terms.(C 9)
- AB4 Explain the concept of heritability.(C 10, HAP)
- AB5 Compare and contrast methods of transferring genetic information.(AB, C 9, C 10, HAP)
- AB6 Relate the concepts of dominant and recessive genes to common heritable traits.
(C 9)
- AB7 Explain and simulate recombinant DNA procedures.(AB, C 9, C 10)
- AB8 Explain and perform procedures used in tissue culturing.(AB, C 9, C 10)
- AB9 Research emerging methods of genetic engineering.(AB, C 9, C 10)
- AB10 Properly and safely manipulate equipment and procedures used in performing genetic engineering tasks.(AB, C 9, C 10)

The Application of Biotechnology to Animal Management and Reproduction

- AB11 Apply principles of biotechnology to animal selection.(C10)
- AB12 Apply principles of biotechnology to animal health.(C 10)
- AB13 Apply principles of biotechnology to the management of animal waste.(ES)
- AB14 Explore the application of artificial insemination in animal science.(C 10)
- AB15 Describe the purposes and procedures of embryo transfer.(C 10)
- AB16 Investigate and discuss the application of biotechnology to estrus manipulation.(C 10)
- AB17 Explore developments in biotechnology regarding gender selection.(C 10)

The Application of Biotechnology to Plant Propagation, Growth and Development

- AB18 Design, conduct, evaluate and revise experiments related to the application of biotechnology to both sexual and asexual plant propagation.(C 10, AB)
- AB19 Perform various tissue culturing techniques.(C 10, AB)
- AB20 Discuss the stages of plant growth and investigate and analyze alterations in plant growth as a result of biotechnology.(C 10, AB)
- AB21 Evaluate the impact of biotechnology on making plants more resistant to insects, diseases and frost.(AB)

Laboratory Investigations/Hands-On Learning

- AB22 Engage in active inquiries, investigations, and hands-on activities a minimum of 50 percent of the time.
- AB23 Conduct explorations in a variety of environments (e.g., laboratories, libraries, parks, and other outdoor locations).
- AB24 Properly and safely manipulate equipment, materials, chemicals, organisms, and models.
- AB25 Use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laser discs) to collect, analyze, and/or report data, interact with simulations, and research.

Ethical Questions Created by Biotechnology

- AB26 Examine ethical questions raised by biotechnology.(AB, SS, LA)
- AB27 Distinguish the difference between fact and opinion.(AB, SS, LA)

Leadership Development for the Biotechnology Industry

- AB28 Obtain current information from printed sources and the Internet concerning biotechnology and evaluate for accuracy.(AB, SS, LA)
- AB29 Debate biotechnology issues.(AB, SS, LA)

Technology Applications in Agricultural Biotechnology

- AB30 Use computers and the World Wide Web (WWW) to:
- Solve problems related to work-based experience programs in agricultural biotechnology.
 - Locate, evaluate, and collect information from a variety of sources related to agricultural biotechnology.
 - Develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
- AB31 Demonstrate skills in word processing and the use of data bases, spreadsheets, graphics and telecommunications.
- AB32 Use TV/satellite, VCR and Laser discs/DVD to retrieve information to complete classroom assignments related to agricultural biotechnology.
- AB33 Use cameras and/or camcorders to record activities and progress of special projects in the area of agricultural biotechnology.

Process/workplace Skills and Agricultural Biotechnology

- AB34 Use computers and other electronic technologies to access, gather, store, retrieve, organize, analyze, and report data.
- AB35 Explore careers available in biotechnology.(AB)
- AB36 Use a variety of sources to investigate the educational requirements of various careers in biotechnology and related sciences.(AB)
- AB37 Analyze problems, state causes and effects, and plan, organize, and implement a solution to the problem or a concept to improve the situation or process.
- AB38 Demonstrate correct language usage in all oral and written work.
- AB39 Perform effectively in both leadership and non-leadership roles.
- AB40 Evaluate information for reliability, completeness, and applicability to various assignments.
- AB41 Participate as a team member to complete a variety of assignments.

Agriscience 11

Course Description: This area of agriscience is designed to provide students with knowledge, skills and competencies needed to enter various occupations in agriculture and natural resources. Topics covered in agriscience are animal science, plant science, agricultural mechanics, microcomputer applications, leadership and supervised agricultural experience programs. The program combines knowledge and skills with experiential learning and FFA for a total program effect.

Agricultural Buildings And Equipment

- AGS1 Compare and contrast fencing systems, materials, tools and management practices.(AM 1, AM 2, PTC, C 9, C 10, G, T, AGP, LA)
- AGS2 Analyze and discuss types of agricultural buildings and related construction.(AM 1, AM 2, PTC, C 9, C 10, G, T, AGP, LA)
- AGS3 Interpret agricultural equipment service manuals and maintenance schedules.(AM 1, AM 2, PTC, C 9, C 10, G, T, AGP, LA)
- AGS4 Perform basic transit procedures.(AM 1, AM 2, AP, CP, G, T, AGP, LA)

Pesticide Safety and Management

- AGS5 Investigate and discuss pesticide types and pest control.(AB, AC, C 9, C 10, ES)
- AGS6 Examine control methods, chemical formulation and equipment used to control pests in the greenhouse.(AB, AC, C 9, C 10, ES)
- AGS7 Identify information on a pesticide label.(AB, AC, C 9, C 10, ES)
- AGS8 Explore the safe handling and disposal of pesticides.(AB, AC, C 9, C 10, ES)
- AGS9 Identify and perform the steps in calibrating a sprayer.(AB, AC, C 9, C 10, ES, PTC)
- AGS10 Research integrated pest management.(LA)

Health And Care of Farm Related Animals

- AGS11 Investigate and discuss the symptoms of unhealthy animals.(AB, ES, C 9, C 10)
- AGS12 Identify and diagnose symptoms of disease and parasites.(AB, ES, C 9, C 10, LA)
- AGS13 Analyze the treatment and prevention of animal disease.(AB, ES, C 9, C 10, LA)
- AGS14 Utilize techniques in administering medicine and immunizing.(AB, ES, C 9, C 10, LA)
- AGS15 Examine the treatment and prevention of animal parasites.(AB, ES, C 9, C 10, LA)
- AGS16 Identify and illustrate the methods for administering medicines to animals.(AB, ES, C 9, C 10)
- AGS17 Design and utilize a herd health program.(AB, ES, C 9, C 10, LA)
- AGS18 Differentiate between animal welfare and animal rights.(AB, ES, C 9, C 10, LA)

Work-based Experiential Programs (Supervised Agricultural Experience Programs)

- AGS19 Complete and summarize record book enterprises related to students, Supervised Agricultural Experience Program.(AM 1, AM 2, SS)
- AGS20 Calculate efficiency factors related to students, Supervised Agricultural Experience Program.(AM 1, AM 2, SS)

Managing Farm Woodlots

- AGS21 Compare and contrast the methods of identifying trees.(AB, ES, C 9, C 10)
- AGS22 Identify trees common to West Virginia.(AB, ES, C 9, C 10)
- AGS23 Evaluate major forest type and primary uses.(AB, ES, C 9, C 10)
- AGS24 Measure tree height and diameter.(AM 1, ALG, G, T)
- AGS25 Identify and utilize units of measurement (mile, rod, chain & acre).(AM 1, AM 2)
- AGS26 Calculate the number of acres in a timber tract.(AM 1, AM 2, G)
- AGS27 Examine the habitat necessary for wildlife.(AB, ES, C 9, C 10)

Laboratory Investigations / Hands-on Learning

- AGS28 Engage in active inquiries, investigations, and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and laboratory skills.
- AGS29 Properly and safely manipulate equipment, materials, chemicals, organisms, and models.

- AGS30 Conduct explorations in a variety of environments (e.g., laboratories and outdoor locations)
- AGS31 Use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laserdiscs) to collect, analyze and/or report data, interact with simulations, and research.

Leadership in Agriscience

- AGS32 Conduct meetings using parliamentary law.(SS, LA)
- AGS33 Serve as a small group team leader.(SS)
- AGS34 Present prepared and extemporaneous speeches on issues affecting agriscience.(SS)
- AGS35 Engage in committees and leadership development activities.(SS)
- AGS36 Model and exhibit community service.(SS)

Principles of Safety

- AGS37 Wear appropriate protective gear.(AB, AC, ES, C 9, C 10)
- AGS38 Maintain a safe working environment.(AB, AC, ES, C 9, C 10)
- AGS39 Identify and engage in safety practices on the farm and in the work place.(AB, AC, ES, C 9, C 10)

Technology Applications in Agriscience

- AGS40 Use computers and the World Wide Web (WWW) to:
- Solve problems related to work-based experience programs in agriscience.
 - Locate, evaluate, and collect information from a variety of sources related to agriscience .
 - Develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
- (AB, C 9, C 10, ES HAP, PTC, CT, SS)
- AGS41 Use TV/satellite, VCR and Laserdiscs/DVD to retrieve information to complete assignments related to agriscience .
- AGS42 Demonstrate skills in word processing and the use of data bases, spreadsheets, graphics, and telecommunications.
- AGS43 Use cameras and/or camcorders to record activities and progress of special projects in the area of agriscience .

Process/workplace Skills And Agriscience

- AGS44 Use computers and other electronic technologies to access, gather, store, retrieve, organize, analyze, and report data.
- AGS45 Explore careers available in agriscience.(AB)
- AGS46 Use a variety of sources to investigate the educational requirements of various careers in agriscience and related sciences.(AB)
- AGS47 Analyze problems, state causes and effects, and plan, organize, and implement a solution to the problem or a concept to improve the situation or process.
- AGS48 Demonstrate correct language usage in all oral and written work.
- AGS49 Perform effectively in both leadership and non-leadership roles.
- AGS50 Evaluate information for reliability, completeness, and applicability to various assignments.
- AGS51 Participate as a team member to complete a variety of assignments.

Animal and Veterinary Science - Small Animals

Course Description: This agricultural science course is designed to give students a working knowledge of veterinary science through the study of many animals including dogs, cats, birds, reptiles and other pets. This course will provide an understanding of breeds, animal health, nutrition, training, anatomy and physiology, grooming, economic and marketing principles and related employment skills. Students will develop a thorough knowledge of animals along with their management in health care related to technician and veterinarian skills.

Leadership

- AVS1 Demonstrate an awareness of FFA and its components.(AB)
- AVS2 Utilize record-keeping skills in work-based experience programs (SAE).(AB, AM 1, LA)
- AVS3 Research appropriate career opportunities in veterinary medicine.(AB, LA)
- AVS4 Draft a resume', fill out a job application, demonstrate job seek/keep and computer skills.(AB,LA)
- AVS5 Develop and exhibit personal relation and communication skills.(LA)
- AVS6 Demonstrate an awareness of employment and animal welfare ethics.(AB)

History And Selection of Small Animals

- AVS7 Trace the history of domestic animals and relate it to human and animal health.(AB)
- AVS8 Classify small animals according to purposes/use.(AB)
- AVS9 Identify breeds of small animals (dogs, cats, birds, reptiles, etc.).(AB)
- AVS10 Examine the characteristics of small animals and incorporate into laboratory experimentation and disease evaluation.(AB)

Handling And Restraint

- AVS11 Identify and use tools related to handling and restraint of small animals.(AB)
- AVS12 Demonstrate methods and techniques used in restraint of small animals.(AB)
- AVS13 Develop a basic understanding of animal behavior.(AB)
- AVS14 Demonstrate the ability to follow post-operative care and management of animals.(AB)
- AVS15 Utilize safety practices when handling and caring for animals.(AB)

Grooming And Clipping

- AVS16 Utilize safety practices in grooming and clipping small animals.(AB)
- AVS17 Identify and use animal grooming tools.(AB)
- AVS18 Demonstrate an awareness of grooming practices (bathing, clipping, nail trimming, combing/brushing).(AB)
- AVS19 Use proper care in applying topical medications.(AB)

Anatomy And Physiology

- AVS20 Identify the major parts and examine the functions of the skeletal system.(AB, HAP)
- AVS21 Identify the major parts and examine the functions of the muscular system.(AB, HAP)
- AVS22 Identify the major parts and examine the functions of the nervous system.(AB, HAP)
- AVS23 Identify the major parts and examine the functions of the endocrine system.(AB, HAP)
- AVS24 Identify the major parts and examine the functions of the respiratory system.(AB, HAP)
- AVS25 Identify the major parts and examine the functions of the circulatory system.(AB, HAP)
- AVS26 Identify the major parts and examine the functions of the reproductive system.(AB, HAP)
- AVS27 Identify the major parts and examine the functions of the excretory system.(AB, HAP)
- AVS28 Identify the major parts and examine the functions of the digestive system.(AB, HAP)
- AVS29 Compare and contrast ruminant and monogastric systems.(AB, HAP)
- AVS30 Investigate the functions of other small animal digestive systems (avian, rabbits, reptiles).(AB, HAP)

Animal Health And Management

- AVS31 Determine the type of care and housing facilities needed.(AB)
 AVS32 Examine mechanical injury and perform basic first aid.(AB)
 AVS33 Identify signs/symptoms of disease, as well as prevention and treatment.(AB)
 AVS34 Utilize techniques in administering medicine and immunizing.(AB, AM 1)
 AVS35 Understand veterinarian hospital design, procedures and care of equipment and supplies.(AB)
 AVS36 Recognize relationship between owner, animal and veterinarian to maintain a healthy client relationship.(LA)

Laboratory Practices And Procedures / Hands-on Learning

- AVS37 Engage in active inquiries, investigations and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and laboratory skills.
 AVS38 Properly and safely manipulate equipment, materials, chemicals, organisms and models.
 AVS39 Conduct explorations in a variety of environments (e.g., laboratories and outdoor locations).
 AVS40 Use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laserdiscs) to collect, analyze and/or report data, interact with simulations, and research.
 AVS41 Recognize the value of laboratory procedures in evaluating the functions of organs to assist in disease diagnosis.(AB)
 AVS42 Utilize and care for diagnostic testing equipment and supplies used in a veterinarian clinic.(AB)
 AVS43 Collect laboratory samples and interpret test results to diagnose animal health.(AB)

Nutrition

- AVS44 Define, discuss and utilize terms associated with nutrition.(HAP)
 AVS45 List and describe the basic nutrients and their functions.(HAP)
 AVS46 Analyze pet food labels and determine the nutritional value of feeds and feedstuffs.(HAP, AB, AC)
 AVS47 Recognize signs of nutritional deficiencies.(HAP, AB)
 AVS48 Analyze feeding and care requirements throughout life cycle and pregnancy.(HAP)

Marketing

- AVS49 Research types of laws, regulations and licenses as needed in a veterinarian clinic.(AB)
 AVS50 Calculate and analyze costs of owning and operating an animal care business.(AB, AM 1)

Technology Applications in Animal Science

- AVS51 Use computers and the World Wide Web (WWW) to:
 · Solve problems related to work-based experience programs in animal science.
 · Locate, evaluate, and collect information from a variety of sources related to animal science .
 · Develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
 AVS52 Demonstrate skills in word processing and the use of data bases, spreadsheets, graphics, and telecommunications.
 AVS53 Use TV/satellite, VCR and Laserdiscs/DVD to retrieve information to complete assignments related to animal science .
 AVS54 Use cameras and/or camcorders to record activities and progress of special projects in the area of animal science.

Process/workplace Skills and Animal Science

- AVS55 Use computers and other electronic technologies to access, gather, store, retrieve, organize, analyze, and report data.
 AVS56 Explore careers available in animal science.(AB)
 AVS57 Use a variety of sources to investigate the educational requirements of various careers in animal science and related sciences.(AB)
 AVS58 Analyze problems, state causes and effects, and plan, organize, and implement a solution to the problem or a concept to improve the situation or process.

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- AVS59 Demonstrate correct language usage in all oral and written work.
- AVS60 Perform effectively in both leadership and non-leadership roles.
- AVS61 Evaluate information for reliability, completeness, and applicability to various assignments.
- AVS62 Participate as a team member to complete a variety of assignments.

Animal And Veterinary Science - Large Animals

Course Description: This course is designed to give students advanced knowledge of veterinary science, which includes the study of large farm animals (horses, cattle, sheep, goats and swine). This course will provide an understanding of breeds, animal health, nutrition, anatomy and physiology, training, economic and marketing principles and related employment skills. Students will develop a thorough knowledge of large animals and their management in health care related to technician and veterinarian skills.

Leadership

- AVS2.1 Participate in committee and leadership development activities associated with FFA.(AB)
- AVS2.2 Complete and summarize records of SAE Program and health program on individual animals.(AB, AM)
- AVS2.3 Shadow appropriate career opportunities in Veterinary Medicine.(AB)
- AVS2.4 Initiate a job search and complete application for entry into college level programs in Veterinary Science.(AB, LA)
- AVS2.5 Develop communication skills through prepared and extemporaneous speaking.(LA)

History And Selection of Farm Animals

- AVS2.6 Trace the history of domestic farm animals and relate it to human and animal health.(AB)
- AVS2.7 Classify farm animals according to purposes/use.(AB)
- AVS2.8 Identify breeds of large animals (horses, cattle, sheep, goats, swine).(AB)
- AVS2.9 Relate the characteristics of breeds to methods of selection.(AB)

Handling And Restraint

- AVS2.10 Identify and use tools related to handling and restraint of large animals.(AB, HAP)
- AVS2.11 Demonstrate methods of techniques used in restraint of large animals.(AB, HAP)
- AVS2.12 Utilize basic commands and animal behavior methods to control animals.(AB)
- AVS2.13 Utilize safety practices when handling and caring for animals.(AB)

Grooming And Clipping

- AVS2.14 Utilize safety practices in grooming and clipping large animals.(AB)
- AVS2.15 Identify and utilize tools pertinent to the grooming, brushing and bathing of large animals.(AB)
- AVS2.16 Demonstrate the ability to follow post-operative care and management of animals.(AB)

Anatomy And Physiology

- AVS2.17 Identify the major parts and examine the functions of the skeletal system of large animals.(AB, HAP)
- AVS2.18 Identify the major parts and examine the functions of the muscular system of large animals.(AB, HAP)
- AVS2.19 Identify the major parts and examine the functions of the nervous system of large animals.(AB, HAP)
- AVS2.20 Identify the major parts and examine the functions of the endocrine system of large animals.(AB, HAP)
- AVS2.21 Identify the major parts and examine the functions of the respiratory system of large animals.(AB, HAP)
- AVS2.22 Identify the major parts and examine the functions of the circulatory system of large animals.(AB, HAP)
- AVS2.23 Identify the major parts and examine the functions of the reproductive system of large animals.(AB, HAP)
- AVS2.24 Identify the major parts and examine the functions of the excretory system of large animals.(AB, HAP)
- AVS2.25 Identify the major parts and examine the functions of the digestive system of large animals.(AB, HAP)

- AVS2.26 Compare and contrast large animal ruminant and monogastric digestive systems.(AB, HAP)
 AVS2.27 Investigate functions of exotic animal digestive systems.(AB, HAP)

Animal Health And Management

- AVS2.28 Determine the type of care and housing facilities needed for large animals.(AB)
 AVS2.29 Examine mechanical injury and perform basic first aid requirements for large farm animals.(AB)
 AVS2.30 Identify signs/symptoms of disease, as well as prevention and treatment of large animals.(AB)
 AVS2.31 Utilize techniques in administering medicine and immunizing large farm animals.(AB)
 AVS2.32 Understand veterinarian hospital design, procedures and care of equipment and supplies used with a large farm animal.(AB)
 AVS2.33 Recognize relationships between owner, animal and veterinarian to maintain a healthy client relationship.(AB)

Laboratory Practices And Procedures / Hands-on Learning

- AVS2.34 Engage in active inquiries, investigations and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and laboratory skills.
 AVS2.35 Properly and safely manipulate equipment, materials, chemicals, organisms and models.
 AVS2.36 Conduct explorations in a variety of environments (e.g., laboratories and outdoor locations).
 AVS2.37 Use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laserdiscs) to collect, analyze and/or report data, interact with simulations, and research.
 AVS2.38 Recognize the value of laboratory procedures in evaluating the functions of organs to assist in disease diagnosis of large animals.(AB)
 AVS2.39 Utilize and care for diagnostic testing equipment and supplies used in a veterinarian clinic and field operations.(AB, AC)
 AVS2.40 Collect laboratory samples and interpret test results to diagnose animal health.(AB, AC)

Nutrition

- AVS2.41 Define, discuss and utilize terms associated with large animal nutrition.(AB, HAP, AC)
 AVS2.42 List and describe the basic nutrients and their functions.(AB, HAP, AC)
 AVS2.43 Analyze feed labels and determine the nutritional value of feeds and feedstuffs.(AB, HAP, AC)
 AVS2.44 Recognize signs of nutritional deficiencies.(AB, HAP, AC)
 AVS2.45 Analyze feeding and care requirements for maintaining pregnancy of large animals.(AB, HAP, AC)

Marketing

- AVS2.46 Record data and complete information required by law and regulations in the management of large animals.(HAP, AB)
 AVS2.47 Calculate and analyze cost of owning and operating a large animal health clinic. (HAP, AB)

Technology Applications in Animal Science

- AVS2.48 Use computers and the World Wide Web (WWW) to:
 · Solve problems related to work-based experience programs in animal science.
 · Locate, evaluate, and collect information from a variety of sources related to animal science.
 · Develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
 AVS2.49 Demonstrate skills in word processing and the use of data bases, spreadsheets, graphics, and telecommunications.

AVS2.50 Use TV/satellite, VCR and Laserdiscs/DVD to retrieve information to complete assignments related to animal science .

AVS2.51 Use cameras and/or camcorders to record activities and progress of special projects in the area of animal science .

Process/workplace Skills And Animal Science

AVS2.52 Use computers and other electronic technologies to access, gather, store, retrieve, organize, analyze, and report data.

AVS2.53 Explore careers available in animal science.(AB)

AVS2.54 Use a variety of sources to investigate the educational requirements of various careers in animal science and related sciences.(AB)

AVS2.55 Analyze problems, state causes and effects, and plan, organize, and implement a solution to the problem or a concept to improve the situation or process.

AVS2.56 Demonstrate correct language usage in all oral and written work.

AVS2.57 Perform effectively in both leadership and non-leadership roles.

AVS2.58 Evaluate information for reliability, completeness, and applicability to various assignments.

AVS2.59 Participate as a team member to complete a variety of assignments.

Aquaculture

Course Description: This course of study is designed to provide experiential knowledge, skills and entrepreneurial competencies needed to enter various occupations in aquaculture and other scientific fields within aquaculture. This course integrates curricula of biology, physics, earth science and chemistry in producing aquatic species.

Orientation to the Aquaculture Industry

- AQUA1 Explore the role of aquaculture in the past, present and future.(SS, AB)
- AQUA2 Relate the importance of aquaculture to state, national, and international economies.(SS, AB)
- AQUA3 Examine employment trends and cycles related to aquaculture.(SS, AB)

Leadership Development in Aquaculture

- AQUA4 Present prepared and extemporaneous speeches on issues concerning the aquaculture industry.(LA)
- AQUA5 Participate in community service.(SS)
- AQUA6 Demonstrate problem solving and decision making skills.
- AQUA7 Conduct meetings using parliamentary law.(SS)

Production Systems in Aquaculture

- AQUA8 Identify components of an aquaculture system and calculate water volumes, flow rates, solubility, density, etc.(PTC, AM 1)
- AQUA9 Research appropriate species for closed and flow-through systems.(C 10, AB)
- AQUA10 Explain basic animal management requirements for warm and cold water species.(C 10, AB)
- AQUA11 Investigate and discuss factors that influence site selection.
- AQUA12 Using a bill of materials, design and/or construct a closed system.(AM 1, AM 2)

Developing Work-based Experiential Programs (Supervised Agricultural Experience Programs) in Aquaculture

- AQUA13 Define and explain the different supervised experience programs that are available in aquaculture.
- AQUA14 Prepare a business plan for implementation.(SS)
- AQUA15 Explore careers associated within the aquaculture industry.
- AQUA16 Create and demonstrate the key aspects of a marketing plan.(SS)
- AQUA17 Demonstrate different ways a fish can be processed.

Anatomy and Physiology

- AQUA18 Identify and explain the functions of body systems in aquatic species.(C 10, AB)
- AQUA19 Explain the process of spawning.(C 10, AB)
- AQUA22 Distinguish common fish health problems in closed systems.(C 10)
- AQUA21 Investigate the role of breeding and selection in genetic improvement.(C 10)

Nutrition

- AQUA22 Identify and compare common types of feed.
- AQUA23 Calculate feed rates.(AM I, AM II, ALG)
- AQUA24 Calculate feed conversion.(AM I, AM II, ALG)
- AQUA25 Calculate feed efficiency.(AM I, AM II, ALG)
- AQUA26 Describe the nutritional needs of fish at different stages of growth.(C 10)

Water Chemistry and its Relationship to Aquaculture

- AQUA27 Explain water quality parameters.- pH, Oxygen level, nitrates, nitrites, etc.(ES, C 10, AC, AB)
- AQUA28 Demonstrate sampling and testing techniques.(ES, AC, C 9, C 10)
- AQUA29 Design a waste water management system.(C 9, C 10)

Safety in Aquaculture Laboratories

- AQUA30 Maintain a safe working environment in the aquaculture laboratory.
 AQUA31 Demonstrate and apply laboratory safety in aquaculture settings.

Laboratory Practices and Procedures / Hands-on Learning

- AQUA32 Engage in active inquiries, investigations and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and laboratory skills.
 AQUA33 Properly and safely manipulate equipment, materials, chemicals, organisms and models.
 AQUA34 Conduct explorations in a variety of environments (e.g., laboratories and outdoor locations).
 AQUA35 Use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laserdiscs) to collect, analyze and/or report data, interact with simulations, and research.

Technology Applications in Aquaculture

- AQUA40 Use computers and the World Wide Web (WWW) to:
 · Solve problems related to work-based experience programs in aquaculture.
 · Locate, evaluate, and collect information from a variety of sources related to aquaculture .
 · Develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
 AQUA41 Demonstrate skills in word processing and the use of data bases, spreadsheets, graphics, and telecommunications.
 AQUA42 Use TV/satellite, VCR and Laserdiscs/DVD to retrieve information to complete assignments related to aquaculture .
 AQUA43 Use cameras and/or camcorders to record activities and progress of special projects in the area of aquaculture .

Process/workplace Skills and Aquaculture

- AQUA44 Use computers and other electronic technologies to access, gather, store, retrieve, organize, analyze, and report data.
 AQUA45 Explore careers available in aquaculture.(AB)
 AQUA46 Use a variety of sources to investigate the educational requirements of various careers in aquaculture and related sciences.(AB)
 AQUA47 Analyze problems, state causes and effects, and plan, organize, and implement a solution to the problem or a concept to improve the situation or process.
 AQUA48 Demonstrate correct language usage in all oral and written work.
 AQUA49 Perform effectively in both leadership and non-leadership roles.
 AQUA50 Evaluate information for reliability, completeness, and applicability to various assignments.
 AQUA51 Participate as a team member to complete a variety of assignments.

Environmental Technology

Course Description: This class will cover various aspects of environmental science applications to prevent detrimental effects on our ecosystem. Units will include solid and hazardous waste, water purification, waste water treatment, solid erosion control, nutrient management and environmental surveying.

Solid Waste

- ET1 Analyze sources of solid waste.(C 9, LA, C 10, SS)
- ET2 Examine hazards in solid waste materials and disposal.(C 9, LA, C 10, SS)
- ET3 Compare and contrast methods of solid waste disposal.(C 9, AM, LA, C 10)
- ET4 Explain and participate in recycling.(C 10, ES, LA, C 10, SS)
- ET5 Describe composting.(C 9, LA, C 10, SS)
- ET6 Explore methods and benefits of composting.(C 9, C 10, SS)

Hazardous Waste

- ET7 Identify types of hazardous waste. (ES, AC, LA, SS)
- ET8 Describe ecotoxicology.(AB)
- ET9 Explain hazardous waste disposal.(C 10, AM 1, LA, SS)
- ET10 Explain safety procedures and simulate clean-up of spills.(ES, LA, SS)

Water Purification

- ET11 Describe the composition of water.(C 9, LA)
- ET12 Explain the importance of water.(C 10, LA)
- ET13 Identify sources of water.(ES)
- ET14 Investigate and discuss how water is stored and distributed.(ES, C 10, AM 1, LA)
- ET15 Research how water is used and managed.(ES, AM 1, C 10)
- ET16 Name and distinguish various types of wetlands.(C 9)
- ET17 Explore the benefits and function of wetlands.(C 10, LA)
- ET18 Analyze how human action affects wetlands.(C 10, LA,SS)

Wastewater Treatment and Disposal

- ET19 Identify sources of wastewater.(ES, SS)
- ET20 Describe hazards in wastewater.(ES, LA, SS)
- ET21 Compare and contrast ways of treating wastewater.(C 10, LA, SS)
- ET22 Research the products of wastewater treatment, including the production and use of biosolids.(AM 1, ES, SS)
- ET23 Recognize and investigate the important biological, chemical, and biogeochemical processes in wastewater treatment.(C 9, AM 1, C 10, LA, SS)
- ET24 Explain the components and operation of a wastewater treatment system.(C 10, AM 1, LA, SS)

Soil Erosion Control

- ET25 Identify and describe the physical properties of soil and their impact on soil erosion.(ES, C 9, C 10, LA)
- ET26 Compare and contrast types of soil erosion.(ES, C 9, C 10)
- ET27 Illustrate soil conservation practices for urban and agricultural areas.(ES, LA, SS, C 10)
- ET28 Utilize a soil survey to make environmental decisions.(C 9, SS, C 10)
- ET29 Explain the best management practices to control sediment from urban areas, agriculture and forests.(AM 1, C 10, LA, SS)
- ET30 Examine soil erosion control devices.(ES, AM 1, C 10)

Nutrient Management

- ET31 Investigate and discuss non-point source pollution.(ES, C 10)
- ET32 Utilize soil nutrient testing procedures to determine available nutrients.(C 9, AM 1, C 10)
- ET33 Utilize nutrient testing procedures to determine organic matter content.(ES, AM 1, C 10)

- ET34 Complete a nutrient management plan.(ES, AM 1, C 10)
- ET35 Calibrate a nutrient spreader for rate of application.(ES, AM 1, C 10)
- ET36 Perform water testing procedures and interpret results to determine impacts of non-point source pollution.(ES, AM 1, C 10)

Environmental Surveying

- ET37 Demonstrate basic surveying skills.(AM 1, SS)
- ET38 Utilize topographical maps to make environmental decisions.(ES, AM 1, SS)
- ET39 Apply design principles to pond and wetland construction, sediment basins, and other similar structures.(C 10, AM 1)
- ET40 Identify and accurately utilize surveying equipment.(AM 1)

Leadership

- ET41 Participate in WV Envirothon and other activities related to the curriculum.(ES, AM, LA, SS)
- ET42 Utilize Internet World Wide Net to explore speciality areas in horticulture.(SS)

Laboratory Practices And Procedures / Hands-on Learning

- ET43 Engage in active inquiries, investigations and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and laboratory skills.
- ET44 Properly and safely manipulate equipment, materials, chemicals, organisms and models.
- ET45 Conduct explorations in a variety of environments (e.g., laboratories and outdoor locations).
- ET46 Use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laserdiscs) to collect, analyze and/or report data, interact with simulations, and research.

Technology Applications in Environmental Technology

- ET47 Use computers and the World Wide Web (WWW) to:
 - Solve problems related to work-based experience programs in environmental technology.
 - Locate, evaluate, and collect information from a variety of sources related to environmental technology .
 - Develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
- ET48 Demonstrate skills in word processing and the use of data bases, spreadsheets, graphics, and telecommunications.
- ET49 Use TV/satellite, VCR and Laserdiscs/DVD to retrieve information to complete assignments related to environmental technology .
- ET50 Use cameras and/or camcorders to record activities and progress of special projects in the area of environmental technology .

Process/workplace Skills and Environmental Technology

- ET51 Use computers and other electronic technologies to access, gather, store, retrieve, organize, analyze, and report data.
- ET52 Explore careers available in environmental technology.(AB)
- ET53 Use a variety of sources to investigate the educational requirements of various careers in environmental technology and related sciences.(AB)
- ET54 Analyze problems, state causes and effects, and plan, organize, and implement a solution to the problem or a concept to improve the situation or process.
- ET55 Demonstrate correct language usage in all oral and written work.
- ET56 Perform effectively in both leadership and non-leadership roles.
- ET57 Evaluate information for reliability, completeness, and applicability to various assignments.
- ET58 Participate as a team member to complete a variety of assignments.

Greenhouse Technology

Course Description: This area of study is designed to provide both college bound students and work bound students with the basic skills and knowledge needed in the greenhouse management industry. Major instructional concepts provide students with individual goals and objectives including: plant environments, classification, plant processes, growing media, plant nutrients, propagation, growth, pests and management procedures, nursery and landscape techniques, structures operation and maintenance and advanced greenhouse practice and technologies.

Leadership Development

- GP1 Demonstrate an awareness of FFA and its components.(SS, LA)
- GP2 Utilize record-keeping skills in work-based experience programs (SAE).(AM 1, SS, AGP)
- GP3 Develop and exhibit communication skills.(LA)
- GP4 Draft and complete a resume', complete a job application, and demonstrate job seek/keep skills.(LA)
- GP5 Demonstrate personal and social skills.(LA)
- GP6 Research career opportunities in the greenhouse management industry.(C 9)

Greenhouse Structure, Operation And Maintenance

- GP7 Identify different greenhouse parts and compare types of structures and coverings.(C 10)
- GP8 Demonstrate safety and proper manipulation of greenhouse equipment.(C 10)
- GP9 Diagram operational systems in the greenhouse operation.(C 10)
- GP10 Analyze suitable greenhouse locations and recommend interior layout.(C 9)

Plant Classification And Identification

- GP11 Demonstrate an understanding of the natural classification system for the plant kingdom.(C 10, AB, ES)
- GP12 Identify and research plants that are important to the greenhouse industry.(C 9)

Environmental Control of Plant Growth

- GP13 Describe the plant processes involved with plant growth and development.(AB, ES, C 10)
- GP14 List plant growth regulators and document their effects on plants.(C 10, AB, ES,)
- GP15 Explain how essential elements become available for plant use.(C 9, AB, ES, C 10)
- GP16 Identify and document the effects of environmental factors on plant growth.(AB, ES, C 9)

Greenhouse Media And Containers

- GP17 Research the components of media and amendments.(ES, C 10)
- GP18 Demonstrate the effect of various greenhouse media and proper media preparation on plant growth.(ES, C 10)
- GP19 Compare and contrast basic types and sizes of containers used in greenhouse management.(ES, C 10)

Plant Processes And Propagation

- GP20 Perform methods of propagating plants.(AB, C 10, ES)
- GP21 Manipulate total environment from juvenile to mature plant.(AB, C 10, AC)
- GP22 Demonstrate knowledge of plant growth and propagation processes including photosynthesis, respiration, transpiration and pollination.(AB, C 10, ES)

Identifying And Controlling Disease, Insects, And Weeds

- GP23 Identify and exhibit guidelines for pesticide use.(AB, ES)
- GP24 Practice integrated pest management procedures.(AB, ES, C 9)
- GP25 Describe and evaluate control methods, chemical formulations and equipment used to control pests in the greenhouse.(AB, ES, AM 1, C9)

Greenhouse Business Management

- GP26 Explore and discuss the various types of records kept in a greenhouse business.(AM 1, SS, AGP)
- GP27 Use computers to solve problems related to greenhouse management.(SS)
- GP28 Describe the methods and determine the values and limitations of effective advertising.(SS)
- GP29 Develop a plan for profitable sales techniques.(SS)
- GP30 Record receipts and expenditures.(AM 1, SS, AGP)

Laboratory Practices and Procedures / Hands-on Learning

- GP31 Engage in active inquiries, investigations and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and laboratory skills.
- GP32 Properly and safely manipulate equipment, materials, chemicals, organisms and models.
- GP33 Conduct explorations in a variety of environments (e.g., laboratories and outdoor locations).
- GP34 Use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laserdiscs) to collect, analyze and/or report data, interact with simulations, and research.

Technology Applications in Greenhouse Technology

- GP35 Use computers and the World Wide Web (WWW) to:
 - Solve problems related to work-based experience programs in greenhouse technology.
 - Locate, evaluate, and collect information from a variety of sources related to greenhouse technology .
 - Develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
- GP36 Demonstrate skills in word processing and the use of data bases, spreadsheets, graphics, and telecommunications.
- GP37 Use TV/satellite, VCR and Laserdiscs/DVD to retrieve information to complete assignments related to greenhouse technology.
- GP38 Use cameras and/or camcorders to record activities and progress of special projects in the area of greenhouse technology .

Process/workplace Skills and Greenhouse Technology

- GP39 Use computers and other electronic technologies to access, gather, store, retrieve, organize, analyze, and report data.
- GP40 Explore careers available in greenhouse technology.(AB)
- GP41 Use a variety of sources to investigate the educational requirements of various careers in greenhouse technology and related sciences.(AB)
- GP42 Analyze problems, state causes and effects, and plan, organize, and implement a solution to the problem or a concept to improve the situation or process.
- GP43 Demonstrate correct language usage in all oral and written work.
- GP44 Perform effectively in both leadership and non-leadership roles.
- GP45 Evaluate information for reliability, completeness, and applicability to various assignments.
- GP46 Participate as a team member to complete a variety of assignments.

Horticulture

Course Description: Horticulture includes art, science and technology. This field of study explains concepts of plant growth and how plants are used in our environment for aesthetics, ecosystems and as plant products for human consumption. Students will gain skills for entry-level employment or entrance into an advanced training/degree program.

Leadership Development

- HORT1 Demonstrate an awareness of FFA and its components.(SS)
- HORT2 Utilize record-keeping skills in work-based experience programs (SAE).(AM 1, SS, AGP)
- HORT3 Develop and exhibit communication skills.(LA)
- HORT4 Draft a resume, fill out a job application, and demonstrate job seek/keep skills.(LA)
- HORT5 Demonstrate an awareness of employment and horticulture industry ethics.(C 9)
- HORT6 Research career opportunities in the horticulture industry.(C 9)

Plant Classification And Identification

- HORT7 Develop an understanding of the natural classification system for the plant kingdom.(C 10, AB)
- HORT8 Identify plant species and explore their benefit to people.(C 9)
- HORT9 Identify and research plants that are important to the greenhouse industry.(C 9)
- HORT10 Describe the plant processes involved with plant growth and development.(C 10, ES, AB)
- HORT11 List plant growth regulators and document their effects on plants.(C 10)
- HORT12 Explain how essential elements become available for plant use.(C 9, C 10)
- HORT13 Identify and document the effects of environmental factors on plant growth.(C 9, C 10)
- HORT14 Compare and contrast types of plant-growing media.(C 10)
- HORT15 Determine appropriate amendments for optimum plant growth.(C 10)
- HORT16 Explain and utilize soil and water conservation practices.(C 9, ES)

Plant Processes And Propagation

- HORT17 Perform methods of propagating plants.(AB, ES)
- HORT18 Manipulate total environment from juvenile to mature plant.(AB, ES, AC, C 10)
- HORT19 Demonstrate knowledge of plant growth and propagation processes including photosynthesis, respiration, transpiration and pollination.(AB, ES)

Pest Management

- HORT20 Explain and apply the concepts of integrated pest management.(C 9, AB, ES)
- HORT21 Identify safety guidelines for tools, equipment and pesticide use.(C 9)
- HORT22 Identify pests and evaluate control methods according to label interpretation.(C 10, AB)
- HORT23 Recognize, calibrate and operate pesticide application equipment.(AM 1, C 9)
- HORT24 Research and discuss the environmental and health concerns relating to pesticide usage.(ES, C 9)
- HORT25 Demonstrate knowledge of and interpret federal and state pesticide laws.(ES, C 9)

Selected Speciality Areas in Horticulture

- HORT26 Explore professions in floriculture and understand the scope of job opportunities.(C 9)
- HORT27 Demonstrate various techniques and procedures commonly used in the floriculture industry.(AB, C 9)
- HORT28 Explore professions in greenhouse management and understand the scope of job opportunities.(C 9)
- HORT29 Demonstrate various techniques and procedures commonly used in the greenhouse management industry.(C 9, AB)
- HORT30 Explore professions in nursery production and understand job requirements.(C 9)
- HORT31 Demonstrate techniques and procedures used in the nursery production industry.(AB)
- HORT32 Research careers in the landscape and turf industry.(C 9)
- HORT33 Perform basic landscape design, plantings and maintenance techniques.(AB)
- HORT34 Utilize internet world wide web to explore specialty areas in horticulture.(SS)

Laboratory Practices And Procedures / Hands-on Learning

- HORT35 Engage in active inquiries, investigations and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and laboratory skills.
- HORT36 Properly and safely manipulate equipment, materials, chemicals, organisms and models.
- HORT37 Conduct explorations in a variety of environments (e.g., laboratories and outdoor locations).
- HORT38 Use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laserdiscs) to collect, analyze and/or report data, interact with simulations, and research.

Technology Applications in Horticulture

- HORT39 Use computers and the World Wide Web (WWW) to:
- Solve problems related to work-based experience programs in horticulture.
 - Locate, evaluate, and collect information from a variety of sources related to horticulture .
 - Develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
- HORT40 Demonstrate skills in word processing and the use of data bases, spreadsheets, graphics, and telecommunications.
- HORT41 Use TV/satellite, VCR and Laserdiscs/DVD to retrieve information to complete assignments related to horticulture .
- HORT42 Use cameras and/or camcorders to record activities and progress of special projects in the area of horticulture .

Process/workplace Skills and Horticulture

- HORT43 Use computers and other electronic technologies to access, gather, store, retrieve, organize, analyze, and report data.
- HORT44 Explore careers available in horticulture.(AB)
- HORT45 Use a variety of sources to investigate the educational requirements of various careers in horticulture and related sciences.(AB)
- HORT46 Analyze problems, state causes and effects, and plan, organize, and implement a solution to the problem or a concept to improve the situation or process.
- HORT47 Demonstrate correct language usage in all oral and written work.
- HORT48 Perform effectively in both leadership and non-leadership roles.
- HORT49 Evaluate information for reliability, completeness, and applicability to various assignments.
- HORT50 Participate as a team member to complete a variety of assignments.

Soil And Plant Science (Agronomy)

Course Description: This area of study is designed to provide students with scientific knowledge and experiences essential to careers in soil and plant science. The course includes major units in soil formation, soil properties, land classification, fertility, plant growth and the impact of agriculture on the environment.

Orientation to Soil And Plant Science

- SPS1 Research career opportunities in soil and plant science.(AB, LA)
- SPS2 Demonstrate an awareness of the impact of agriculture on the environment.(AB, SS)
- SPS3 List and describe the function of federal, state and local entities and interest groups concerned with soil and plant science.(AB, LA, SS)
- SPS4 Examine the role of soil and plants in the ecosystem.(AC, LA)

Leadership Development

- SPS5 Participate in meetings using parliamentary law.(SS)
- SPS6 Use interpersonal skills in team problem solving.(SS)
- SPS7 Prepare and deliver a brief presentation on an agronomic topic.(SS, LA)

Provide Work-based Experiential Learning Opportunities

- SPS8 Explore opportunities for work-based experience through supervised experience programs.(C 10)
- SPS9 Define record keeping terms for supervised experience programs.(AB, AM 1)
- SPS10 Develop budgets for potential supervised experience programs.(AM 1)

Soil Origin And Development

- SPS11 Determine how soil is formed.(C 9, LA, SS)
- SPS12 Interpret information from soil surveys.(C 9, LA, SS, AM 1)

Physical Properties of Soil

- SPS13 Define and determine soil depth.(C 10, AM 1, LA, SS)
- SPS14 Define and determine soil texture.(ES, LA)
- SPS15 Define and determine soil structure.(ES)
- SPS16 Define and determine soil permeability.(AM 1, LA)
- SPS17 Define and determine drainage.(AM1, LA, SS)
- SPS18 Define and determine slope.(AM 2, LA, SS)

Classification of Soils Into Soil Series And Land Capability Classes

- SPS19 Classify soils by common physical properties.(C 9)
- SPS20 Describe soil series of the region.(C 9, LA, SS)
- SPS21 Determine land capability classes and recommend appropriate land management practices.(AM 1, LA, SS)

Plant Nutrition And Soil Fertility

- SPS22 List and describe the functions of macro and micronutrients.(AB, C 10, LA)
- SPS23 Describe and identify plant nutrient deficiencies.(C 10, LA)
- SPS24 Explain the function and management of soil pH.(C 9, AM 1, LA)
- SPS25 Describe and engage in the process of soil testing.(C 10, LA)
- SPS26 Interpret and apply data generated by soil testing.(C 10, AM 1, LA)
- SPS27 List and compare sources of plant nutrients.(C 10)
- SPS28 Identify nutrient deficiencies and plant diseases.(C 10)
- SPS29 Conduct plant growth experiments.
- SPS30 Use soil testing equipment.(C10)

Plant Structures and Their Functions

- SPS31 Explain basic plant production requirements.(C 10, LA)
- SPS32 Identify the major parts of a plant.(AB, C10)
- SPS33 Describe the function of the major parts of a plant.(C 10, LA)
- SPS34 Demonstrate knowledge of plant growth processes photosynthesis, respiration and transpiration.(AB, ES)

Row Crop Management

- SPS35 Identify row crops common to the area.(C 10)
- SPS36 Describe cultural requirements and production practices of row crops.(C 10)
- SPS37 List and describe harvesting methods.(C10, LA)

Forage Management

- SPS38 Identify forage crops common to the area.(C 9)
- SPS39 Describe cultural requirements and production practices of forage crops.(C 10, LA)
- SPS40 List and describe harvesting methods.(C 10, LA)

Soil and Water Conservation

- SPS41 Define and provide examples of erosion.(ES, LA)
- SPS42 Explain agricultural practices to conserve soil and reduce pollution (stewardship).(C 10, LA)
- SPS43 Predict impacts of erosion.(ES)
- SPS44 Identify and describe best management practices to prevent soil erosion.(ES)
- SPS45 Utilize the world wide web to explore speciality areas in soil and plant science.(SS)

Laboratory Practices and Procedures / Hands-on Learning

- SPS46 Engage in active inquiries, investigations and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and laboratory skills.
- SPS47 Properly and safely manipulate equipment, materials, chemicals, organisms and models.
- SPS48 Conduct explorations in a variety of environments (e.g., laboratories and outdoor locations).
- SPS49 Use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laserdiscs) to collect, analyze and/or report data, interact with simulations, and research.

Technology Applications in Agronomy

- SPS50 Use computers and the World Wide Web (WWW) to:
 - Solve problems related to work-based experience programs in agronomy.
 - Locate, evaluate, and collect information from a variety of sources related to agronomy .
 - Develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
- SP51 Demonstrate skills in word processing and the use of data bases, spreadsheets, graphics, and telecommunications.
- SPS52 Use TV/satellite, VCR and Laserdiscs/DVD to retrieve information to complete assignments related to agronomy .
- SPS53 Use cameras and/or camcorders to record activities and progress of special projects in the area of agronomy .

Process/workplace Skills and Agronomy

- SPS54 Use computers and other electronic technologies to access, gather, store, retrieve, organize, analyze, and report data.
- SPS55 Explore careers available in agronomy.(AB)

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- SPS56 Use a variety of sources to investigate the educational requirements of various careers in agronomy and related sciences.(AB)
- SPS57 Analyze problems, state causes and effects, and plan, organize, and implement a solution to the problem or a concept to improve the situation or process.
- SPS58 Demonstrate correct language usage in all oral and written work.
- SPS59 Perform effectively in both leadership and non-leadership roles.
- SPS60 Evaluate information for reliability, completeness, and applicability to various assignments.
- SPS61 Participate as a team member to complete a variety of assignments.

Science Instructional Goals

Scientific literacy for all students is the fundamental goal of the science curriculum. All West Virginia children must be prepared to live and work productively in a highly scientific, technological world. Economic competitiveness is dependant on an educated, trained workforce that understands why and how things work. Students must learn to make evidence-based decisions in their personal lives and on societal issues. Drawing upon the National Science Education Standards, the goals of Project 2061, and the tenets of Scope, Sequence, and Coordination Project, the science curriculum delineates what students must know, understand, and be able to do. Inquiry-based science instruction is emphasized throughout the K-12 curriculum.

Nature of Science

Students will develop an understanding of the nature of science which encompasses the understanding and the practice of scientific inquiry; the acquisition and the nature of scientific knowledge; and the comprehension of scientific endeavors.

Scientific Attitudes/Habits of Mind

Through cultivation of scientific attitudes (i.e., demand for verification, test for validation, display of curiosity), students will develop an understanding of the limits of science and to evaluate scientific advances and technological applications as they impact society. Through participation in the scientific enterprise, students will construct their knowledge about the natural and designed world.

Scientific Processes/Thinking Skills

Students will develop and demonstrate the scientific processes for investigating the world. They will utilize critical thinking skills to make decisions based on evidence and employ appropriate strategies to solve problems. The processes of science used to construct knowledge not only help students find meaning in science, but also assist students in the development of important life management and work skills. Ample opportunities are needed for students to develop the scientific skills such as formulating questions; making predictions; designing experiments; making observations; classifying, organizing, and analyzing data; drawing conclusions; and evaluating results.

Laboratory Investigations/Hands-On Learning

Scientific inquiry is a pathway to knowledge. Students acquire skills for learning and gain knowledge of the natural world from direct observation, interaction, and concrete manipulation of the tools and the materials of science. Students will engage in active inquiries, investigations, and hands-on activities a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills.

Science Themes/Subject Matter

Through the integration of the fields of science and the development of unifying themes, students will be able to see the interrelationships among biology, chemistry, physics, and the earth sciences. Scientifically literate students will make connections in the formal education setting and will apply their knowledge and skills to daily life experiences. Science themes - systems, changes, and models - provide students with unifying conceptual schemes that increase their understanding of the natural world.

Science History

Science is a human endeavor. Studying historical and current discoveries of scientists and scientific milestones provide students with information about how discoveries have influenced current scientific thought and advances. Scientifically literate students will realize the contributions of diverse cultures, past and present scientists, and society in general.

Science, Technology, and Society

Understanding science and technology in the context of personal and social perspectives are critical issues in preparing students to take an active and responsible role in society. To live and work in the highly scientific and technological world of the twenty-first century, students must be able to identify problems and design, implement, and evaluate solutions. Students must comprehend the inherent link between science and technology and their impact on society.

Kindergarten Science

The Coordinated and Thematic Science (CATS) Kindergarten objectives emphasize the process skills. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy in the fields of biology, chemistry, physics, and earth sciences. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes, and models. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. CATS Kindergarten enhances the child's natural curiosity about the environment and augments the awe and wonder of inquiries and discoveries using the senses and by hands on manipulation of objects to build a strong foundation of concepts blended with safety principles.

Nature of Science

- K.1 perceive science as the human's search for an understanding of the world by asking questions about themselves and their world (e.g., ~~make qualitative observations about one's own physical characteristics; recognize arms, legs, head, eyes, ears, etc.; make observations about things found in nature, clouds, animals, plants, etc.; compare size, shape, and structure of living things~~)
- K.2 ~~define science as a search for answers about themselves and their world (e.g., recognize the roles of people involved in science careers)~~
- K.3 explore objects and events (e.g., make qualitative observations using the five senses, identify changes in nature)
- K.4 ~~probe deeply into~~ explore natural phenomena by asking and answering questions about the environment (e.g., animals, plants, stars, weather)
- K.5 use a variety of communication techniques (e.g., pictures, models, graphs)
- K.6 realize that science is never finished ~~by observing changes in the environment (e.g., weather cycles, plant and animal cycles)~~ new knowledge leads to new questions)
- K.7 recognize that a solution to one scientific problem often creates new problems (e.g., recycling)

Scientific Attitudes/Habits of Mind

- K.8 ask and answer questions to further an appreciation and joy of discovery of the natural world

- K.9 demonstrate innate curiosity, initiative, and creativity by asking questions about the environment (e.g., day/night, weather conditions, living things)
- K.10 be in awe and wonder of the patterns, variations, and interactions of natural objects in the environment (e.g., tree, leaves, animal structures, sun and shadow)
- K.11 trust observations and accept results of personal discoveries (e.g., use five senses)
- K.12 listen to and be tolerant of different viewpoints (e.g., working in groups, communicate what is perceived)
- K.13 continue probing phenomena until questions are resolved (e.g., properties of living and non-living things, effects of weather)
- K.14 regard science as an integrated whole and a part of daily life
- K.15 recognize that scientists work alone and in groups (e.g., visit scientists at work, work in groups to make simple models)

Scientific Processes/Thinking Skills

- K.16 develop observational skills (e.g., use of senses)
- K.17 collect and record information in a variety of ways (e.g., drawings, weather calendar, graphs)
- K.18 use a variety of classification systems (e.g., sorting by color, shape, size, texture)
- K.19 make predictions based on personal observations (e.g., clouds-rain, cold weather-snow, bud-flowers, metamorphosis of butterflies)

- K.20 use mathematical skills in investigations (e.g., ordering, sequencing, counting, measuring)
- K.21 participate in drawing conclusions and making decisions
- K.22 use decision making skills in daily life (e.g., selecting clothes for weather conditions)

Laboratory Investigations/

Hands-On Learning

- K.23 engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and laboratory skills
- K.24 use scientific instruments and everyday materials to investigate the natural world (e.g., hand lens, metric ruler, balance, thermometer, magnets, computers)
- K.25 use safe and proper techniques for handling, manipulating, and caring for science materials (e.g., follow safety rules, maintain a clean work area, treat living organisms humanely)

Science Themes/Subject Matter

- K.26 develop an understanding of the scientific themes of systems, changes, and models (e.g., systems are made of parts which interact with one another; change occurs gradually, repetitively, or randomly; models are representations of real things)
- K.27 understand that the study of living and non-living things in the natural world integrates living organisms, earth materials, and physical properties of matter
- K.28 establish connections across the curriculum (e.g., integrate science with mathematics, social studies, language arts, arts, and/or physical education)
- K.29_{3,4,5} compare, sort, and group objects according to size, shape, color, weight, texture and buoyancy- *systems*

- K.30_{3,4,5,6} using the five senses, identify living and non-living things- *systems*
- K.31_{3,4,5,7,9} observe water can be a liquid or a solid (e.g., rain, snow)- *changes*
- K.32 observe the properties of plants and animals (e.g., movement, growth)- *systems*
- K.33_{3,4,5,6,7} observe changes in plants and animals (e.g., animal baby to adult, seed to plant)- *changes*
- K.34_{3,5,7,9} observe models of plants and animals in different environments (e.g., terrariums, aquariums, animals and plants in a forest, pond, field)- *models*
- K.35 understand the terms hot and cold, warm and cool- *systems*
- K.36₅ demonstrate that heat can be created by rubbing hands together- *systems*
- K.37_{3,5,6,8,10} discover magnetic properties of objects- *systems*
- K.38 recognize the effects of energy on the environment (e.g., light, heat)- *systems*
- K.39 observe the effects of gravity (e.g., falling objects)- *changes*
- K.40_{3,5,6,8,10,11} observe various particle sizes (e.g., crushing a sugar cube)- *changes*
- K.41 explore changes in energy (e.g., hot/cold, light/dark, loud/soft)- *changes*
- K.42 show that objects can be moved in different ways (e.g., straight, circular, fast, and slow)- *models*
- K.43 observe, record, and compare the length of time it takes to travel from one place to another (e.g., faster/slower)- *changes*
- K.44 using a color chart, identify the colors- *models*
- K.45 observe clouds and know that there are different kinds- *systems*
- K.46₃ observe the effects of wind- *systems*
- K.47₃ name and describe ~~hte~~ the four seasons- *systems*
- K.48_{3,5,8} observe the weather and describe it in general terms- *systems*
- K.49₃ observe air temperature changes during the day- *changes*
- K.50₃ observe and graph daily changes in weather- *changes*

- K.51₃ recognize that there are more stars than you can see or count- *changes*
- K.52₃ recognize that the stars, sun, and moon appear to move- *changes*
- K.53 observe and compare the properties of rock, sand, and soil- *changes*
- K.54 observe the effects of weather on humans, animals, and plants- *changes*
- K.55₃ explore the reason for day and night- *changes*
- K.56_{4,5,7,9} observe and describe the ~~effect of evaporation on salt water and tap of water in various environments-~~ *changes*
- K.57 make a model of the earth to illustrate that the earth has more water than land- *models*
- K.58₃ use materials to make imprints (e.g., wet sand, clay)- *models*
- K.59₃ draw and describe models of the sun, moon, and earth- *models*
- K.60_{3,4} use a chart to identify the types of weather daily (e.g., sunny, cloudy)- *models*

Science History

- K.61 listen to the lives and discoveries of scientists (~~e.g., from short stories and news items, films and videos, and visit with men and women scientists~~)
- K.62 recognize that science changes over time (~~e.g., dinosaurs no longer live, rocks break off from mountains~~)
- K.63 realize that scientists will continue to discover new things (e.g., ~~listen to reports from daily papers and news magazines and visit with scientists current events~~)

Science, Technology, and Society

- K.64 recognize through the use of speakers, field trips, audio-visual, and/or printed material that there are many science-related careers ~~through the use of speakers, field trips, audio-visual, and/or printed material (e.g., veterinarian, forest ranger)~~
- K.65 recognize that science skills are used in most careers ~~not usually related to science (e.g., farmer, construction worker)~~

- K.66 observe how technology has ~~positively or negatively affected the quality of life in West Virginia and the world (e.g., toys, laser price scanner, litter)~~ benefits as well as draw backs
- K.67 observe that common daily events involve science (e.g., ~~use of car, use of microwave, ice melting~~ riding bikes, pencil sharpeners)
- K.68 develop respect and responsibility for the environment by recognizing the interrelationship of living and non-living things and engaging in conservation practices

Computer/Technology

- K.69 use appropriate software to practice and master Kindergarten instructional objectives in science
- K.70 on a keyboard, use the letters of his/her name and/or numbers to "Log On"
- K.71 on a keyboard, use special function keys such as "Return/Enter, space bar, and Esc"
- K.72 select a program from a menu
- K.73 use a mouse to "point and click"
- K.74 identify the uses of technology at home and play
- K.75 identify various components of a computer (e.g., monitor, keyboard, CPU, disk drive, mouse, printer)

Grade One Science

The Coordinated and Thematic Science (CATS) One objectives builds on the process skills and adds data gathering and reporting. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy in the fields of biology, chemistry, physics, and earth sciences. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes, and models. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated in all activities. CATS One continues the excitement of learning about the natural world and allows the beginning of experimentation and data collection to emphasize the tools of science and the properties of matter.

Nature of Science

- 1.1 identify science as a search for answers about themselves and their world ~~(e.g., understand that living things share characteristics, make observations about differences among objects found in nature, distinguish among living and non-living)~~
- 1.2 recognize the roles of people involved in science careers
- 1.3 explore objects and events using the five senses
- 1.4 describe changes in nature observations as accurately as possible
- 1.5 ~~probe deeply into~~ explore natural phenomena by asking and answering questions about the environment (e.g., animals, plants, mountains, rivers)
- 1.6 use a variety of communication techniques (e.g., sketches, pictographs, models)
- 1.7 realize that science is never finished ~~by observing changes in the environment (e.g., weather cycles, plant and animal cycles, energy cycles)~~ new knowledge leads to new questions
- 1.8 recognize that a solution to one scientific problem often creates new problems (e.g., recycling, pollution)

Scientific Attitudes/Habits of Mind

- 1.9 ask and answer questions to further an appreciation and joy of discovery of the natural world
- 1.10 demonstrate innate curiosity, initiative, and creativity by questioning

- 1.11 observations of changes in their environment (e.g., life cycles, motion of celestial objects, sun and shadow) be in awe and wonder of the patterns, variations, and interactions of natural objects in the environment (e.g., trees, rivers, rock formations, weather)
- 1.12 trust observations of changes in the environment (e.g., use of senses)
- 1.13 listen to and be tolerant of different viewpoints by engaging in collaborative activities
- 1.14 continue probing phenomena until questions are resolved (e.g., properties of living and non-living, motions of sun and moon)
- 1.15 recognize that developing solutions to problems takes time and patience
- 1.16 recognize that science includes both individual and cooperative ventures ~~(e.g., making models, visit scientists at work, read about lives of scientists)~~

Scientific Processes/Thinking Skills

- 1.17 develop observation skills (e.g., use of senses)
- 1.18 collect, record, and compare information (e.g., pictograph, bar graph of heights, months of birthdays)
- 1.19 use a variety of classification systems (e.g., sorting, sequencing) and associate objects and characteristics (e.g., spirals in shells, growth rings of trees, movement of living things)
- 1.20 measure the length and width of various objects using standard and non-standard units (e.g., metric ruler, paper clips, counting bears)

- 1.21 use mathematical skills in scientific investigations (e.g., ordering, sequencing, measuring, graphing)
- 1.22 describe trends of data and make predictions based on that data (e.g., metamorphosis of frogs, seasonal changes and plants, temperature and weather)
- 1.23 participate in decision making

Laboratory Investigations/

Hands-On Learning

- 1.24 engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and laboratory skills
- 1.25 use scientific equipment and everyday materials to investigate the world (e.g., hand lens, balance, thermometer, seeds, rocks, magnets, calculators, computers)
- 1.26 use safe and proper techniques for handling, manipulating, and caring for science materials

Science Themes/Subject Matter

- 1.27 develop an understanding of the scientific themes of systems, changes, and models (e.g., systems is a collection of parts and processes that interact with each other; change occurs gradually, repetitively, or randomly; a model is a picture, description, or a representation of the real thing)
- 1.28 understand that the study of living and non-living in the natural world integrates living organisms, earth materials, and physical properties of matter
- 1.29 establish connections across the curriculum (e.g., integrate science with mathematics, social studies, language arts, arts, and/or physical education)
- 1.30_{3,4,5} compare, sort, and group objects according to size, shape, color, texture, weight, buoyancy, and magnetic properties- *systems*
- 1.31_{4,5,6} classify objects as living or non-living- *systems*

- 1.32_{4,5,6,7,8,9,10,11} recognize that water can be a solid (ice), a liquid (rain), and can change from one form to another- *changes*
- 1.33_{3,5,6,7,8,9,10} identify needs of living things (e.g., food, water, light)- *systems*
- 1.34_{3,4,5,6,7} recognize, compare, and/or sequence changes in living things (e.g., seed to plant, tadpole to frog, caterpillar to butterfly) -*changes*
- 1.35_{3,5,7,9} construct and/or manipulate models that depict movement of living and non-living things in air, water, space, and on land (e.g., birds and airplanes flying, fish and boats moving through water, animals and vehicles moving on land)- *models*
- 1.36_{3,5,6,7} recognize that heat can be produced in many ways (e.g., burning, rubbing hands together)- *systems*
- 1.37_{3,6,7} understand energy types and sources (e.g., sunlight, electricity) and their relationship to heat and temperature- *systems*
- 1.38 compare the effects of force on an object (e.g., changing direction, stopping, slowing down, speeding up)- *systems*
- 1.39 notice that objects can change direction when striking a surface (e.g., balls off a wall, light off a mirror)- *changes*
- 1.40 observe the changes in the object's motion while moving over a surface (e.g., slowing, speeding up, curving)- *changes*
- 1.41 recognize that sound may change in volume as it travels through different substances (e.g., air, water, wood)- *changes*
- 1.42_{3,5,6,8,10} examine objects with magnetic properties and observe the changes in fields (e.g., magnet and iron filings between transparencies)- *changes*
- 1.43 draw pictures of objects that produce heat (e.g., sun, stove, toaster)- *models*
- 1.44 record/draw a person's shadow at different times of the day- *models*
- 1.45 construct a model of a simple machine to show how to make work easier (e.g., lever, wedge)- *models*

- 1.46 construct a musical instrument to demonstrate that sounds are produced by vibrations (e.g., rubber band guitar)- *models*
- 1.47₃ compare the day sky with the night sky- *systems*
- 1.48₃ identify stars as very distant objects that give off light- *systems*
- 1.49 explain that the moon reflects light from the sun- *systems*
- 1.50 identify reasons why the sun is important- *systems*
- 1.51 identify bodies of water and land forms on Earth- *systems*
- 1.52₃ identify important uses of air- *systems*
- 1.53₃ identify various weather changes (daily and by seasons) and their effect on living organisms- *changes*
- 1.54_{3,4} observe and record changes in weather- *changes*
- 1.55 record temperature at different times of the day (e.g., cool morning, warm at noon)- *changes*
- 1.56₃ understand that the sun, moon, and stars appear to move- *changes*
- 1.57₃ infer that heat is energy and some materials transfer heat better than others- *changes*
- 1.58 identify the globe as a model of the Earth- *models*
- 1.59₃ compare imprints (e.g., animal tracks, leaf prints, shell prints)- *models*
- 1.60 construct a wind machine to show wind direction (e.g., wind sock)- *models*
- 1.61_{3,4,5,7,9} recognize that earth materials consist of solids (e.g., rocks, soils), liquids (e.g., water), and gases (e.g., air) in the atmosphere- *models*
- 1.62_{3,9} observe and explain the water cycle (e.g., Ziploc bag with water taped to windows)- *models*

Science History

- 1.63 study the lives and discoveries of scientists (~~e.g., use short stories, films, and videos~~) about men and women of science and visit their places of work)
- 1.64 recognize that science changes over time (~~e.g., stars appear and disappear, new animals replace dinosaurs~~)
- 1.65 realize that scientists will continue to discover new things (e.g., ~~listen to~~

~~reports and news articles about new stars, plants, and animals and visit with scientists about their work in laboratories~~ current events)

Science, Technology, and Society

- 1.66 recognize through the use of speakers, field trips, audio-visual, and/or printed material that there are many science-related careers through ~~the use of speakers, field trips, audio-visual, and/or printed material~~ (e.g., ~~astronomer, geologist~~)
- 1.67 recognize that science skills are used in most careers ~~not usually related to science~~ (e.g., ~~carpenter, bee keeper~~)
- 1.68 develop an awareness of how technology has positively or negatively affected the quality of life in ~~West Virginia and the world~~ (e.g., ~~electromagnets, power lines~~)
- 1.69 recognize that common daily events involve science (e.g., CD players, velcro, weather)
- 1.70 develop respect and responsibility for the environment by recognizing the interrelationship of living and non-living things and engaging in conservation practices

Computer/Technology

- 1.71 use appropriate software to practice and master first grade instructional objectives in science
- 1.72 turn on/off a student workstation
- 1.73 on a keyboard, use letters, numbers, and other special function keys (e.g., shift, delete/backspace, and arrow keys) to input information
- 1.74 save and/or retrieve a file
- 1.75 print a document
- 1.76 identify the uses of technology at school and work
- 1.77 demonstrate respect for the computer work of others
- 1.78 identify fundamental computer terms (e.g., disk, software, hardware, boot/start, cursor)
- 1.79 using the graphing application of appropriate software, create tables and/or bar graphs
- 1.80 use a calculator to perform mathematical functions in data analysis

Grade Two Science

The Coordinated and Thematic Science (CATS) Two objectives build upon the early stages of experimentation and maintenance of natural curiosity. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy in the fields of biology, chemistry, physics and earth sciences. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes and models. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated in all activities. CATS Two will provide opportunities for developmental and academic growth. The activities will introduce the concepts that science and technology are interrelated. The curricular thrust will be to develop early problem-solving skills through observation, experimenting and concluding.

Nature of Science

- 2.1 determine that science is a search for answers and an understanding of the world (~~e.g., classify plants and animals based on observations, compare likenesses and differences among plants and animals, observe changes in the environment caused by humans and/or nature~~)
- 2.2 identify the role of community people in science careers
- 2.3 compare and contrast objects and events using the five senses
- 2.4 identify examples of changes in nature describe observations as accurately as possible
- 2.5 ~~probe deeply into~~ explore natural phenomena by asking and answering questions about the environment (e.g., animals, plants, mountains, rivers, deserts, grasslands, weather)
- 2.6 use a variety of communication techniques (e.g., pictographs, models, simple bar graphs, logs)
- 2.7 realize that science is never finished by ~~observing changes in the environment (e.g., weather cycles, energy cycles, life cycles~~ new knowledge leads to new questions)
- 2.8 recognize that a solution to one scientific problem often creates new problems (e.g., recycling, pollution, conservation)

Scientific Attitudes/Habits of Mind

- 2.9 ask and answer questions while participating in investigations that lead to an appreciation and joy of discovery of the natural world

- 2.10 demonstrate innate curiosity, initiative, and creativity by observing, classifying, and comparing (~~e.g., states of matter, structure and function of living and non-living things~~)
- 2.11 be in awe and wonder of the patterns, variations, and interactions of natural objects in the environment (e.g., sun, earth and moon, plant and animal structures)
- 2.12 ~~trust observations of living and non-living things in the environment (e.g., wild and domesticated animals, weather phenomena)~~ and accept results of personal discoveries (e.g., use of senses)
- 2.13 listen to and be tolerant of different viewpoints by engaging in collaborative activities and coming to a group decision
- 2.14 continue probing phenomena until questions are resolved (~~e.g., properties of living and non-living things, interaction of objects~~)
- 2.15 engage in problem-solving activities that have multiple solutions or explanations
- 2.16 recognize that science includes both individual and cooperative ventures (~~e.g., group solutions to problems, individual collections of living and non-living things~~)

Scientific Processes/Thinking Skills

- 2.17 observe, collect and record information (e.g., graphing, ordering, sequencing, measuring)

- 2.18 use a variety of classification systems (e.g., properties of living and non-living things)
- 2.19 use mathematical skills in SI (metric) units in investigations (e.g., addition and subtraction, measurement of length, weight, and temperature)
- 2.20 use data to make predictions and construct reasonable explanations (e.g., sink and float, magnetic and non-magnetic objects, growth rate of plants)
- 2.21 plan and conduct simple investigations

Laboratory Investigations/

Hands-On Learning

- 2.22 engage in active inquiries, investigations and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and laboratory skills
- 2.23 manipulate scientific instruments and everyday materials to investigate the natural world (e.g., hand lens, balance, thermometer, metric ruler, magnets, bulbs and batteries, weather instruments, calculators, computers)
- 2.24 use safe and proper techniques for handling, manipulating, and caring for science materials.

Science Themes/Subject Matter

- 2.25 develop an understanding of the scientific themes of systems, changes, and models (e.g., a system consists of many parts that which interact with each other and give rise to new properties; change occurs gradually, repetitively, or randomly; a model is a picture, description, or representation of the real thing)
- 2.26 understand that the study of living and non-living objects in the natural world integrates living organisms, earth materials, and physical properties of matter
- 2.27 establish connections across the curriculum (e.g., integrate science with mathematics, social studies,

language arts, arts, and/or physical education)

- 2.28^{3,4,5,6,8,10} compare, sort, and group objects according to size, shape, color, weight, texture, buoyancy, magnetic properties and states of matter - *systems*
- 2.29^{3,4,5,6,7,8} identify the structures of living things and explain their functions (e.g., wings for flying, fins for swimming, ~~flowers for attracting insects, physical characteristics inherited from parents~~ roots for support and obtaining water) - *systems*
- 2.30^{3,5,6,7,8,9,10} observe, classify, compare, investigate, record and discuss needs of living things in different environments - *systems*
- 2.31^{3,4,5,6,7} observe, record, predict and discuss changes in living things (e.g., adaptations, growth and development) - *changes*
- 2.32^{3,4,5,6,7,8} construct and/or manipulate models that depict movement, structures, and functions of living things (e.g., animal movements, plant parts) models
- 2.33^{3,4,5,6,7,8} identify substances, mixtures and simple solutions - *models*
- 2.34^{3,5,6,8,10} demonstrate that a magnet can attract or repel objects - *systems*
- 2.35 illustrate ways to produce sound (e.g., striking and plucking strings) - *systems*
- 2.36^{4,5,6,7,8,9,10,11} explain energy types, sources and their relationship to heat and temperatures - *systems*
- 2.37 recognize that sound can change in pitch and volume - *changes*
- 2.38 investigate how matter changes from one state to another (e.g., melting, freezing, boiling) - *changes*
- 2.39 draw a picture of an electric circuit illustrating that electricity travels - *models*
- 2.40 recognize that some materials conduct heat better than others (e.g., metals) - *models*
- 2.41 conclude that solids, liquids, and gases take up space - *models*
- 2.42 recognize that a shadow is cast when an object blocks light - *systems*

- 2.43₃ explain how the Earth rotating on its axis causes day/night - *systems*
- 2.44 identify structural adaptations that benefit living organisms - *systems*
- 2.45 describe the water cycle and identify various sources of water - *systems*
- 2.46_{5,6,9,11} distinguish changes in the atmosphere (e.g., wind movement) - *changes*
- 2.47 collect and observe the amount of rain in one week - *changes*
- 2.48 examine changes in non-living things (e.g., events that shape the Earth) - *changes*
- 2.49₃ understand that the moon has phases - *changes*
- 2.50₃ describe how fossils are formed - *changes*
- 2.51₃ construct a collage of resources used for heating homes and buildings - *models*
- 2.52₃ construct and explain models (e.g., sun, moon, earth and landforms) - *models*
- 2.53_{3,4} construct a chart showing weather conditions over a period of time - *models*
- 2.54₃ sequence pictures of events to illustrate the passage of time - *models*
- 2.55 use a map key to identify features (e.g., mountains, rivers, lakes) - *models*
- 2.56₃ match a fossil or a picture of a fossil, with a picture of its original organism (e.g., dinosaur shell, fern) - *models*

Science History

- 2.57 study the lives and discoveries of scientists of different cultures and backgrounds (~~e.g., read stories about Thomas Edison, Jacques Cousteau, Alexander Graham Bell, and Rachel Garsen and visit scientists in their laboratory~~)
- 2.58 recognize that science changes over time (~~e.g., earth features change shape, variations of birds appeared, plants of long ago became coal~~)
- 2.59 realize that scientists will always have new things to discover (e.g., galaxies, diseases, plants, and animals)

Science, Technology and Society

- 2.60 develop an understanding through the use of speakers, field trips, audio-visual, and/or printed material that there are many science-related careers ~~through the use of speakers, field trips, audio-visual, and/or printed material (e.g., inventor, meteorologist)~~
- 2.61 understand that science skills are used in most careers ~~not usually related to science (e.g., piano tuner, photographer)~~
- 2.62 understand how technology has positively or negatively affected the quality of life in ~~West Virginia and the world (e.g., solar energy use, sound "pollution")~~
- 2.63 understand that common daily events involve science (~~e.g., food, electricity, toys, transportation~~)
- 2.64 develop respect and responsibility for the environment by recognizing the interrelationship of living and non-living things and engaging in conservation practices

Computer/Technology

- 2.65 use appropriate software to practice and master second grade instructional objectives in science
- 2.66 practice correct keyboarding posture and finger placement for the home row keys
- 2.67 use a mouse to "click and drag"
- 2.68 execute a science program from disk and/or CD-ROM
- 2.69 using the graphing application of appropriate software, create tables and/or bar graphs
- 2.70 use appropriate software to practice reading and interpreting graphs and charts
- 2.71 identify the ways technology changes the lives of people in the community
- 2.72 describe the right of an individual to ownership of his/her (computer) work
- 2.73 identify the function of the various components of a computer system (e.g., monitor, keyboard, mouse, disk drive, CD-ROM, printer)
- 2.74 use a calculator to perform mathematical functions in data analysis

Grade Three Science

The Coordinated and Thematic Science (CATS) Three objectives build upon problem-solving and experimentation and move into a more in-depth study of science. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy in the fields of biology, chemistry, physics, and earth sciences. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes, and models. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated in all activities. CATS Three highlights science-related careers. ~~the beginning of~~ The study of geology and astronomy expands in CATS Three. Collecting materials, testing the materials, recording data and developing concepts related to physics and chemistry are introduced to expand investigative abilities that lead to logical conclusions.

Nature of Science

- 3.1 discuss the ways science is a search for answers and an understanding of the world ~~(e.g., ask questions about your role in your world with litter and pollution)~~
- 3.2^{4,5,6,7} **given the science-related careers of a nurse, doctor, dentist, x-ray technician, etc., state the roles each plays in a community**
- 3.3^{4, 5, 6, 7, 8, 9, 10, 11} **explore objects and events by attributes (e.g., shape, color, texture)**
- 3.4 differentiate natural changes from man-made changes
- 3.5 probe deeply into natural phenomena by asking and answering questions about the environment ~~(e.g., oceans, landforms, volcanoes, weather)~~
- 3.6 use a variety of communication techniques (e.g., charts, bar graphs, pie graphs, models, written descriptions)
- 3.7 realize that science is never finished ~~by observing changes in the environment (e.g., weather cycles, energy cycles, life cycles, rock cycles)~~ new knowledge leads to new questions)
- 3.8 recognize that a solution to one scientific problem often creates new problems (e.g., recycling, pollution, conservation, waste disposal)

Scientific Attitudes/Habits of Mind

- 3.9 ask and answer questions while recognizing interactions that further an appreciation and joy of discovery of the natural world
- 3.10 demonstrate innate curiosity, initiative, and creativity by constructing models to investigate their environment
- 3.11^{4, 5, 6, 7, 8, 9, 10, 11} **be in awe and wonder of the patterns, variations, and interactions of natural objects in the environment (e.g., food chain, rocks and minerals)**
- 3.12 trust observations as a basis for taking risks involved in new tasks and skills
- 3.13 listen to and be tolerant of different viewpoints by engaging in collaborative activities and be willing to modify ideas when new and valid information is presented
- 3.14 continue probing phenomena until questions are resolved ~~(e.g., properties of matter, motions of sun and moon and planets, adaptations of plants and animals)~~
- 3.15 recognize that developing solutions to problems takes time, patience, and persistence
- 3.16 recognize that science includes both individual and cooperative ventures ~~(e.g., read about scientific discoveries, on-going group investigations)~~

Scientific Processes/Thinking Skills

- 3.17^{3,4,5,6,7,8,9,10} **sort, classify, and compare materials based on useful properties (e.g., magnetism, density, solubility, and conductivity)**
- 3.18^{3,4,5,6,7,8,9,10,11} **given a set of objects, group or order the objects according to an established scheme (e.g., celestial objects, patterns of motion, constellations)**
- 3.19^{6,8,11} **given a set of events, objects, shapes, designs, or numbers, find patterns of constancy or regularity**
- 3.20^{4,5} **apply mathematical skills and use metric units (e.g., graphing, ~~addition, subtraction, multiplication, division,~~ calculations, and measurement of length and volume of liquid samples)**
- 3.21^{3,4,5,6,7,8,9,10,11} **establish a data table, graph, map, or diagram and use it to answer questions (e.g., volume, temperature, and rates of freezing, melting, and boiling)**
- 3.22 **support statements with facts (e.g., found in nature books, magazines, and the Internet)**
- 3.23^{3,4,5,6,7,8,9,10,11} **construct predictions and make inferences based on patterns of evidence**
- 3.24^{4,5,6,8,9,10,11} **when collecting and observing things around you, look for changes and question what may cause the change (e.g., the effect of push or pull on a moving object, motion related to points of reference, falling bodies, fossils, and weather maps)**
- 3.25₇ **relate an organism's pattern of behavior to the nature of its environment (e.g., the kinds and numbers of other organisms present, the availability of food, and the physical characteristics of the environment)**
- 3.26^{4,7,10} **test variables (e.g., those that effect plant growth, speed, action of water on soil, and shadow formation)**

Laboratory Investigations/

Hands-On Learning

- 3.27 **engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and laboratory skills**
- 3.28^{4,5,6,7,8,10,11} **use scientific instruments and everyday materials to investigate the natural world (e.g., graduated cylinder, hand lens, thermometer, bulbs and batteries, tuning fork, and calculators)**
- 3.29 **use safe and proper techniques for handling, manipulating, and caring for science materials**

Science Themes/Subject Matter

- 3.30 **develop an understanding of the scientific themes of systems, changes, and models (e.g., systems consists of many parts that interact with one another and give rise to new properties or functions; change occurs gradually, repetitively, or randomly; a model is a picture, description, or simulation of the real thing)**
- 3.31 **understand that the study of living and non-living objects in the natural world integrates living organisms, earth materials, and physical properties of matter**
- 3.32 **establish connections across the curriculum (e.g., integrate science with mathematics, social studies, language arts, arts, and/or physical education)**
- 3.33^{3,4,5,6,8,10,11} **compare, sort, and group objects according to solids, liquids, gases, and mixtures - systems**
- 3.34^{4,5,6,7,8,9,10,11} **compare and contrast chemical and physical changes - systems**
- 3.35^{3,4,5,6,7,8} **identify the structures of living things, including their systems, and explain their functions (e.g., roots absorb water, circulatory system to move materials) - systems**

- 3.36^{5,7,9} relate the structures and behaviors of living organisms to the environment in which they live (e.g., beaks and feet in birds, seed dispersal, camouflage, different types of flowers) - *systems*
- 3.37^{5,6,7,8,9,10} describe the relationships among the plants and animals in a closed system of interdependent organisms (e.g., aquariums, terrariums) - *systems*
- 3.38^{5,6,7,8,9,10} identify relationships among organisms in an ecosystem (e.g., sequencing food chains, behavior, adaptations, factors that effect populations, predator-prey relationships) - *systems*
- 3.39^{4,5,6,7} observe, measure, and record changes in living things (e.g., growth and development, variations within species) - *changes*
- 3.40^{3,4,5,6,7,8} manipulate, measure, diagram, construct, arrange, observe and discuss models of plant and animal structures and systems - *models*
- 3.41^{3,5,6,8,10,11} observe chemical reactions (e.g., Alka Seltzer and water, vinegar and baking soda) - *systems*
- 3.42^{5,6,8,11} recognize that moving objects must have a force exerted upon them (e.g., gravity, push or pull, unbalanced force) - *systems*
- 3.43 identify objects that appear to move or not move based upon the motion of other objects - *systems*
- 3.44 find out how the number of turns in an explore the relationship between the strength of the electromagnet affects the strength to the number of coils of wire around a nail - *systems*
- 3.45^{4,5,7,9} show that matter can change phases (e.g., condensation, melting, evaporation) - *changes*
- 3.46^{4,5,7,9} relate changes in states of matter to temperature (e.g., water) - *changes*
- 3.47^{5,6,8,10} recognize energy transformations (e.g., mechanical to heat, electrical to heat) - *changes*
- 3.48 recognize that it takes work to move objects over a distance - *models*
- 3.49 recognize that speed depends on distance and time - *models*
- 3.50^{4,5,7,9} construct models related to the structure of solids, liquids, and gases - *models*
- 3.51^{4,6,9,10,11} identify properties of minerals - *systems*
- 3.52 explain how igneous, sedimentary and metamorphic rocks are formed - *systems*
- 3.53 describe three layers of the Earth - *systems*
- 3.54⁴ identify and describe the various features of the Earth's crust (e.g., plateaus, plain, and valleys) - *systems*
- 3.55^{4,6,7,8,9} explain how the rotations of the Earth causes day and night - *systems*
- 3.56^{4,6} explain how the revolution of Earth and the tilt of Earth's axis causes the seasons - *systems*
- 3.57 plan and carry out investigations to show how shadows are formed - *systems*
- 3.58 describe the similarities and differences among the planets - *systems*
- 3.59^{5,6,7,8,9,10,11} describe the size and surface of the Sun, Moon and Earth - *systems*
- 3.60⁴ relate changes in the environment to the water cycle - *changes*
- 3.61¹⁰ associate fossils as a record of time (e.g., what organisms once lived on Earth, where they lived) - *changes*
- 3.62¹⁰ move through a simple time line illustrating changes on the Earth over the past 50 million years - *changes*
- 3.63^{5,8} describe weather changes by seasons - *changes*
- 3.64^{4,5,7,10} using water and wind explore the eroding of different materials (e.g., sand, mud pile and rocks) - *changes*

- 3.65 describe how volcanoes and earthquakes change the Earth - *changes*
- 3.66_{4,6} recognize the movement of the Sun and Moon in relationship to the Earth's position - *changes*
- 3.67₄ recognize the existence of constellations and their changes through the seasons - *changes*
- 3.68₁₀ make a model of a fossil and review fossil formation - *models*
- 3.69_{6,7} ~~design a collage that represents~~ represent pictorially how Earth's resources are used in every day life (e.g., water, wind, rock, soil, and minerals) - *models*
- 3.70_{7,8,10,11} identify land features using a topographical model or map (e.g., mountains, rivers, valleys, lakes, glaciers, and volcanoes) - *models*
- 3.71_{7,8,9} explain using models the phases of the Moon and eclipses - *models*
- 3.72_{3,5,6,9,11} build a weather station and use to collect and record measurable data (e.g., temperature, wind, direction, wind speed, and precipitation) - *models*
- 3.73_{4,6,7,8,9,10,11} read a weather chart or map - *models*

Science History

- 3.74 study the lives and discoveries of scientists of different cultures and backgrounds (~~e.g., find articles, videos, and books about specific scientists, their discoveries, and their equipment: George Washington Carver, Luther Burbank, John Audubon, Isaac Newton, and Madame Curie and take field trips to places where scientists work~~)
- 3.75 recognize that science changes over time (~~e.g., weathering, new plants and animals appear~~)
- 3.76 realize that scientists will always have questions about the world (e.g., how big is the world, when did it start, how old is it)

Science, Technology and Society

- 3.77 examine through the use of speakers, field trips, audio-visual, and/or printed material that there are many science-related careers ~~through the use of speakers, field trips, audio-visual, and/or printed material (e.g., allergist, environmentalist)~~
- 3.78 examine that science skills are used in most careers ~~not usually related to science (e.g., animator, transportation engineers)~~
- 3.79 research how technology has positively or negatively affected the quality of life ~~in West Virginia and the world (e.g., Biosphere II, "skyglow" light pollution)~~
- 3.80 examine how common daily events involve science (~~e.g., mail delivery, television~~)
- 3.81 develop respect and responsibility for the environment by recognizing the interrelationship of living and non-living things and engaging in conservation practices

Computer/Technology

- 3.82 use appropriate software to practice and master third grade instructional objectives in science
- 3.83 practice proper finger placement for all letters on the keyboard
- 3.84 use a mouse to draw simple graphics
- 3.85 use appropriate software to practice reading, interpreting, and analyzing the data on a chart, graph, and table
- 3.86 use appropriate software to practice drawing conclusions, making predictions, and making inferences based on data from a chart, graph, and table
- 3.87 use appropriate software to practice determining the length of an object
- 3.88 identify the uses of technology in the community (e.g. health care, communications, agriculture)
- 3.89 demonstrate understanding of the concept that copyright law protects a person's (or company's) work
- 3.90 relate the input, output, and processing devices of a computer to their functions

- 3.91 using the graphing application of appropriate software, create tables and/or bar graphs
- 3.92 use a calculator to perform mathematical functions in data analysis
- 3.93 use a variety of instruments (e.g., probes, thermometers, measuring devices) to perform measurements and record data

Grade Four Science

The Coordinated and Thematic Science (CATS) Four objectives builds on the study of geology, astronomy, chemistry and physics. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy in the fields of biology, chemistry, physics and earth sciences. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes, and models. Students will engage in active inquires, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities. CATS Four promotes cooperative learning, group decisions, cultural diversity, careers, and expands the development of hands-on exploration. Basic science concepts are developed and problem-solving abilities are augmented.

Nature of Science

- 4.1 explain that science is a search for truth and an understanding of the world
- 4.2 ^{3, 5, 6, 7} **explore the role of science and science-related careers**
- 4.3 ^{3, 5, 6, 7, 8, 9, 10, 11} **design a model given a set of attributes (e.g., design a fish)**
- 4.4 explain the changes in nature given a series of pictures illustrating changes
- 4.5 probe deeply into natural phenomena by asking and answering questions about the environment (~~e.g., biomes, weather patterns~~)
- 4.6 **use a variety of communication techniques (e.g., charts, bar graphs, pie graphs, models, reports)**
- 4.7 realize that science is never finished by observing changes in the environment (~~e.g., seasons, energy cycles, life cycles, rock cycles, weathering, erosion~~ new knowledge leads to new questions)
- 4.8 recognize that a solution to one scientific problem often creates new problems (e.g., recycling, pollution, conservation, waste disposal, need for technology)

Scientific Attitudes/Habits of Mind

- 4.9 **experience the joy of discovery of the natural world by developing questions and an understanding of the natural world which lead to investigations**

- 4.10 demonstrate innate curiosity, initiative, and creativity by designing simple experiments (~~e.g., electrical circuits, evaporation and condensation~~)
- 4.11 be in awe and wonder of the patterns, variations, and interactions of objects in the universe (~~e.g., constellations, rock cycle, weather patterns~~)
- 4.12 trust observations of discoveries when trying new tasks and skills
- 4.13 listen to and be tolerant of different viewpoints by engaging in collaborative activities and modifying ideas when new and valid information is presented
- 4.14 continue probing phenomena until questions are resolved (~~e.g., motion of celestial objects, relationship of living things and habitat, transfer of energy~~)
- 4.15 recognize that developing solutions to problems requires persistence, flexibility, open-mindedness, and alertness for the unexpected
- 4.16 recognize that science includes both individual and cooperative ventures (~~e.g., interview scientists and meteorologists, group investigation, and model building~~)

Scientific Processes/Thinking Skills

- 4.17 ^{5, 6, 7, 8, 9, 10, 11} **sort, classify, and compare objects, and events based on properties (e.g., mass, volume, density, conductivity)**
- 4.18 ^{3, 5, 6, 7, 8} **given a set of objects, group or order the objects according to an established scheme**

- 4.19^{5,6,8,10,11} **apply mathematical skills and use metric units (e.g., graphing, multiplication, division, and measurement of length and volume)**
- 4.20^{5,6,8,9} **establish the variables and controls in an experiment**
- 4.21^{3,5,6,7,8,9,10,11} **construct a hypothesis when provided a problem (e.g., cause and effects of an event, based on formation of shadows)**
- 4.22^{3,5,6,7,8,9,10,11} **construct predictions and inferences based on patterns of evidence**
- 4.23^{3,5,6,7,8,9,10,11} **test variables (e.g., factors that effect plant growth, action of water in shaping the earth, and causes and effects of events)**
- 4.24^{3,5,6,7,8,9,10,11} **interpret data presented in a table, graph, or diagram and use it to answer questions and make decisions**
- 4.25^{5,6,7,8,9,10,11} **draw and support a conclusion based on patterns of evidence (e.g., weather maps, change of speed in a given amount of time, change in wave motions with changes in energy, and variation of plants)**
- 4.26 **support statements with facts (e.g., found in books, multimedia, Internet)**

Laboratory Investigations/

Hands-On Learning

- 4.27 **engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and laboratory skills**
- 4.28 **use scientific instruments and everyday materials to investigate the natural world (e.g., observe the natural world using instruments such as a hand lens, microscope, telescope, thermometer, magnets, bulbs and batteries, graduated cylinders, calculators, computers)**
- 4.29 **demonstrate safe and proper techniques for handling, manipulating, and caring for science materials**

Science Themes/Subject Matter

- 4.30 **develop an understanding of the scientific themes of systems, changes, and models (e.g., systems consists of many parts that interact with one another and give rise to new properties or functions; change occurs gradually, repetitively, or randomly; a model is a picture, description, simulation, or equation which represents the real thing)**
- 4.31 **understand that the study of living and non-living objects in the natural world integrates living organisms, earth materials, and physical properties of matter**
- 4.32 **establish connections across the curriculum (e.g., integrate science with mathematics, social studies, language arts, arts, and/or physical education)**
- 4.33^{3,4,5,6,7,8,9,10,11} **compare, sort, and group objects according to buoyancy, magnetic properties, states of matter, density, solubility, conductivity and ability to react - systems**
- 4.34^{3,5,6,7,8} **identify the structures of living things including their systems, and explain their function (e.g., skeletons, teeth structures, plant needles and leaves) - systems**
- 4.35^{3,5,7,9} **describe the different characteristics of plants and animals which help them to survive in different niches and environments - systems**
- 4.36^{3,5,6,7,8,9,10} **describe the environments and conditions which are needed for the survival of living things (e.g., water, sunlight, soil, food, climate, correct habitat, environmental barriers) - systems**
- 4.37^{3,5,6,7} **classify living things according to their structures and functions (e.g., taxonomy) - systems**
- 4.38^{3,5,6,7,8,9,10} **review relationships among organisms in an ecosystem (e.g., fresh water, salt water, and**

- terrestrial organisms and habitats, climate as related to biomes, food webs) - systems**
- 4.39_{3,5,6} **identify human uses of plants and animals (e.g., food sources, medicines) - systems**
- 4.40 **associate the behaviors of living things to external and internal influences (e.g., hunger, climate, seasons) - systems**
- 4.41 **identify cells in plants and animals (e.g., use hand lenses or microscopes to examine plant and animal cells) - systems**
- 4.42 **identify variations in structures and function within and among species of living things (e.g., different seeds, leaves, skeletons, different forms of reproduction, animal and plant structures) - changes**
- 4.43_{3,5,6,7} **recognize, compare, and/or sequence changes in living things (e.g., plant and animal life cycles) - changes**
- 4.44 **describe environmental barriers to the migration of animals - changes**
- 4.45 **construct and explain models of habitats, food chains, and food webs - models**
- 4.46_{5,6,7,8,9,10,11} **observe and investigate how properties can be used to identify substances (e.g., acids and bases, solubility, conductivity, magnetism, acidic, and basic) - systems**
- 4.47_{3,5,6,7,8,9,10,11} **examine simple chemical changes (e.g., tarnishing, rusting, burning) - changes**
- 4.48₁₀ **~~construct Bohr models of atoms - models~~ understand that materials may be composed of parts that are too small to be seen without magnification - systems**
- 4.49 **identify different forms of energy and describe energy transformation (e.g., electrical to heat, light to mechanical) - systems**
- 4.50 **examine properties of waves (e.g., transverse, longitudinal, frequency, wavelengths) - systems**
- 4.51 **relate motion to its properties (e.g., frame of reference, position) - systems**
- 4.52_{3,5,7,9} **relate changes in states of matter to energy transformation (e.g., adding heat) - systems**
- 4.53_{5,6,11} **predict and investigate the changes in motion produced when applied force is changed (e.g., increase/decrease in applied force, ~~length of vibrating strings~~, length of time force is applied) - changes**
- 4.54_{3,5,7,9} **identify various changes in states (e.g., solids to liquids, liquids to solids, solids to gas) - changes**
- 4.55_{5,6,10,11} **use models to demonstrate heat, light, and sound (~~how produced, production~~, how changed, applications to every day living, ~~how moved~~ movement through system) - models**
- 4.56_{5,10} **construct simple electrical circuits (e.g., conductors, non-conductors, complete/incomplete) - models**
- 4.57_{6,9,10,11} **explain the relationship between the rate of cooling and crystal size of igneous rocks - systems**
- 4.58 **describe the Earth's atmosphere - system**
- 4.59₆ **state that air has mass, takes up space, and is made of molecules - systems**
- 4.60_{5,6} **identify the sun as a star - systems**
- 4.61 **explain the reason why other planets are not always seen in the same position**
- 4.62_{4,5} **research evidence to discover the age of the earth - systems**
- 4.63₁₀ **associate fossils with the periods in which they were formed - systems**
- 4.64_{3,5,6,7,8,9,10} **locate and identify patterns of stars and their seasonal changes - changes**
- 4.65₄ **describe the orbits of the sun and moon - changes**

- 4.66₅ **compare and explain the relative time differences to erode materials (e.g., a sand pile, mud pile, rock pile) - *changes***
- 4.67₄ **investigate the cause and effects of volcanoes, earthquakes, and landslides - *changes***
- 4.68_{6,7,8,9,10,11} **enter weather data on weather charts and use the data to hypothesize how air temperature and humidity affect air pressure - *models***

Science History

- 4.69 study the lives and discoveries of men and women scientists of different cultures and backgrounds (e.g., ~~Albert Einstein, Earl Core, Wright Brothers, Gerty Cori, Gertrude Elion, Albert Schweitzer, Lewis and Clark, John Muir~~)
- 4.70 recognize that science changes over time (e.g., ~~discoveries of new ideas creates a need for new equipment, new equipment makes it possible to discover new ideas, new ideas may have positive or negative consequences~~)
- 4.71 realize that scientists will continue to have questions about the world (e.g., what is the smallest particle, what causes diseases, can humans live in space for a long time)

Science, Technology, and Society

- 4.72 explain through the use of speakers, field trips, audio-visual, and/or printed material that there are many science-related careers ~~through the use of speakers, field trips, audio-visual, and/or printed material (e.g., computer technician, food chemist)~~
- 4.73 explain that science skills are used in most careers not usually associated with science (e.g., ~~jewelry maker, pilot~~)
- 4.74 explain how technology has positively or negatively affected the quality of life in ~~West Virginia and the world (e.g., rechargeable batteries, Great Lakes Zebra Mussels, oil spills and clean-up)~~

- 4.75 research how common daily events involve science (e.g., ~~flashlights, laser scanners, printed materials~~)
- 4.76 develop respect and responsibility for the environment by recognizing the interrelationship of living and non-living things and engaging in conservation practices

Computer/Technology

- 4.77 use appropriate software to practice and master fourth grade instructional objectives in science
- 4.78 practice proper finger placement for all keys on a keyboard
- 4.79 use appropriate software to practice reading, interpreting, and analyzing the data on a map, chart, graph, table, and diagram
- 4.80 use appropriate software to practice drawing conclusions, making predictions, and making hypotheses based on data from a map, diagram, chart, graph, and table
- 4.81 identify and demonstrate ways technology is used to access information
- 4.82 demonstrate understanding that the violation of copyright law is a crime
- 4.83 using the graphing application of appropriate software, create tables, charts, and/or graphs
- 4.84 use a calculator to perform mathematical functions in data analysis
- 4.85 use a variety of instruments (e.g., probes, thermometers, measuring devices) to perform measurements and record data

Grade Five Science

The Coordinated and Thematic Science (CATS) Five objectives identify, compare, classify and explain our living and designed worlds. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy in the fields of biology, chemistry, physics, and earth/space sciences. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes and models. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated in all activities. CATS Five reviews earth and the sky, life cycles and habitats of organisms, properties, positions, and motions of objects, and energy. New major concepts introduced at the fifth grade level include changes in properties of matter, structures, functions and adaptations of organisms, and the structure of the earth's system.

Nature of Science

- 5.1 develop a conceptual framework of scientific principles
- 5.2 recognize the interdependency of science themes and scientific concepts
- 5.3 evaluate the interrelationships of scientific concepts to everyday life by making informed decisions and choices using scientific reasoning and knowledge ◇
- 5.4_{6,7} **investigate career choices in science and technology** ◇
- 5.5_{6,7,8} **apply skepticism, careful methods, logical reasoning, and/or creativity in investigating the observable universe (e.g., changing of mechanical energy to electrical energy, electrical energy to mechanical energy, electrical energy to light)**
- 5.6 recognize and appreciate that scientific knowledge is subject to modification as new information challenges current theories
- 5.7 acquire a holistic view of scientific knowledge by integrating reading, writing, mathematics and other disciplines with the science curriculum
- 5.8 use a variety of activities and investigations to produce a sense of wonder about the natural world and the joy of discovery
- 5.9 recognize that the exploration of science is challenging and fulfilling

and establishes patterns of lifelong curiosity and learning

Scientific Attitudes/Habits of Mind

- 5.10 cooperate and collaborate to ask questions, find answers, solve problems and conduct investigations to further an appreciation and joy of scientific discovery ◇
- 5.11 process and integrate experiences with prior knowledge to formulate new ideas
- 5.12 understand that the study of science is a dynamic process and the results are not always definite or complete
- 5.13_{6,7,8,9,10,11} **formulate conclusions through close observations, logic, objectivity, perseverance and integrity in data collection (e.g., adaptations in structures, photosynthesis, respiration)** ◇

Scientific Processes/Thinking Skills

- 5.14 recognize and apply facts, concepts, laws, and theories to explain phenomena
- 5.15_{3,4,6,7,8,9,10} **compare and contrast objects, actions or phenomena according to similarities and differences in order to classify them (e.g., atoms and molecules, AC and DC currents, earthquakes and volcanoes)**

- 5.16^{3,4,6,7,8,9,10,11} **construct and use charts, graphs, and tables to organize, display, interpret, analyze, and explain data (e.g., extrapolation, interpolation) ◇**
- 5.17^{3,4,6,7,8,9,10} **use inferential reasoning to make logical conclusions from collected data (e.g., causes and effects) ◇**
- 5.18^{3,4,6,7,8,9,10,11} **utilize experimentation to demonstrate scientific processes (e.g., formulating questions, predicting, forming hypotheses, quantifying, identifying dependent and independent variables)**
- 5.19^{3,4,6,7,8,9,10,11} **develop rational thinking processes that underlie scientific approaches to problem solving by employing critical-thinking skills in applying scientific knowledge, using imagination and creativity while working individually or cooperatively (e.g., patterns of motion, cycles of matter and energy) ◇**
- 5.20^{3,4,6,7,8,9,10,11} **develop skills in the use of laboratory materials and equipment; and proper communication of scientific data collected (e.g., meter sticks, balances, thermometers, scales, graduated cylinders) ◇**

Laboratory Investigations/

Hands-On Learning

- 5.21 engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and laboratory skills
- 5.22 use a variety of materials and scientific instruments to conduct explorations and investigations of the natural world to explain science concepts (e.g., measure environmental conditions using appropriate instruments) ◇

- 5.23 demonstrate safe techniques for handling, manipulating and caring for science materials, equipment and living organisms ◇

Science Themes/Subject Matter

- 5.24 develop through the study of interdependent themes including systems, changes, and models an understanding of biological, earth/space, and physical science concepts
- 5.25 associate hands-on activities to daily life experiences
- 5.26 express ideas that illustrate the relevance of science, technology, and societal issues
- 5.27^{3,4,6,8,9,10,11} **classify living and non-living things according to properties (e.g., structures and functions, mass, volume, density, solubility, conductivity, magnetism, weight, shape, color, freezing point, boiling point, evaporation, rocks and minerals) - *systems***
- 5.28 identify and explain common energy transformations and conversions incycles of matter (e.g., photosynthesis, water, carbon dioxide, nitrogen, energy conversions including fuels) - *systems*
- 5.29 demonstrate the processes involved in the changes of physical states of matter (e.g., solid to liquid to gas to liquid to solid) - *systems*
- 5.30^{3,4,6,7,8,9,10,11} **recognize and explore methods for investigating physical changes (e.g., evaporating, condensing, boiling, freezing, melting, salinity, density, shape and size) - *changes***
- 5.31₆ **explain the affects of force on motion (e.g., wind currents, hot air on balloons) - *changes***
- 5.32^{5,324,7,8,9,10} **explain how the different characteristics of plants and animals help them to survive in different niches and environments (e.g., adaptations, natural selection, extinction) - *systems***

- 5.33_{4,7,8} identify the structures of living things and explain their functions (e.g., cells, tissues, organs, organ systems, whole organisms, communities, ecosystems) - *systems*
- 5.34_{4,6,8,10} compare variations of plant growth and reproduction (e.g., seed dispersal, asexual and sexual reproduction, needs of growing plants) - *systems*
- 5.35 describe methods that various cells use to obtain and process food - *changes*
- 5.36_{3,4,6,7,8,9,10} trace the pathways of the sun's energy through producers, consumers, and decomposers (e.g., food webs, pyramids) - *models*
- 5.37 explain that the mass of a material is conserved whether it is together, in parts, or in a different state - *systems*
- 5.38 recognize that elements are composed of ~~atoms of the same~~ only one type of matter - *models systems*
- 5.39 using the periodic table, identify common elements according to their symbols - *models*
- 5.40 describe variables affecting the motion of objects (e.g., gravity, friction, density of medium, amount of energy) - *systems*
- 5.41 use SI (metric) units of measurement as they apply to electricity (e.g., amps, volts, watts) - *systems*
- 5.42_{6,7,8,9,10} construct and interpret graphs depicting motion (e.g., speed vs time) - *models*
- 5.43_{4,10} analyze diagrams of circuits (e.g., complete and incomplete circuits, parts and functions) - *models*
- 5.44₈ demonstrate magnetic forces using magnets (e.g., law of magnets, lines of force) - *models*
- 5.45 describe sound as a wave (e.g., compressional wave) - *models*

- 5.46 review fundamental earth science concepts including, relative age of the earth, movement of celestial objects, air has mass and exerts pressure - *systems*
- 5.47_{4,6} understand there are stars in the universe just like our sun as well as many that are bigger or smaller - *systems*
- 5.48₁₀ explore how fossils can be used to determine the age of rock layers - *systems*
- 5.49₆ interpret the influence of land forms on weather and climate - *systems*
- 5.50 identify and describe natural land forms, changes in these land forms and recognize that they may be used as a record of time - *changes*
- 5.51 compare and explain the different rates of weathering in certain materials (e.g., sand pile, mud pile, rock pile) - *changes*
- 5.52_{3,8} explain how the earth's tilt and revolution determine the seasons - *changes*
- 5.53 compare how seasonal weather patterns are affected by the sun (e.g., amount of sunlight, tilt of the earth, revolution) - *changes*
- 5.54_{3,6,9} collect and display weather data to describe weather patterns (e.g., temperatures, wind direction, wind speed, precipitation) - *models*
- 5.55_{3,4,6,7,8,9,10,11} fabricate and illustrate models (e.g., solar system, structure of earth, erosion and weathering, forces which drive the rock cycle) - *models*

Science History

- 5.56_{6,7} articulate the historical significance of scientific discoveries (~~e.g.,~~ as influenced by technological demands, competition, controversy, world events, personalities, and societal issues)
- 5.57_{6,7} compare the evolution of science concepts and theories (e.g., cells, plate tectonics, atoms, genetics)

5.58_{6,7} examine the contributions of men and women of diverse cultures to the development of science

Science, Technology, and Society

5.59_{6,7,8,10,11} give examples of how science and technology are used in daily living ◇

5.60_{6,7,8,10,11} use the knowledge of science and technology to make personal decisions at local and global levels ◇

5.61 evaluate and critically analyze mass media reports of scientific developments and events ◇

5.62_{6,7,8,10,11} critically analyze the effects and impacts of science and technology on global and local problems (e.g., mining, manufacturing, recycling, farming, water quality)

5.63_{6,7,8,10} explore the connections between science, technology, society, and career opportunities

5.64_{6,7,8,10,11} analyze the positive and negative effects of technology on society and the influence of societal pressures on the direction of technological advances

Computer/Technology

5.65 use appropriate software and a variety of audio-visual and/or multimedia materials to practice and master fifth grade instructional objectives in science

5.66 input data using correct keying, editing, and formatting techniques

5.67 using the graphing application of appropriate software, select the suitable graph, chart, or table to display a set of data

5.68 using the graphing application of appropriate software, create tables, charts, and/or graphs

5.69 use a calculator to perform mathematical functions in data analysis

5.70 use a variety of instruments (i.e. probes, thermometers, measuring devices) to perform measurements and record data

5.71 identify database management terms (e.g., database, file, record, field, record, field/category, sort/arrange, select/search, report)

Grade Six Science

The Coordinated and Thematic Science (CATS) Six objectives demonstrate, differentiate, and apply concepts of the living and designed worlds. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy in the fields of biology, chemistry, physics, and earth/space sciences. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of major science themes of systems, changes and models. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated in all activities. CATS Six reviews changes in the properties of matter, structures, functions, and adaptations of organisms, and the structure of the earth's systems. New major concepts introduced at the sixth grade level include motions and forces, ecosystems, diversity of life, energy transformations, plate tectonics, earth's resources and weather.

Nature of Science

- 6.1 develop a conceptual framework of scientific principles
- 6.2 recognize the interdependency of science themes and scientific concepts
- 6.3 evaluate the interrelationships of scientific concepts to everyday life by making informed decisions and choices using scientific reasoning and knowledge ◇
- 6.4_{5,7} **investigate career choices in science and technology** ◇
- 6.5_{5,7,8} **apply skepticism, careful methods, logical reasoning, and/or creativity in investigating the observable universe (e.g., sun, earth, and moon relationships, changes in ecosystems, weather forecasting)**
- 6.6 recognize and appreciate that scientific knowledge is subject to modification as new information challenges current theories
- 6.7 acquire a holistic view of scientific knowledge by integrating reading, writing, mathematics and other disciplines with the science curriculum
- 6.8 use a variety of activities and investigations to produce a sense of wonder about the natural world and the joy of discovery
- 6.9 recognize that the exploration of science is challenging and fulfilling and establishes patterns of lifelong curiosity and learning

Scientific Attitudes/Habits of Mind

- 6.10 cooperate and collaborate to ask questions, find answers, solve problems and conduct investigations to further an appreciation and joy of scientific discovery ◇
- 6.11 process and integrate experiences with prior knowledge to formulate new ideas
- 6.12 understand that the study of science is a dynamic process and the results are not always definite or complete
- 6.13_{4,5,7,8,9,10,11} **formulate conclusions through close observations, logic, objectivity, perseverance and integrity in data collection (e.g., water quality, forces and motion, populations and ecosystems)** ◇

Scientific Processes/Thinking Skills

- 6.14 recognize and apply facts, concepts, laws, and theories to explain phenomena
- 6.15_{3,4,5,7,8,9,10} **compare and contrast objects, actions or phenomena according to similarities and differences in order to classify them (e.g., systems in living organisms, changes in rock record, elements)**
- 6.16_{3,4,5,7,8,9,10,11} **construct and use charts, graphs, and tables to organize, display, interpret, analyze and explain data (e.g., extrapolation, interpolation)** ◇

- 6.17^{3,4,5,7,8,9,10} use inferential reasoning to make logical conclusions from collected data (e.g., causes and effects) ◇
- 6.18^{3,4,5,7,8,9,10,11} utilize experimentation to demonstrate scientific processes (e.g., formulating questions, predicting, forming hypotheses, quantifying, identifying dependent and independent variables)
- 6.19^{3,4,5,7,8,9,10,11} develop rational thinking processes that underlie scientific approaches to problem solving by employing critical-thinking skills in applying scientific knowledge, using imagination and creativity while working individually or cooperatively (e.g., how systems work together, factors which impact the environment, ecological consequences of human interactions) ◇
- 6.20^{3,4,5,7,8,9,10,11} develop skills in the use of laboratory materials and equipment; and proper communication of scientific data collected (e.g., meter sticks, balances, thermometers, scales, graduated cylinders) ◇

Laboratory Investigations/

Hands-On Learning

- 6.21 engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and laboratory skills
- 6.22 use a variety of materials and scientific instruments to conduct explorations and investigations of the natural world to explain science concepts (e.g., measure environmental conditions using appropriate instruments) ◇
- 6.23 demonstrate safe techniques for handling, manipulating and caring for science materials, equipment and living organisms ◇

Science Themes/subject Matter

- 6.24 develop through the study of interdependent themes including systems, changes, and models an understanding of biological, earth/space, and physical science concepts
- 6.25 associate hands-on activities to daily life experiences
- 6.26 express ideas that illustrate the relevance of science, technology, and societal issues within the lessons
- 6.27^{4,8,9,10,11} describe the interactions of various cycles that provide energy and/or materials for growth, repair and shelter (e.g., carbon cycle, water cycle, nitrogen cycle, decomposition, photosynthesis, respiration, transpiration)
- 6.28^{4,5,7,8} identify the structures of living things and explain their functions (e.g., similarities and differences in organisms, complexity in organisms, similarities and differences among closely related groups) - **systems**
- 6.29^{4,5,6,7} classify living things according to their structures and functions (e.g., dichotomous keys, field classification guides) - **systems**
- 6.30^{4,5,7,8,9,10} explain changes in common patterns of interdependence among organisms (e.g., biotic and abiotic factors) - **changes**
- 6.31 demonstrate changes in populations of organisms due to limiting environmental factors (e.g., food supply, predators, disease, habitat) - **changes**
- 6.32^{4,5} analyze the ecological consequences of human interactions with the environment (e.g., renewable and non-renewable resources) - **models**
- 6.33^{5,6,8,10} interpret growth patterns in different plants (e.g., mosses, ferns, perennials, biennials, woody plants, herbaceous plants) - **models**

- 6.34_{3,4,5,7} **demonstrate how the various systems provide for the needs of a living organism (e.g., plants, animals, fungi) - models**
- 6.35 **construct models of plant and animal cells which show the basic parts (e.g., cytoplasm, cell wall, cell membrane, nucleus, chloroplasts) - models**
- 6.36_{3,4,5,7,8,9,10,11} **classify materials according to physical and chemical properties - systems**
- 6.37_{3,4,5,7,8,9,10,11} **identify processes as physical or chemical changes - systems**
- 6.38_{4,8} **identify food as sources of energy in animals - systems**
- 6.39₁₁ **research historical reasons for classifying elements and compounds (e.g., Greek philosophers, European alchemists) - systems**
- 6.40_{8,10,11} **apply knowledge of physical and chemical properties to examine samples of water - systems**
- 6.41₁₀ **~~identify the atom as the smallest particle of an element~~ investigate that matter is composed of tiny particles and that the particles are the same for the same type of matter - systems**
- 6.42_{3,4,5,7,8,9,10,11} **investigate the formation of simple mixtures - changes**
- 6.43₉ **investigate methods for separating mixtures (e.g., evaporation, filtration, chromatography, screening) - changes**
- 6.44_{3,8,10,11} **using indicators, identify substances as acidic, basic, or neutral - changes**
- 6.45₁₁ **identify the symbols of elements - models**
- 6.46₁₁ **using the periodic table, identify elements as metals or non-metals - models**
- 6.47₁₀ **~~draw Bohr's models to indicate the placement of protons and neutrons in the nucleus and electrons outside the nucleus~~ to represent atoms - models**
- 6.48_{5,7,8,9,10,11} **describe properties of matter (e.g., inertia, gravitational interaction, specific heat, malleability, melting point, density) - systems**
- 6.49 **~~differentiate concepts related to~~ explore the electromagnetic spectrum (e.g., wavelengths, frequencies, visible light) - systems**
- 6.50_{8,11} **Interpret the relationship of mass to gravitational force (e.g., larger the mass the larger the gravitational pull, the closer the objects the stronger the pull) - systems**
- 6.51_{4,5,8,11} **examine simple machines and the forces involved (e.g., levers, pulleys) - systems**
- 6.52₁₁ **describe the flow of heat between objects (e.g., hot air rises, absorption and release of heat by metals) - systems**
- 6.53₇ **identify factors affecting reflection and refraction (e.g., nature of surfaces, color, density of medium) - systems**
- 6.54_{5,11} **apply the effects of balanced and unbalanced forces on motion of objects (e.g., inertia, addition and subtraction of forces in a straight line) - changes**
- 6.55 **describe the relationship between different frequencies and receivers (e.g., eyes, ears, radios) - changes**
- 6.56₄ **explain absorption and reflection of light by different objects of various colors and textures (e.g., transparent, translucent, opaque, different colors) - changes**
- 6.57_{3,4,11} **explain motion in terms of frames of reference (e.g., motions on earth, ball thrown in or from moving vehicle) - changes**
- 6.58₄ **relate the length of a shadow to the position or source of illumination (e.g., sundials) - changes**
- 6.59 **~~utilize a model~~ use an arrow to represent direction and amount magniturde of force (e.g., arrow point to show direction) - models**
- 6.60 **diagram simple parallel and series circuits (e.g., bulbs, battery, wires, switch) - models**
- 6.61_{5,7,8,9,10} **analyze graphs depicting motion, predict future motion (e.g., graphs, tables, charts) - models**

- 6.62 relate wave lengths and/or frequency to position on electromagnetic spectrum (e.g., colors, x-ray) - *models*
- 6.63 review fundamental earth science concepts including celestial relationships, air has mass and exerts pressure - *systems*
- 6.64_{4,5} recognize that stars are different temperatures and ages - *systems*
- 6.65_{3,5,7,8,10,11} identify and investigate Earth's resources (e.g., use and abuse, energy sources, how man's utilization affects the environment) - *changes*
- 6.66_{9,10,11} **probe track** atmospheric conditions (e.g., composition, interactions) - *changes*
- 6.67 summarize the forces and results of plate tectonics - *changes*
- 6.68 describe the factors involved in causing catastrophic meteorological and geological events - *changes*
- 6.69 develop an understanding in the change's of the rock record - *changes*
- 6.70_{3,4,5,8,10,11} identify and measure changes in weather (e.g., air temperature, speed and direction of wind, humidity, precipitation) - *changes*
- 6.71_{4,7,8,9,10,11} investigate weather (e.g., forecasting, data, methods, making and using maps, thunderstorms, tornadoes, hurricanes, acid rain) - *models*
- 6.72_{4,9,10,11} construct and explain various models (e.g., solar eclipses, lunar eclipses, rock formation including sedimentary, igneous and metamorphic) - *models*

Science History

- 6.73_{5,7} articulate the historical significance of scientific discoveries (e.g., as influenced by technological demands, competition, controversy, world events, personalities, and societal issues)

- 6.74_{5,7} compare the evolution of science concepts and theories (e.g., cells, plate tectonics, atoms, genetics)
- 6.75_{5,7} examine the contributions of men and women of diverse cultures to the development of science

Science, Technology, and Society

- 6.76_{5,7,8,10} give examples of how science and technology are used in daily living ◇
- 6.77_{5,7,8,10} use the knowledge of science and technology to make personal decisions at the local and global levels ◇
- 6.78 evaluate and critically analyze mass media reports of scientific developments and events ◇
- 6.79_{5,7,8,10} critically analyze the effects and impacts of science and technology on global and local problems (e.g., mining, manufacturing, recycling, farming, water quality)
- 6.80_{5,7,8,10} explore the connections between science, technology, society, and career opportunities
- 6.81_{5,7,8,10} analyze the positive and negative effects of technology on society and the influence of societal pressures on the direction of technological advances

Computer/Technology

- 6.82 use appropriate software, audio-visual and/or multimedia materials to practice and master sixth grade instructional objectives in science
- 6.83 using the graphing application of appropriate software, select the suitable chart, table, or graph to display a set of data
- 6.84 using the graphing application of appropriate software, create tables, charts, and/or graphs

- 6.85 use a calculator to perform mathematical functions in data analysis
- 6.86 use a variety of instruments (i.e. probes, thermometers, measuring devices) to perform measurements and record data
- 6.87 use appropriate software to practice reading, interpreting, analyzing, and evaluating the data on a map, chart, graph, table, and diagram
- 6.88 use appropriate software, practice extrapolating and interpolating information from a graph
- 6.89 use appropriate software to practice drawing conclusions from maps, diagrams, charts, graphs, and tables
- 6.90 use appropriate software to practice making predictions, inferences, and hypothesis from maps, diagrams, charts, graphs, and tables
- 6.91 use appropriate software to practice reading an instrument
- 6.92 input data using correct keying, editing, and formatting techniques
- 6.93 use a database to sort and search data given one and/or two criteria
- 6.94 identify examples of copyright law violations and possible penalties
- 6.95 identify ethical and unethical uses of technology
- 6.96 recognize concerns for the future as they relate to technological changes
- 6.97 identify the role of technology in various careers
- 6.98 retrieve current data from a variety of electronic sources which might include the Internet, and/or software reference programs

Grade Seven Science

The Coordinated and Thematic Science (CATS) Seven objectives evaluate, interpret, and predict conditions and phenomena of the living and designed worlds. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy in the fields of biology, chemistry, physics, and earth/space sciences. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes, and models. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities. CATS Seven reviews motions and forces, ecosystems, diversity of life, energy transformations, plate tectonics, earth's resources, and weather. Major concepts introduced at the seventh grade level include elements, mixtures, and compounds, populations/ecosystems, conservation of matter and energy, and earth's history.

Nature of Science

- 7.1 develop a conceptual framework of scientific principles
- 7.2 recognize the interdependency of science themes and scientific concepts
- 7.3 evaluate the interrelationships of scientific concepts to everyday life by making informed decisions and choices using scientific reasoning and knowledge ◇
- 7.4_{5,6} **investigate career choices in science and technology** ◇
- 7.5_{5,6,8} **apply skepticism, careful methods, logical reasoning, and/or creativity in investigating the observable universe (e.g., uses of natural resources, chemical and physical changes of matter; factors affecting living conditions in space vehicles)**
- 7.6 recognize and appreciate that scientific knowledge is subject to modification as new information challenges current theories
- 7.7 acquire a holistic view of scientific knowledge by integrating reading, writing, mathematics and other disciplines with the science curriculum
- 7.8 use a variety of activities and investigations to produce a sense of wonder about the natural world and the joy of discovery
- 7.9 recognize that the exploration of science is challenging and fulfilling and establishes patterns of lifelong curiosity and learning

Scientific Attitudes/Habits of Mind

- 7.10 cooperate and collaborate to ask questions, find answers, solve problems and conduct investigations to further an appreciation and joy of scientific discovery ◇
- 7.11 process and integrate experiences with prior knowledge to formulate new ideas
- 7.12 understand that the study of science is a dynamic process and the results are not always definite or complete
- 7.13_{4,5,6,8,9,10,11} **formulate conclusions through close observations, logic, objectivity, perseverance and integrity in data collection (e.g., impact of natural phenomena on the environment, conservation of energy, concepts of chemical composition of living things)** ◇

Scientific Processes/Thinking Skills

- 7.14 recognize and apply facts, concepts, laws, and theories to explain phenomena
- 7.15_{3,4,5,6,8,9,10} **compare and contrast objects, actions or phenomena according to similarities and differences in order to classify them (e.g., variations in systems and organisms, characteristics of geological time, models of earth structures)**
- 7.16_{3,4,5,6,8,9,10,11} **construct and use charts, graphs, and tables to organize, display, interpret, analyze, and explain data (e.g., extrapolation, interpolation)** ◇

- 7.17^{3,4,5,6,8,9,10,11} **use inferential reasoning to make logical conclusions from collected data (e.g., causes and effects) ◇**
- 7.18^{3,4,5,6,8,9,10,11} **utilize experimentation to demonstrate scientific processes (e.g., formulating questions, predicting, forming hypotheses, quantifying, identifying dependent and independent variables)**
- 7.19^{3,4,5,6,8,9,10,11} **develop rational thinking processes that underlie scientific approaches to problem solving by employing critical-thinking skills in applying scientific knowledge, using imagination and creativity while working individually or cooperatively (e.g., sequencing of components and processes according to order of occurrence, cause and effect of interruptions in a sequence of a system, representations involving sequencing of processes and components of a system) ◇**
- 7.20^{3,4,5,6,8,9,10,11} **develop skills in the use of laboratory materials and equipment; and proper communication of scientific data collected (e.g., meter sticks, balances, thermometers, scales, graduated cylinders) ◇**

Laboratory Investigations/

Hands-On Learning

- 7.21 engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and laboratory skills
- 7.22 use a variety of materials and scientific instruments to conduct explorations and investigations of the natural world to explain science concepts (e.g., measure environmental conditions using appropriate instruments) ◇
- 7.23 demonstrate safe techniques for handling, manipulating and caring for science materials, equipment and living organisms ◇

Science Themes/Subject Matter

- 7.24 develop through the study of interdependent themes including systems, changes, and models an understanding of biological, earth/space, and physical science concepts
- 7.25 associate hands-on activities to daily life experiences
- 7.26 express ideas that illustrate the relevance of science, technology, and societal issues
- 7.27^{7,9,11} **identify and describe disease causing organisms and the diseases they cause (e.g., bacteria, viruses, protozoa, fungi) - systems**
- 7.28^{3,4,5,6,8} **evaluate how the different adaptations and life cycles of plants and animals help them to survive in different niches and environments (e.g., inherited and acquired adaptations) - systems**
- 7.29^{8,9,10,11} **explain how human body systems work together (e.g., skeletal, muscular, and integumentary systems) - systems**
- 7.30^{3,4,5,6,8,9,10} **predict the trends of interdependent populations if one of the limiting factors is changed - changes**
- 7.31^{5,8} **analyze how changes in the environment have lead to ~~variations~~ in reproductive adaptations (e.g., seed dispersal, egg laying, live birth) - changes**
- 7.32^{6,8,9} **evaluate the consequences of the introduction of chemicals into the ecosystem (e.g., environmental consequences, human health risks, mutations) - changes**
- 7.33^{6,8} **analyze the differences in the growth, development and reproduction of plants (e.g., flowering and non-flowering plants) - changes**
- 7.34 compare the variations in cells, tissues, and organs of the skeletal, muscular, and integumentary systems of different organisms - changes
- 7.35^{3,4,5,6} **construct simple keys to differentiate among living things of similar characteristics - models**

- 7.36 construct and manipulate models which show variations in living things (e.g., skeletal, muscular, integumentary systems) - *models*
- 7.37_{5,6} construct models of biologically important substances (e.g., organic and inorganic molecules) - *models*
- 7.38 differentiate among elements, compounds and mixtures - *systems*
- 7.39_{3,4,6,8,10} differentiate mixtures as solutions, colloids or suspensions - *systems*
- 7.40_{3,5,6,8,10,11} **evaluate types of solutions by (e.g., solutes and solvents, relative concentrations, conductivity, pH) ~~and nine types of solutions (e.g., liquid in gas, solid in solid, gas in gas)~~** - *systems*
- 7.41_{9,11} **studying chemical reactions involving acids and bases, follow the neutralization process by using color indicators and identifying the salt formed in the neutralization reaction** - *changes*
- 7.42_{6,9,11} **write word equations to describe chemical reactions**
- 7.423_{6,8,9,10,11} **describe the behavior of individual particles and verify the conservation of matter while exploring the melting and freezing of pure substances** - *changes*
- 7.434_{6,8,9,10,11} **trace the energy flow into and out of materials and verify that melting and freezing occurs at the same temperature** - *changes*
- 7.445 using pictures to showing cyclical processes in nature (~~trace the water cycle, the nitrogen cycle, and the carbon dioxide cycle~~) - *models*
- 7.45_{6,9,11} **write word equations to describe chemical reactions** - *models*
- 7.46_{3,6,9} **relate characteristics of light and sound to waves (e.g., amplitude, pitch, wavelength, reflection, absorption rate, color)** - *systems*
- 7.47 interpret characteristics of AC and DC circuits (e.g., batteries, transformers) - *systems*
- 7.48 experiment with simple machines to demonstrate the relationship between forces and distance - *systems*
- 7.49 explain the effect of gravity on falling objects (e.g., $g = 9.8\text{m/s}^2$, object dropped on earth and on moon) - *systems*
- 7.50_{4,5,6,8,9,10,11} **relate physical changes to the Kinetic-Molecular Theory (e.g., molecular energy, molecular movement)** - *changes*
- 7.51 explain ~~qualitatively~~ conservation of matter qualitatively (e.g., water cycle, food chain, chemical reactions) - *changes*
- 7.52_{8,9} **explain qualitatively conservation of energy qualitatively (e.g., potential energy to kinetic energy)** - *changes*
- 7.53_{8,9} recognize that energy can be changed from one form to another (e.g., electrical to heat, electrical to mechanical, heat to mechanical) - *changes*
- 7.54 use vectors to represent direction of motion - *models*
- 7.55_{5,6,8,9,10} **analyze motion graphically** - *models*
- 7.56 investigate application of lenses to science (e.g., microscopes, telescopes, magnifying glass, periscopes) - *models*
- 7.57 review fundamental earth science concepts including, motions of sun and moon, weather and topographic maps - *systems*
- 7.58 recognize that stars not only are different in age and size, but also in color, temperature and brightness - *systems*
- 7.59 **describe and compare the physical characteristics of celestial objects** - *systems*
- 7.60₁₀ **depict and relate causes of tides, surfs and currents** - *systems*
- 7.61 examine the relationships among air masses, oceans, weather, convection currents and the sun's energy - *systems*
- 7.62 demonstrate how natural phenomena and societal behaviors impact the environment - *systems*
- 7.63 identify and summarize origin of the universe theories - *systems*

- 7.64 understand man's responsibility to recognize and solve problems involving the environment including solid waste management - *systems*
- 7.65 identify factors affecting living conditions in space - *changes*
- 7.66 compare and contrast geologic time - *changes*
- 7.67_{4,10} **construct and explain various models (e.g., motions of earth, sun and moon, ocean floor structures, coastal landforms and soil erosion) - *models***
- 7.68_{3,8,10,11} **given a topographical model or map; identify land features on topographical map (e.g., mountains, rivers, valleys, lakes, glaciers, volcanoes) - *models***

Science History

- 7.69_{5,6} **articulate the historical significance of scientific discoveries (e.g., as influenced by technological demands, competition, controversy, world events, personalities, societal issues)**
- 7.70_{5,6} **compare the evolution of science concepts and theories (e.g., cells, plate tectonics, atoms, genetics)**
- 7.71_{5,6} **examine the contributions of men and women of diverse cultures to the development of science**

Science, Technology, and Society

- 7.72_{5,6,8,10,11} **give examples of how science and technology are used in daily living**
◇
- 7.73_{5,6,8,10,11} **use the knowledge of science and technology to make personal decisions at the local and global levels**
◇
- 7.74 **evaluate and critically analyze mass media reports of scientific developments and events**
◇
- 7.75_{5,6,8,10,11} **critically analyze the effects and impacts of science and technology on global and local problems (e.g., mining, manufacturing, recycling, farming, water quality)**

- 7.76_{5,6,10} **explore the connections between science, technology, society, and career opportunities**
- 7.77_{5,6,8,10,11} **analyze the positive and negative effects of technology on society and the influence of societal pressures on the direction of technological advances**

Computer/Technology

- 7.78 use appropriate software, audio-visual, and/or multimedia materials to practice and master seventh grade instructional objectives in science
- 7.79 using the graphing application of appropriate software, select the suitable chart, table, or graph to display data
- 7.80 using the graphing application of appropriate software, create tables, charts, and/or graphs
- 7.81 use a calculator to perform mathematical functions in data analysis
- 7.82 use a variety of instruments (i.e. probes, thermometers, measuring devices) to perform measurements and record data
- 7.83 use appropriate software to practice reading, interpreting, analyzing, and evaluating the data on a map, chart, graph, table, and diagram
- 7.84 use appropriate software, practice extrapolating and interpolating information from a graph
- 7.85 use appropriate software to practice drawing conclusions from maps, diagrams, charts, graphs, and tables
- 7.86 use appropriate software to practice making predictions, inferences, and hypothesis from maps, diagrams, charts, graphs, and tables
- 7.87 input data using correct keying, editing, and formatting techniques
- 7.88 use a database to sort and search data to solve a specific problem
- 7.89 demonstrate a knowledge of how technology affects the ways in which people use resources
- 7.90 discriminate between ethical and unethical access to information
- 7.91 associate computer/technology activities with related careers
- 7.92 retrieve current data from a variety of electronic sources which might include the Internet, and/or software reference programs

Grade Eight Science

The Coordinated and Thematic Science (CATS) Eight objectives analyze, quantify, and explain conditions and phenomena of the living and designed worlds. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy in the fields of biology, chemistry, physics, and earth/space sciences. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes and models. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities. CATS Eight reviews elements, mixtures, and compounds, populations/ecosystems, conservation of matter and energy, and earth's history. Major concepts introduced at the eighth grade level include reproduction, genetics, behavior, chemical reactions, and environmental concerns.

Nature of Science

- 8.1 develop a conceptual framework of scientific principles
- 8.2 recognize the interdependency of science themes and scientific concepts
- 8.3 evaluate the interrelationships of scientific concepts to everyday life by making informed decisions and choices using scientific reasoning and knowledge ◇
- 8.4^{5,6,7} **investigate career choices in science and technology** ◇
- 8.5^{5,6,7} **apply skepticism, careful methods, logical reasoning, and/or creativity in investigating the observable universe (e.g., effect of human existence on the biosphere, fundamentals of genetics, sampling techniques involved in data collection)**
- 8.6 recognize and appreciate that scientific knowledge is subject to modification as new information challenges current theories
- 8.7 acquire a holistic view of scientific knowledge by integrating reading, writing, mathematics and other disciplines with the science curriculum
- 8.8 use a variety of activities and investigations to produce a sense of wonder about the natural world and the joy of discovery
- 8.9 recognize that the exploration of science is challenging and fulfilling and establishes patterns of lifelong curiosity and learning

Scientific Attitudes/Habits of Mind

- 8.10 cooperate and collaborate to ask questions, find answers, solve problems and conduct investigations to further an appreciation and joy of scientific discovery ◇
- 8.11 process and integrate experiences with prior knowledge to formulate new ideas
- 8.12 understand the study of science is a dynamic process and the results are not always definite or complete
- 8.13^{4,5,6,7,9,10,11} **formulate conclusions through close observations, logic, objectivity, perseverance and integrity in data collection (e.g., Newton's Laws of Motion, forces causing the construction and destruction of topographical features, how to illustrate the path of waves traveling through different media)** ◇

Scientific Processes/Thinking Skills

- 8.14 recognize and apply facts, concepts, laws, and theories to explain phenomena
- 8.15^{3,4,5,6,7,9,10} **compare and contrast objects, actions or phenomena according to similarities and differences in order to classify them (e.g., refraction and reflection of light, how waves travel through different materials, how to represent forces as vectors)**

- 8.16_{3,4,5,6,7,9,10,11} **construct and use charts, graphs, and tables to organize, display, interpret, analyze, and explain data (e.g., extrapolation, interpolation) ◇**
- 8.17_{3,4,5,6,7,9,10,11} **use inferential reasoning to make logical conclusions from collected data (e.g., causes and effects) ◇**
- 8.18_{3,4,5,6,7,9,10,11} **utilize experimentation to demonstrate scientific processes (e.g., formulating questions, predicting, forming hypotheses, quantifying, identifying dependent and independent variables)**
- 8.19_{3,4,5,6,7,9,10,11} **develop rational thinking processes that underlie scientific approaches to problem solving by employing critical-thinking skills in applying scientific knowledge, using imagination and creativity while working individually or cooperatively (e.g., properties of substances and environmental impact, adaptations of organisms to their habitat, methods of classifying common organisms by observable characteristics) ◇**
- 8.20_{3,4,5,6,7,9,10,11} **develop skills in the use of laboratory materials and equipment; and proper communication of scientific data collected (e.g., meter sticks, balances, thermometers, scales, graduated cylinders) ◇**

Laboratory Investigations/

Hands-On Learning

- 8.21 engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and laboratory skills
- 8.22 use a variety of materials and scientific instruments to conduct explorations and investigations of the natural world to explain science concepts (e.g., measure environmental conditions using appropriate instruments) ◇

- 8.23 demonstrate safe techniques for handling, manipulating and caring for science materials, equipment and living organisms ◇

Science Themes/Subject Matter

- 8.24 develop through the study of interdependent themes including systems, changes, and models an understanding of biological, earth/space, and physical science concepts
- 8.25 associate hands-on activities to daily life experiences
- 8.26 express ideas that illustrate the relevance of science, technology, and societal issues
- 8.27 summarize problems related to water on earth as a life sustaining substance (e.g., quality and quantity of surface and ground water)
- 8.28₁₀ **identify and explain the structures and functions of cell organelles (e.g., mitochondria, cell membrane, nucleus) - systems**
- 8.29₁₀ **discuss the interdependencies within and among organelles, cells, tissues, organs, and systems - systems**
- 8.30_{7,9,10,11} **explain how human body systems work together (e.g., circulatory, respiratory, reproductive systems) - systems**
- 8.31_{3,4,5,6,7,9,10} **analyze how structures, functions and behaviors of organisms lead to species continuity (e.g., reproductive/mating behaviors, seed dispersal) - systems**
- 8.32_{3,4,5,6} **group unknown organisms ~~into correct taxonomy~~ based on observable characteristics (e.g., use dichotomous keys) - systems**
- 8.33_{7,9,10,11} **compare the variations in cells, tissues, and organs of the circulatory, respiratory, and reproductive systems of different organisms - changes**
- 8.34_{4,5,6,9,10,11} **design an environment in which the chemical and energy needs for the growth, reproduction and development of plants are met**

- (e.g., food pyramids, decomposition) - *models*
- 8.35_{4,6,8,10,11} demonstrate how living cells obtain the essentials of life (e.g., transpiration, respiration, photosynthesis) - *models*
- 8.36_{9,11} demonstrate the basic principles of genetics (e.g., Mendel's laws, DNA, monohybrid crosses, production of sperm and egg, production of body cells, genes, chromosomes, inherited traits) - *models*
- 8.37 construct and manipulate models which show variations in living things (e.g., circulatory, respiratory, reproductive systems) - *models*
- ~~8.38_{9,10,11} classify chemical reactions as endothermic and exothermic - *systems*~~
- 8.39_{8,11} identify elements as metallic, non-metallic or metalloid and locate them on the periodic table - *systems*
- 8.39₁₀ draw Bohr's Model for each element identifying protons, neutrons, and electrons for each element - *models*
- 8.40₁₁ assign each element to its chemical family on the periodic table and note similarities in outer energy, level electrons within each family - *systems*
- 8.41_{3,6,10,11} utilize properties of acidity, conductivity, and solubility to classify substances - *systems*
- 8.42_{9,10,11} classify chemical reactions as endothermic and exothermic - *systems*
- 8.42_{3,6,9,11} classify chemical reactions as synthesis, decomposition, single replacement or double replacement and identify the oxidation reactions (e.g., elements or compounds combining with oxygen) - *systems*
- 8.44₁₁ write word equations for chemical reaction - *models*
- 8.43_{5,9,10,11} identify acid-base reactions and verify that matter is conserved in chemical reactions - *systems*
- 8.44_{6,7,9,10,11,12} identify chemical reaction factors that might affect the reaction rates including catalysts, temperature changes, light energies, and particle size - *changes*
- 8.45_{7,10} evaluate gaseous systems noting the variation in diffusion rates - *changes*
- 8.46_{8,7,9,10,11} examine the expansion of gases at elevated temperatures - *changes*
- ~~8.47₁₀ draw Bohr's Model for each element identifying protons, neutrons, and electrons for each element - *models*~~
- ~~8.48₁₁ write word equations for chemical reaction - *models*~~
- 8.49_{4,5,6,7,10,11} relate physical properties of matter to everyday life (e.g., reflection/refraction, magnetism/compasses, density of regular/irregular objects, temperature/molecular movement, pendular motions and other vibrating objects) - *systems*
- 8.50 identify sources of energy (e.g., petroleum refinement, windmills, geothermal) - *systems*
- ~~8.51 describe Newton's Laws of Motion and identify examples (e.g., sailboat, bouncing balls, firing a rifle) - *systems*~~
- 8.52₁ interpret and illustrate changes in waves as they pass through various mediums (e.g., sound through water and metal, light through thicknesses of glass) - *changes*
- 8.53_{2,7,9,10,11} describe how sound is perceived by the ear (e.g., range of hearing, frequency, amplitude) - *changes*
- 8.54_{3,7,9} apply the conservation of energy theory to energy transformations (e.g., electrical/heat, heat/mechanical) - *changes*
- 8.55₄ quantitatively represent work, power, pressure (e.g., $W=fd$, $P=W/t$, pressure = force/area) - *models*
- 8.56_{5,6,7,9,10} draw vector quantities (e.g., displacement, velocity, force) - *models*
- 8.57_{6,5,6,7,9,10} graph and interpret the relationships (e.g., distance versus time, speed versus time, acceleration versus time) - *models*
- 8.57 describe Newton's Laws of Motion and identify examples (e.g., sailboat, bouncing balls, firing a rifle) - *systems*

- 8.58_{9,10} **illustrate qualitatively and quantitatively Newton's Laws of Motion (e.g., $F=m \times a$, $D=v \times t$, $p=m \times v$, simple machines, $W=f \times d$) - models**
- 8.59 **illustrate quantitatively mechanical advantage of simple machines - models**
- 8.60 **review fundamental earth and space science concepts including the characteristics of stars, topographic maps and weather maps - systems**
- 8.61 ~~compare and contrast the orbits of planets and comets - systems~~
- 8.62₁ **relate rock formation to the types of fossil fuels - systems**
- 8.63 ~~identify resources as being renewable or non-renewable - systems~~
- 8.64₂ **summarize and explain the principle of plate tectonics - systems**
- 8.63 **construct and interpret rock layer models through stratigraphic interpretation (e.g., age, environment when deposited) - models**
- 8.64 **examine energy transfer in Earth science (e.g., forces in construction of topographical features, causes of geological phenomena, interaction of atmosphere and oceans) - changes**
- 8.65₅ **determine the relationship between the Earth's magnetism and directions on the Earth's surface through the construction and use of a compass - models**
- 8.65 ~~explore the societal effects of meteorological phenomena - systems~~
- 8.66 **describe the factors involved in mining resources - systems**
- 8.67 **identify resources as being renewable or non-renewable - systems**
- 8.68 **explore the societal effects of meteorological phenomena - systems**
- 8.67 ~~compare and contrast the different types of galaxies (e.g., shape, size, components) - systems~~
- 8.68 ~~recognize societal concerns with exploration and colonization of space - systems~~
- 8.69_{3,5} **relate climatic patterns and change to Earth's revolution and tilt of the axis - changes**

- 8.70 ~~examine energy transfer in Earth science (e.g., forces in construction of topographical features, causes of geological phenomena, interaction of atmosphere and oceans) - changes~~
- 8.70 **recognize societal concerns with exploration and colonization of space - systems**
- 8.71_{3,4,5,6,7,9,10,11} **diagram the motions of the Sun, Moon, and Earth and explain the astronomical phenomena associated with these motions with an emphasis on gravitational variances - models**
- 8.72 **compare and contrast the orbits of planets and comets - systems**
- 8.73 **compare and contrast the different types of galaxies (e.g., shape, size, components) - systems**
- 8.72_{4,5,6} **use a variety of instruments to gather data (e.g., mass, temperature, electrical current, air pressure, wind direction, wind speed, and humidity) - models**
- 8.73 ~~construct and interpret rock layer models through stratigraphic interpretation (e.g., age, environment when deposited) - models~~
- 8.74₅ ~~determine the relationship between the Earth's magnetism and directions on the Earth's surface through the construction and use of a compass - models~~

Science History

- 8.75_{5,6,7} **articulate the historical significance of scientific discoveries (e.g., as influenced by technological demands, competition, controversy, world events, personalities, societal issues)**
- 8.76_{5,6,7} **compare the evolution of science concepts and theories (e.g., cells, plate tectonics, atoms, genetics)**
- 8.77_{5,6,7} **examine the contributions of men and women of diverse cultures to the development of science**

Science, Technology, and Society

- 8.78_{5,6,8,10,11} give examples of how science and technology are used in daily living
◇
- 8.79_{5,6,7,10,11} **use the knowledge of science and technology to make personal decisions at the local and global levels** ◇
- 8.80 evaluate and critically analyze mass media reports of scientific developments and events ◇
- 8.81_{5,6,8,10,11} **critically analyze the effects and impacts of science and technology on global and local problems (e.g., mining, manufacturing, recycling, farming, water quality)**
- 8.82_{5,6,10} **explore the connections between science, technology, society, and career opportunities**
- 8.83_{5,6,8,10,11} **analyze the positive and negative effects of technology on society and the influence of societal pressures on the direction of technological advances**

- 8.91 use appropriate software, practice extrapolating and interpolating information from a table, chart, and graph
- 8.92 use appropriate software to practice drawing conclusions from maps, diagrams, charts, graphs, and tables
- 8.93 use appropriate software to practice making predictions, inferences, and hypothesis from maps, diagrams, charts, graphs, and tables
- 8.94 use appropriate software to practice reading an instrument or gauge
- 8.95 use a database to sort and search data to solve a specific problem
- 8.96 identify various careers in the field of technology
- 8.97 discriminate between legal and illegal use of electronic information (including material that is protected by copyright)
- 8.98 retrieve current data from a variety of electronic sources which might include the Internet, and/or software reference programs

Computer/Technology

- 8.84 use appropriate software, audio-visual and/or multimedia materials to practice and master eighth grade instructional objectives in science
- 8.85 input data using correct keying, editing, and formatting techniques
- 8.86 using the graphing application of appropriate software, select the suitable chart, table or graph to display data
- 8.87 using the graphing application of appropriate software, create tables, charts, and/or graphs
- 8.88 use a calculator to perform mathematical functions in data analysis
- 8.89 use a variety of instruments (i.e. probes, thermometers, measuring devices) to perform measurements and record data
- 8.90 use appropriate software to practice reading, interpreting, analyzing, and evaluating the data on a map, chart, graph, table, and diagram

Adolescent Science Education

The goal of adolescent science education prescribes that all students be scientifically literate. To accomplish scientific literacy, a curriculum based on an integration of science, mathematics, and technology with an emphasis on development of themes and concepts shall be utilized. The science program represents a core curriculum from which all students will successfully complete three science courses (Coordinated and Thematic Science Nine, Coordinated and Thematic Science Ten, and one approved science elective) for science credit toward high school graduation.

The CATS Nine and CATS Ten courses continue the development of biology, chemistry, physics, and earth/space science concepts from the middle school curriculum. CATS Nine and CATS Ten are laboratory-based courses. Completion of CATS Nine and CATS Ten assures that students possess the foundational knowledge and preparation needed for advanced, in-depth study in all fields of science - biological sciences, chemistry, physics, and the environmental earth sciences. Students who complete the entry/skilled level agricultural education programs are required to complete a minimum of CATS Nine and Ten.

Students must select at least one science approved elective. **Approved electives must address all seven overarching goals of the science curriculum.** They are in-depth studies in laboratory-based natural sciences and science applications.

Required Courses

Coordinated and Thematic Science Nine
Coordinated and Thematic Science Ten

Approved Elective Courses*

Advanced Biology Eleven/Twelve (11/12)
Biology - Technical Conceptual (11/12)
Human Anatomy and Physiology (11/12)
Advanced Chemistry Eleven/Twelve (11/12)
Chemistry - Technical / Conceptual (11/12)
Advanced Environmental Earth Science Eleven/Twelve (11/12)
Advanced Physics - Eleven/Twelve (11/12)
Physics - Technical / Conceptual (11/12)
AP Courses
College Courses

*** A minimum of one advanced course for each of the four fields of science (Biological Sciences, Chemistry, Environmental Earth Sciences, and Physics) must be offered.**

County school systems or individual high schools may opt to offer additional approved science electives such as Astronomy, Biochemistry, Botany/Zoology, Coordinated and Thematic Science (11/12) ~~Eleven/Twelve~~, Ecology, Microbiology, Organic Chemistry, Physical Geology. The instructional goals and objectives must be approved by the county board of education.

Grade Nine Science

The Coordinated and Thematic Science (CATS) Nine objectives continue the development of foundational knowledge in biology, chemistry, physics, and the earth sciences. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy across these major fields of science. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes, and models. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated in all activities. Building on the knowledge and skills acquired in CATS Eight, students in CATS Nine will expand and deepen their understanding of major concepts such as energy interactions, genetic probabilities, chemical changes and mineral composition of local rock layers.

Nature of Science

- 9.1 participate in activities that consider alternate, changing points of view to stimulate the development of a sense of inquiry ◇
- 9.2 recognize general limitations of science
- 9.3₁₁ explain that science is composed of observations set in a testable framework of ideas
- 9.4 conclude that science is a blend of creativity, logic and mathematics

Scientific Attitudes/Habits of Mind

- 9.5_{4,5,6,7,8,10,11} model and exhibit the skills, attitudes and/or values of scientific inquiry (e.g., curiosity, logic, objectivity, openness, skepticism, appreciation, diligence, integrity, fairness, creativity) ◇
- 9.6 demonstrate ethical practices for science (e.g., established research protocol, accurate record keeping, replication of results and peer review) ◇
- 9.7₁₁ apply scientific approaches to seek solutions for everyday problems (e.g., personal, community health, population growth, natural resources, environmental quality, natural and human induced hazards and scientific and technological challenges) ◇

Scientific Processes/Thinking Skills

- 9.8_{3,4,5,6,7,8,10,11} demonstrate science processes within a problem solving setting (e.g., observing, measuring, communicating, comparing, ordering, categorizing, classifying, relating, hypothesizing, predicting, inferring and applying) ◇
- 9.9_{3,4,5,6,7,8,10,11} organize qualitative and quantitative data into tables, diagrams, and/or graphs for analysis ◇
- 9.10_{3,4,5,6,7,8,10,11} identify, analyze, and infer using patterns and relationships in data (e.g., cause and effect graphical analysis including interpolation and extrapolation) ◇
- 9.11 use SI (metric) measurements
- 9.12 apply rational thinking processes that underlie scientific approaches to problem solving by employing critical thinking skills, imagination and creativity while working individually and/or cooperatively ◇
- 9.13 use the tools of science safely, accurately and appropriately ◇
- 9.14_{4,5,6,8} identify independent and dependent variables in experimental investigations
- 9.15 manipulate variables to extend experimental activities

- 9.16₁₁ **design, conduct, evaluate and revise experiments (e.g., identify questions and concepts that guide scientific investigations, design and conduct scientific investigations, use technology and mathematics to improve investigations and communications, formulate and revise scientific explanations and models using logic and evidence, recognize alternative explanations, communicate and defend a scientific argument, understand about scientific inquiry) ◇**

Laboratory Investigations/

Hands-on Learning

- 9.17 engage in active inquiries, investigations and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and laboratory skills ◇
- 9.18 properly and safely manipulate equipment, materials, chemicals, organisms and models ◇
- 9.19 conduct explorations in a variety of environments (e.g., laboratories, museums, libraries, parks and other outdoors locations) ◇
- 9.20 use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laser discs) to collect, analyze and/or report data, interact with simulations, and research ◇

Science Content and Themes /Subject Matter

- 9.21 articulate connections among the major disciplines of science
- 9.22 utilize the thematic approach incorporating the following themes: systems, changes, and models
- 9.23₁₁ **analyze and explain the principles of genetics (e.g., monohybrid and dihybrid crosses, mutations, genotypes, phenotypes, X and Y chromosomes, multiple alleles, DNA, probability, diversity) - models**

- 9.24_{7,8,10,11} **identify and explain the structures and functions of tissues (e.g., striated, cardiac, smooth muscle) - systems**

- 9.25_{7,8,10,11} **explain how human body systems work together (e.g., excretory, digestive systems) - systems**

- 9.26_{7,11} **identify and describe microscopic organisms and foreign substances in the environment and their harmful effects (e.g., microorganisms, mutagens, carcinogens) - systems**

- 9.27₆ **mathematically illustrate changes in populations of organisms - changes**

- 9.28 **identify the organisms and the chemical processes involved in the decay of materials - changes**

- 9.29_{4,6,8,10,11} **trace the transfer of matter and energy in the chemical/molecular processes of photosynthesis, respiration, and fermentation - changes**

- 9.30_{7,8,10,11} **compare the variations in cells, tissues, and organs of the excretory and digestive systems of different organisms - changes**

- 9.31_{3,4,5,7,8,10,11} **design an environment which demonstrates the interdependence of plants and animals (e.g., energy and chemical cycles, adaptations of structures and behaviors) - models**

- 9.32 **illustrate meiosis and mitosis and relate to chromosome number and production of sperm, egg, and body cells - models**

- 9.33 **construct and manipulate models which show variations in living things (e.g., excretory, digestive systems) - systems, models**

- 9.34₁₁ **review the relationship between elements and their location in the periodic table including families, metals, nonmetals and metalloids - systems**

- 9.35₁₁ determine the number of neutrons, protons and electrons given atomic number and average atomic mass number and relate to the periodic table position - systems
- 9.34 ~~list the characteristics of radioactivity including alpha and beta particles and gamma rays - systems~~
- 9.356 associate proton number with type of element, electron distribution with reactivity, and number of neutrons with nuclear stability - systems
- 9.36₁₁ ~~review the relationship between elements and their location in the periodic table including families, metals, nonmetals and metalloids - systems~~
- 9.37₁₁ ~~determine the number of neutrons, protons and electrons given atomic number and average atomic mass number and relate to the periodic table position - systems~~
- 9.37 list the characteristics of radioactivity including alpha and beta particles and gamma rays - systems
- 9.38 define and describe the half life of a radioactive isotope - models
- 9.39 define a chain reaction and show an example using a radioactive isotope (e.g., U-235) - changes
- 9.40 differentiate between fission and fusion - changes
- 9.41₁₀ trace the development of the model of the atom (e.g. Crookes, Thompson, Becquerel, Rutherford and Bohr) - models
- 9.42 write formulas and name compounds given oxidation numbers of monatomic and polyatomic ions - models
- 9.3843₁₁ identify and distinguish kinds of chemical bonds including ionic, nonpolar covalent and polar covalent - systems
- 9.3944₁₁ recognize that water has unusual properties due to its molecular shape, polarity, and hydrogen bonding - systems
- 9.405_{6,7,8,10,11} recognize that all chemical reactions involve energy changes (e.g. endothermic and exothermic reactions) - systems
- 9.446₁₁ experimentally determine the products of chemical reactions then write and balance chemical equations - changes, models
- 9.427_{6,7,11} conduct, write equations and classify five types of chemical reactions including synthesis, decomposition, single displacement, double displacement and combustion - changes, models
- 9.48 draw structures of simple organic compounds (e.g. alkanes, alcohols) - models
- 9.439_{6,7,8,10,11} investigate the relationships among temperature, pressure and volume in gases with respect to Charles Law (V-T), Boyles Law (V-P) and Gay-Lussac's Law (P-T) - changes
- 9.4450_{10,11} diagram the relationship between energy and phase changes (e.g. freezing, boiling, sublimation) - models
- 9.45₁₀ ~~trace the development of the model of the atom (e.g. Crookes, Thompson, Becquerel, Rutherford and Bohr) - models~~
- 9.46 ~~write formulas and name compounds given oxidation numbers of monatomic and polyatomic ions - models~~
- 9.47 ~~draw structures of simple organic compounds (e.g. alkanes, alcohols) - models~~
- 9.4851₁₁ demonstrate water characteristics including capillary action, surface tension, adhesion and cohesion via a variety of methods (e.g. chromatography, meniscus readings) - models
- 9.52_{5,6,7,8,10,11} determine experimentally the density an object by measuring its mass and volume - models
- 9.53_{6,7,8,10,11} identify and describe various forms of energy (e.g., electromagnetic, electrical, chemical, mechanical, nuclear form) - changes
- 9.54_{7,8} differentiate among energy transformations (e.g., heat, light, sound, mechanical, chemical, nuclear) - changes

- 9.55 relate absorption and dissipation of heat to the composition of a material - systems
- 9.56 describe the behavior of atoms and molecules in terms of the Kinetic Molecular Theory (e.g., gases, liquids, solids) - systems
- 9.49_{8,10} experiment with a pendulum to determine which variables (amplitude, mass, length) will affect the motion of the pendulum - systems
- 9.50₇ relate the force between charged objects to the charge on the objects and the distance between them - systems
- 9.58 define and solve problems involving potential difference - models
- 9.59 solve electrical problems (e.g., Ohm's Law $I = V/R$, Power $P = I^2R$) - models
- 9.60 hypothesize and experiment when different components are substituted in an electrical circuit. Test the hypothesis - models
- 9.61 demonstrate and diagram a magnetic field using a bar magnet and iron filings - models
- 9.62 review foundational concepts of kinematics (e.g., speed-distance-time relationships) and dynamics (e.g., Newton's Laws, simple machines) - systems
- 9.63_{8,10} experiment with a pendulum to determine which variables (amplitude, mass, length) will affect the motion of the pendulum - systems
- 9.64 define types of waves and their properties (e.g., interference, diffraction, resonance) - models
- 9.54₆₅ examine the differences and similarities between transverse and longitudinal waves - systems
- 9.66 use the wave equation to determine the relationships among speed, wavelength, and frequency - models
- 9.52 relate absorption and dissipation of heat to the composition of a material - systems
- 9.53 describe the behavior of atoms and molecules in terms of the Kinetic

- Molecular Theory (e.g., gases, solids, liquids) - systems
- 9.54 relate wavelength to color and frequency - systems
- 9.55 review of foundational concepts including refraction, speed, distance, time, Newton's Laws, simple machines, tables and graphs, heat absorption, energy transformations, and air pressure - systems
- 9.56_{7,8} differentiate energy transformations (e.g., heat, light, sound, mechanical, chemical, nuclear) - changes
- 9.57 define a chain reaction and show an example using a radioactive isotope (e.g., U-235) - changes
- 9.58 differentiate between fission and fusion - changes
- 9.59_{6,7,8,10,11} identify and describe various forms of energy (e.g., electromagnetic, electrical, chemical, mechanical, nuclear form) - changes
- 9.60_{5,6,7,8,10,11} solve for variables using the density equation, $D = m/V$ and experimentally determine the density of an object making measurements of mass and volume - models
- 9.61 define and solve problems involving potential difference - models
- 9.62 define types of waves and their properties (e.g., interference, diffraction, resonance) - models
- 9.63 use the wave equation to determine the relationships among speed, wavelength, and frequency - models
- 9.64 solve electrical problems (e.g., Ohm's Law $I = V/R$, Power $P = I^2R$) - models
- 9.65 hypothesize and experiment when different components are substituted in an electrical circuit. Test the hypothesis - models
- 9.66 demonstrate and diagram a magnetic field using a bar magnet and iron filings - models
- 9.67 list the characteristics of electromagnetic waves and identify uses - models

9.68 ~~define and describe half life of a radioactive isotope - models~~

9.698 ~~demonstrate light as a wave motion (e.g., ripple tank) - models~~

9.7069 ~~review characteristics of light (e.g., reflect, refract, diffract) - change~~

9.70 relate wavelength to color and frequency - systems

9.71 interpret how sound travels through different materials (e.g., transmitted, reflected, or absorbed) - changes

9.72_{4,6,10,11} analyze and describe a common rock sample (e.g., color, grain, and composition) - models

9.73_{4,6,10,11} employ tests to identify rocks and minerals (e.g., streak, color, hardness, cleavage) - models

9.71 ~~review fundamental earth science concepts including air has mass and exerts pressure, physical states of matter - systems~~

9.72 ~~research uses and values of natural resources - systems~~

9.73 ~~research space technology in everyday life - systems~~

9.74 examine how scientists use seismographic evidence in determining structure and composition of the Earth's interior - systems

9.75₁₀ examine geologic time emphasizing isotopic ages and biostratigraphy - changes

9.76_{3,5,6} estimate the age of materials using existing radioactive data - systems

9.77 investigate formation and destruction of mountains (e.g., weathering, earthquakes, volcanoes, plate tectonics) - changes

9.78_{8,10} read and interpret topographic maps including estimation of linear distance - models

9.79_{3,4,5,6,7,8,10,11} describe how warm air can hold more water vapor than cold air - systems

9.80 relate temperature, pressure, wind speed, wind direction, and humidity as elements of weather - systems

9.81_{4,6,7,8,10,11} construct and use weather maps and charts (e.g., temperature, pressure, wind speed, wind direction, humidity) - models

9.82_{3,6} examine and use models to describe interactive cycles (e.g., water cycle, nitrogen cycle, and carbon cycle) - changes

9.83₁₀ distinguish the movements of subsurface water - changes

9.84_{6,8} relate the structure of the ocean floor to the kind of organisms present - systems

9.85 explore the properties and motions of oceans - systems

9.86 research uses and values of natural resources - systems

9.87₁₀ research current environmental issues (e.g., effects of pollution, solid waste management, local, national, and global issues) - systems

9.88 research applications of space technology in everyday life (e.g., velcro, teflon, weather satellites) - systems

9.7589 explain and compare motions of the sun and moon - systems

9.90 construct and explain models (e.g., solar systems, galaxies, constellations, stellar types, and stellar evolution) - models

9.76 ~~relate temperature, pressure, wind speed, wind direction, and humidity as elements of weather - systems~~

9.77_{3,4,5,6,7,8,10,11} ~~interpret why warm air can hold more water vapor than cold air - systems~~

9.78_{3,5,6} ~~estimate the age of materials using existing radioactive data - systems~~

9.79₁₀ ~~research current environmental issues (e.g., effects of pollution, solid waste management, local, national, and global issues) - systems~~

9.80_{6,8} ~~relate the structure of the ocean floor to the kind of organisms present - systems~~

9.81 ~~explore the properties and motions of oceans - systems~~

~~9.82 interpret how sound travels through different materials (e.g., transmitted, reflected, or absorbed) -changes~~

~~9.83_{3,6} examine and describe interactive cycles (e.g., water cycle, nitrogen cycle, and carbon cycle) -changes~~

~~9.84₁₀ distinguish the movements of subsurface water -changes~~

~~9.85₁₀ examine geologic time emphasizing isotopic ages and biostratigraphy -changes~~

~~9.86 investigate formation and destruction of mountains (e.g., weathering, earthquakes, volcanoes, plate tectonics) -changes~~

~~9.87_{4,6,7,8,10,11} construct and use weather maps and charts (e.g., temperature, pressure, wind speed, wind direction, humidity) -models~~

~~9.88_{4,6,10,11} analyze and describe a common rock sample (e.g., color, grain, and composition) -models~~

~~9.89_{4,6,10,11} employ tests to identify rocks and minerals (e.g., streak, color, hardness, cleavage) -models~~

~~9.90_{6,10} estimate linear distance on a map scale (e.g., topographic maps) -models~~

~~9.91 construct and explain models (e.g., solar systems, galaxies, constellations, stellar types, and stellar evolution) -models~~

~~9.92 use a model to describe the functions of the water cycle (e.g., water entering and leaving the atmosphere, flow of water and precipitation) -models~~

Science History

9.931 identify contributors to the scientific body of knowledge including their diverse cultures

9.942 trace the historical development of key historical concepts and principles describing their impact on modern thought and life

9.953 describe the impact of cultural, technological, and economic influences on the evolving nature of scientific thought and knowledge ◇

Science, Technology, and Society

9.964 apply scientific skills and technological tools to address personal and societal needs ◇

9.975 engage in decision making activities and actions to resolve science-technology-society issues ◇

9.986 investigate and analyze the interdependence of science and technology ◇

9.997 describe the scientific concepts underlying technological innovations ◇

~~9.10098~~ explore occupational opportunities in science and technology including the academic preparation necessary ◇

Computer/Technology

9.10499 access, gather, store, retrieve, and organize data using hardware and software designed for these purposes ◇

9.1020 collect, analyze, and display data using computers and other electronic technology ◇

9.1031 access internet resources for a variety of purposes (e.g., research, exchange data, e-mail, real-time investigations) ◇

9.1042 demonstrate skills in the use of word processing, data bases, spreadsheets, graphics and telecommunication ◇

9.1053 identify and solve problems with the appropriate technology ◇

9.1064 incorporate correct grammar, spelling, vocabulary, and graphical representation for both written and oral multimedia presentations ◇

Grade Ten Science

The Coordinated and Thematic Science (CATS) Ten objectives conclude the development of foundational knowledge of biology, chemistry, physics, and the earth sciences. Through the spiraling, inquiry-based program of study, all students will demonstrate scientific literacy across these major fields of science. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes, and models. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and research laboratory skills. Safety instruction is integrated in all activities. Building on the knowledge and skills acquired in CATS Nine, students in CATS Ten will expand their depth of understanding of major concepts such as energy transformation qualifications, cellular biology, molecular genetics, embryology, physical, chemical and nuclear changes, fossils, mineral extraction techniques, and environmental concerns.

Nature of Science

- 10.1 participate in activities that consider alternate, changing points of view to stimulate the development of a sense of inquiry ◇
- 10.2 recognize general limitations of science knowledge
- 10.3₁₁ explain that science is composed of observations set in a testable framework of ideas
- 10.4 conclude that science is a blend of creativity, logic and mathematics

Scientific Attitudes/Habits of Mind

- 10.5_{4,5,6,7,8,9,11} model and exhibit the skills, attitudes and values of scientific inquiry (e.g., curiosity, logic, objectivity, openness, skepticism, appreciation, diligence, integrity, fairness, creativity)
- 10.6 demonstrate ethical practices for science (e.g., established research protocol, accurate record keeping, replication of results and peer review) ◇
- 10.7₁₁ apply scientific approaches to seek solutions for everyday problems (e.g., personal, community health, population growth, natural resources, environmental quality, natural and human induced hazards and scientific and technological challenges) ◇

Scientific Processes/Thinking Skills

- 10.8_{3,4,5,6,7,8,9,11} demonstrate science processes within a problem solving setting (e.g., observing, measuring, communicating, comparing, ordering, categorizing, classifying, relating, hypothesizing, predicting, inferring and applying) ◇
- 10.9_{3,4,5,6,7,8,9,11} organize qualitative and quantitative data into tables, diagrams, and/or graphs for analysis ◇
- 10.10_{3,4,5,6,7,8,9,11} identify, analyze, and infer using patterns and relationships in data (e.g., cause and affect graphical analysis including interpolation and extrapolation) ◇
- 10.11 use SI (metric) measurements
- 10.12 apply rational thinking processes that underlie scientific approaches to problem solving by employing critical thinking skills, imagination and creativity while working individually and/or cooperatively ◇
- 10.13 use the tools of science safely, accurately and appropriately ◇
- 10.14_{4,5,6,8,9} identify independent and dependent variables in experimental investigations
- 10.15₉ manipulate variables to extend experimental activities

- 10.16^{9,11} design, conduct, evaluate and revise experiments (e.g., identify questions and concepts that guide scientific investigations, design and conduct scientific investigations, use technology and mathematics to improve investigations and communications, formulate and revise scientific explanations and models using logic and evidence, recognize alternative explanations, communicate and defend a scientific argument, understand about scientific inquiry) ◇

Laboratory Investigations/

Hands-on Learning

- 10.17 engage in active inquiries, investigations and hands-on activities for a minimum of 50 percent of the instructional time ◇
- 10.18 properly and safely manipulate equipment, materials, chemicals, organisms and models ◇
- 10.19 conduct explorations in a variety of environments (e.g., laboratories, museums, libraries, parks and other outdoors locations) ◇
- 10.20 use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laser discs) to collect, analyze and/or report data, interact with simulations, and research ◇

Science Themes and Content /Subject Matter

- 10.21 articulate connections among major disciplines of science
- 10.22 utilize the thematic approach incorporating the following themes: systems, change, and models
- 10.23^{4,5,6,8,11} **review the needs of growing plants and the environments supplying those needs - systems**
- 10.24⁶ **identify and explain the structures and functions of cell organelles (e.g., Golgi bodies,**

endoplasmic reticulum, mitochondria, chloroplast, ribosomes, lysosomes, vacuoles) - systems

- 10.25^{7,8,9,11} **explain how human body systems work together (e.g., nervous, endocrine, immune) - systems**
- 10.26^{3,4,5,6,7,8,9} **review factors that affect succession and populations and communities (e.g., use maps, graphs, charts, and tables) - systems**
- 10.27 **identify mechanisms for the movement of materials into and out of cells (e.g., active and passive transport, endo- and exocytosis) - systems**
- 10.28 review principles of genetics - systems
- 10.28^{9,11} **explain relate the role of DNA analysis to genetic disorders, forensic science, molecular genetics, and biotechnology in controlling cellular functions (e.g., protein synthesis, heredity, cell division, cellular functions) - systems**
- 10.29^{30,3,4,5,6,7,8,9,11} **construct concept maps showing energy flow and cycles of matter between chemical and biological systems including photosynthesis, stored chemical energy, decomposition, carbon and nitrogen cycles) - changes**
- 10.30^{1,8} **trace matter and energy flow through the respiration processes of glycolysis, the Krebs cycle, and electron transport system (e.g., ATP, carbon, oxygen, water) - changes**
- 10.31^{2,7,8,9,11} **compare the variations in cells, tissues, and organs of the nervous, endocrine and immune systems of different organisms - changes**
- 10.32³ **compare the embryonic development of invertebrate and vertebrate animals (e.g., ontogeny**

- and phylogeny, diversity, taxonomy) - *changes*
- 10.334_{3,4,5,6,7,8,9} relate the role of natural selection to the development and/or extinction of a species - *changes*
- 10.345_{7,8,9,11} ~~illustrate~~ depict the interdependence of cells, tissues, organs, and systems to the life functions of the whole organism - *models*
- 10.356 construct and manipulate models which show variations in living things (e.g., nervous, endocrine, immune systems) - *models*
- 10.367_{3,5,6,8,11} investigate the properties of solutions including density, conductivity, solubility, concentration, pH, and colligative properties - *systems*
- 10.378₁₁ use polarity, molecular shape, and hydrogen bonding to explain why water is considered the "universal solvent" - *systems*
- 10.389_{6,7,8,9,11} interpret graphs showing the relationships among temperature, pressure, and volume in gases with respect to Charles Law (V-T), Boyles Law (V-P), and Gay-Lussac Law (P-T) - *systems*
- 10.3940_{4,5,6,7,8,9,11} differentiate between physical, chemical, and nuclear changes - *changes*
- 10.401 measure the change in heat gained or lost during chemical reactions using the specific heat of water (e.g., heat released during burning of food materials, acid-base neutralization) - *changes*
- 10.442₁₁ investigate the relationship between energy and phase change in order to demonstrate heat of fusion and/or heat of vaporization - *changes*
- 10.423 recognize that the equation $E=mc^2$ can be used to illustrate the conversion of mass to energy during nuclear reactions - *changes*
- 10.434₁₁ validate the law of conservation of matter in chemical reactions - *changes*
- 10.445_{6,7,9,11} use chemical equations to represent chemical and biochemical reactions (e.g., photosynthesis) - *models*
- 10.456 predict the isotope or radiation particle emitted during nuclear reactions given either isotope or radiation particles - *models*
- 10.467 complete simple nuclear equations given all but one of the materials involved in the reaction - *models*
- 10.478 illustrate how scientists used the electromagnetic spectrum to show the energy levels of electrons within atoms - *models*
- ~~10.48 relate characteristics and behavior of waves with earth and life processes (e.g., erosion, vision) - systems~~
- 10.49 apply Newton's Laws of Motion to living systems (e.g., walking) - models
- 10.4950 calculate the relationship among rate, force, momentum and time - *systems*
- 10.51 construct and interpret (extrapolate and interpolate) kinematics graphs - models
- 10.52_{8,9} describe and quantify how machines can provide mechanical advantages - models
- 10.503 summarize the relationship between frequency and speed (e.g., Doppler effect) - *systems*
- 10.514_{8,9} determine the effect of different forces on vibrating systems (e.g., pendulums, springs) - *systems*
- 10.525₉ qualitatively explain the relationship between electricity and magnetism (e.g., the electromagnetic field) - *systems*
- 10.536_{4,5} describe how components of an electric circuit function individually and as a component in an electric circuit - *systems*
- ~~10.54 review of fundamental concepts including air pressure, speed~~

- (distance and time), pendulums, vibrating objects - ~~systems~~
- 10.55^{7,9,11} demonstrate qualitative and quantitative understanding of pressure in various systems (e.g., water pipes, circuits, blood vessels) - ~~systems~~
- 10.57^{8,3,4,5,6,7,8,9,11} qualitatively and quantitatively describe the conservation of energy (e.g., thermal, chemical, mechanical) - ~~changes~~
- 10.57^{9,5,6,7,8,9,11} relate the physical change in substances to changes in temperature (e.g., thermal expansion/contraction, increases/decreases in density) - ~~changes~~
- 10.60^{5,6,7,8,11} identify and describe the effects of specific heat on heating and cooling objects - ~~models~~
- 10.61 relate characteristics and behavior of waves with earth and life processes (e.g., erosion, vision) - ~~systems~~
- 10.58⁶² explain the relationship between wind and waves - ~~models~~
- 10.59⁶³ differentiate between the movement of water particles in a wave and the movement of wave energy - ~~models~~
- 10.60⁴ explain the cause of tides - ~~models~~
- 10.64^{5,9} compare and contrast the characteristics and uses of waves in various parts of the electromagnetic spectrum - ~~models~~
- 10.62^{6,9} calculate the frequency of a particular wavelength - ~~models~~
- 10.63^{7,9} measure the rate of absorption of infrared radiation in containers of various colors - ~~models~~
- 40.64 ~~apply Newton's Laws of Motion to living systems (e.g., walking) - models~~
- 40.65 ~~extrapolate and interpolate graphs of distance and time (e.g., migration) - models~~
- 40.66^{6,9} ~~describe and quantify how machines can provide mechanical advantages - models~~
- 40.67^{5,6,7,8,11} ~~identify and describe the effects of specific heat on heating and cooling objects - models~~
- 10.68 review fundamental earth science concepts including tests to identify rocks and minerals, ~~topographic maps - systems~~
- 10.69³ investigate fossils (e.g., origins, use in establishing geological time, types of plants and animals included in fossil-fuel formation, compare fossils to present day organisms) - ~~systems~~
- 10.70¹¹ ~~examine~~ investigate the effects of natural phenomena on the environment (e.g., oceanographic, meteorologic) - ~~systems~~
- 10.71³ ~~probe~~ investigate characteristics of the atmosphere (e.g., relationship of air pressure to temperature and humidity, demonstrate that air has mass and exerts pressure - ~~systems~~
- 10.72⁷ compare and contrast the characteristics of Earth to the other planets - ~~systems~~
- 10.73^{8,9} illustrate methods to recover subsurface water for human use - ~~systems~~
- 10.74⁹ relate electromagnetic fields to the earth's magnetosphere - ~~systems~~
- 10.75⁷ describe factors determining the height and frequency of tides - ~~systems~~
- 10.76 identify and describe the effects of ocean currents on climate - ~~change~~
- 40.77^{9,11} ~~interpret apparent motion of constellations and their relationship to the rotation of the earth - change~~
- 10.78^{7,4} explore and explain the energy relationships in earth science (e.g., weather, plate tectonics, height and frequency of waves) - ~~change~~
- 40.79 ~~summarize technological advances in astronomy and meteorology - change~~
- 10.80⁷⁸ research current environmental issues (e.g., depletion of fossil fuels,

- global warming, destruction of rain forest pollution) - *change*
- 10.84⁷⁹₈ **review physical changes in earth materials due to temperature variations and relate those changes to earth's natural processes - *change***
- 10.820_{4,7} **utilize a stream table to observe the effects of water on the earth's surface (e.g., changes in particle size, slope, velocity) - *change***
- 10.831₁₁ **construct and interpret maps (e.g., use maps of geographic features to predict flora and fauna, weather maps and charts to observe and predict weather, topographical maps to illustrate surface features)- *models***
- 10.82_{9,11} **interpret apparent motion of constellations and their relationship to the rotation of the earth - *change***
- 10.83 **summarize technological advances in astronomy and meteorology - *change***

Science History

- 10.84 identify contributors to the scientific body of knowledge including their diverse cultures
- 10.85 trace the historical development of key scientific concepts and principles describing their impact on modern thought and life
- 10.86 describe the impact of cultural, technological and economic influences on the evolving nature of scientific thought and knowledge ◇

Science, Technology and Society

- 10.87 apply scientific skills and technological tools to address personal and societal needs ◇
- 10.88 engage in decision making activities and actions to resolve science-technology-society issues ◇
- 10.89 investigate and analyze the interdependence of science and

technology ◇

- 10.90 describe the scientific concepts underlying technological innovations ◇
- 10.91 explore occupational opportunities in science and technology including the academic preparation necessary ◇

Computer and Technology

- 10.92 access, gather, store, retrieve, and organize data using hardware and software designed for these purposes ◇
- 10.93 collect, analyze and display data using computers and other electronic technology ◇
- 10.94 access Internet resources for a variety of purposes (e.g., research, exchange data, E-mail, and real-time investigations) ◇
- 10.95 demonstrate skills in use of word processing, data bases, spreadsheets, graphics and telecommunications ◇
- 10.96 identify and solve problems with the appropriate technology ◇
- 10.97 incorporate correct grammar, spelling, vocabulary and graphical representation for both written and oral multimedia presentations ◇

Advanced Biology Eleven/Twelve (11/12)

This is an **advanced level course** designed for students who have completed Coordinated and Thematic Science (CATS) 10 and desire a broader, **in-depth study** of the content found in many biological fields of endeavor. This course is designed to build upon and extend the Biology concepts, skills, and knowledge from the CATS 7-10 program. Students interested in health and scientific related careers will build and expand their laboratory skills and experiences. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills.

Nature of Science

- B.1 participate in activities that consider alternate, changing points of view to stimulate the development of a sense of inquiry ◇
- B.2 recognize general limitations of science
- B.3 **explain that science is composed of observations set in a testable framework of ideas**
- B.4 conclude that science is a blend of creativity, logic, and mathematics

Scientific Attitudes/Habits of Mind

- B.5_{4,5,6,7,8,9,10} **model and exhibit the skills, attitudes and values of scientific inquiry (e.g., curiosity, logic, objectivity, openness, skepticism, appreciation, diligence, integrity, fairness, creativity) ◇**
- B.6 demonstrate ethical practices for science (e.g., established research protocol, accurate record keeping, replication of results and peer review) ◇
- B.7 **apply scientific approaches to seek solutions for everyday problems (e.g., personal, community health, population growth, natural resources, environmental quality, natural and human induced hazards and scientific and technological challenges) ◇**

Scientific Processes/Thinking Skills

- B.8_{3,4,5,6,7,8,9,10} **demonstrate science processes within a problem solving setting (e.g., observing, measuring, communicating, comparing, ordering, categorizing, classifying, relating, hypothesizing, predicting, inferring, and applying) ◇**
- B.9_{3,4,5,6,7,8,9,10} **organize qualitative and quantitative data into tables, diagrams, and/or graphs for analysis ◇**
- B.10_{3,4,5,6,7,8,9,10} **identify, analyze, and infer using patterns and relationships in data (e.g., cause and effect graphical analysis including interpretation and extrapolation) ◇**
- B.11 use SI measurement (metric)
- B.12 apply rational thinking processes that underlie scientific approaches to problem solving by employing critical thinking skills, imagination, and creativity while working individually and/or cooperatively ◇
- B.13 use the tools of science safely, accurately, and appropriately ◇
- B.14_{4,5,6,8,9} **identify independent and dependent variables in experimental investigations**
- B.15₉ **manipulate variables to extend experimental activities**

- B.16₉ design, conduct, evaluate and revise experiments (e.g., identify questions and concepts that guide scientific investigations, design and conduct scientific investigations, use technology and mathematics to improve investigations and communications, formulate and revise scientific explanations and models using logic and evidence, recognize alternative explanations, communicate and defend a scientific argument, understand about scientific inquiry) ◇

Laboratory Investigations/

Hand-On Learning

- B.17 engage in active inquiries, investigations, and hands-on activities for a minimum of 50 percent of instructional time ◇
- B.18 properly and safely manipulate equipment, materials, chemicals, organisms, and models ◇
- B.19 conduct explorations in a variety of environments (e.g., laboratories, museums, libraries, parks and other outdoors locations) ◇
- B.20 use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laser discs) to collect, analyze, and/or report data, interact with simulations, and research ◇

Science Themes/Subject Matter

- ~~B.21_{9,10} apply molecular genetic principles to explain energy patterns (e.g., DNA, RNA, recombinant DNA, role of enzymes, mutations, population dynamics)~~
- ~~B.22_{7,9} illustrate the stages in the life cycle of pathogens and trace the causes of diseases~~
- ~~B.23_{7,8,9,10} investigate the interrelationships between anatomy and physiology of organisms~~

~~B.24_{7,8} discuss external and internal factors that could damage cells, tissues, organs, or systems (e.g., carcinogens, fractures, noise, temperature)~~

~~B.25_{8,9,10} trace matter and energy transfer that occurs during cellular respiration and photosynthesis~~

~~B.26 construct models of all cell types showing structure, function, and biochemical processes~~

~~B.27 classify organisms into proper taxonomic groups by embryology, morphology, biochemistry, and karyotyping~~

~~B.28 compare the diversity of living organisms by grouping organisms according to similar characteristics (e.g., Monerans, protists, fungi, plants, simple and complex animals)~~

~~B.29 trace the embryological development of organisms~~

~~B.30 investigate and analyze responses of the ecosystem to events that cause changes~~

~~B.31_{8,9,10} design and map a biome or ecosystem showing geographical features, climate, and organisms that will adapt to life conditions there~~

~~B.32 construct maps of the relationships between past and present life forms~~

~~B.33 explore and identify the different areas of biology (e.g., entomology, ichthyology, ornithology, phycology, zoology)~~

B.21 review of foundational chemical concepts including atomic structure, bonding, chemical reactions, water, and pH as they relate to living systems

B.22 investigate the molecules of life, carbohydrates, lipids, nucleic acids, and proteins and their function in the living systems

B.23 identify the structure, functions, and interactions of eukaryotic cell organelles and their products.

B.24 analyze the chemistry and structure of the cell membrane and relate structure to its function

- B.25** relate cell membrane to export and import of molecules necessary for the living system; exploring osmosis, diffusion, active and passive transport, and dialysis.
- B.26** compare differences in prokaryotic/eukaryotic, plant/animal cells
- B.27** research the diversity/uniqueness of the cell, exploring nerve cells, blood cells, gametes, etc.
- B.28** explore capture and release of energy as demonstrated by photosynthesis, cellular respiration and fermentation and the role of coenzymes and vitamins.
- B.29** differentiate between eukaryotic and prokaryotic cell division.
- B.30** recognize and describe the phases of the cell cycle
- B.31** identify the stages of mitotic and meiotic eukaryotic cell division and explain significance of the stages
- B.32** investigate and discuss DNA as the agent of heredity and the importance of replication and mutation in the diversity of life
- B.33** evaluate the advantages of asexual and sexual reproduction.
- B.34** identify Mendel's 1st Law and 2nd Law of Genetics and apply these laws to predict phenotypic and genotypic ratios from mono and dihybrid crosses
- B.35** explore basic phenotypic and genotypic genetics beyond Mendel including such things as incomplete dominance, gene interaction, codominance, multi-alleles, crossing over, genetic recombination; and influences of environment, development, sex, and age.
- B.36** discuss sex determination;
- B.37** discuss human genetic anomalies such as sickle cell anemia, PKU, Down syndrome, Klinefelter's syndrome, Cystic fibrosis, and Tay-Sacs;
- B.38** explore the discovery of DNA and its structure by constructing a model to demonstrate the nucleotide bonding and the double helix structure;
- B.39** identify the function of DNA in replication and transfer of the genetic code.
- B.40** identify the function of the RNAs: messenger, transfer, and ribosomal in the transcription and translation process of protein formation.
- B.41** discuss the regulatory process in controlling gene function.
- B.42** introduce genetic engineering through current DNA technology practices and the social issues that it raises.
- B.43** discuss gene mutations in relation to their causes and their relationship to DNA; such as substitutions, additions, deletions, and point mutations.
- B.44** provide evidence of evolution and natural selection, including examples such as peppered moth, fossil records, biogeography, molecular biology, and comparative anatomy.
- B.45** research pioneers of evolution such as Darwin, Wallace, Lamarck, Malthus.
- B.46** review current authors of evolutionary ideas, such as Gould and Mayr;
- B.47** discuss modern and past hypotheses on the origin of life.
- B.48** present overview of the taxonomy and systematics of living organisms comparing DNA as the modern basis of classification to older methods based on morphology.
- B.49** compare characteristics that place individual living organisms in the modern classification system.
- B.50** discuss reasons why viruses are not included in the modern classification system.
- B.51** explore the various systems of the human organism and their interactions
- B.52** investigate and discuss that disease is the break down of structure and/or function of an organism.
- B.53** investigate and discuss that regulation of an organism's internal environment involves

sensing the external environment and changing physiological activities to keep conditions within the range required to survive.

- B.54 investigate and discuss that behavior is one kind of response an organism can make to an internal or environmental stimulus and that a behavioral response requires coordination and communication at many levels, including cells, organ systems, and whole organisms.
- B.55 investigate and discuss that behavioral response is a set of actions determined in part by heredity and in part from experience.
- B.56 investigate and discuss that an organism's behavior evolves through adaptation to its environment.
- B.57 investigate and discuss that extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival.
- B.58 investigate and discuss ecology as the interaction of living organisms and their nonliving environment stressing the carbon, nitrogen, phosphorus, and water cycles.
- B.59 using a food web trace the energy flow through an ecosystem with emphasis on the role producers, consumers, and decomposers.
- B.60 investigate and discuss the number of organisms any environment can support depends on the resources available.
- B.61 investigate and discuss the impact that humans may have on the quality of the biosphere such as depletion of the rainforest, pollution of estuaries, strip mining, depletion of fossil fuels and deterioration of ozone layer.

Science History

- B.3462 identify contributors to the scientific body of knowledge including their diverse cultures

- B.3563 trace the historical development of key scientific concepts and principles describing their impact on modern thought and life

- B.3664 describe the impact of cultural, technological and economic influences on the evolving nature of scientific thought and knowledge ◇

Science, Technology and Society

- B.3765 apply scientific skills and technological tools to address personal and societal needs ◇
- B.3866 engage in decision making activities and actions to resolve science-technology-society issues ◇
- B.3967 investigate and analyze the interdependence of science and technology ◇
- B.4068 describe the scientific concepts underlying technological innovations ◇
- B.4469 explore occupational opportunities in science and technology including the academic preparation necessary ◇

Computer and Technology

- B.4270 access, gather, store, retrieve, and organize data using hardware and software designed for these purposes ◇
- B.4371 collect, analyze and display data using computers and other electronic technology ◇
- B.4472 access Internet resources for a variety of purposes (e.g., research, exchange data, E-mail, and real-time investigations) ◇
- B.4573 demonstrate skills in use of word processing, data bases, spreadsheets, graphics and telecommunications ◇
- B.4674 identify and solve problems with the appropriate technology ◇
- B.4775 incorporate correct grammar, spelling, vocabulary and graphical representation for both written and oral multimedia presentations ◇

Biology - Technical Conceptual (11/12)

This is an **advanced level course** designed for students who have completed Coordinated and Thematic Science (CATS) 10 and who are interested in the field of technical biology with the scientific knowledge and opportunities to develop the inquiry, problem solving and decision making abilities necessary for their future vocation. **Biology - Technical Conceptual (11/12) is an alternative to Advanced Biology (11/12) and is designed to prepare students for technical careers.** The course will provide an in-depth study in the chemical nature of life, cellular functions, microbiology, ecology, biotechnology, zoology and botany with application emphasis. It builds on the fundamental concepts developed in CATS 7-10 in a rigorous and integrated manner. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities.

Nature of Science

- BTC.1 participate in activities that consider alternate, changing points of view to stimulate the development of a sense of inquiry ◇
- BTC.2 recognize general limitations of science
- BTC.3 explain that science is composed of observations set in a testable framework of ideas
- BTC.4 conclude that science is a blend of creativity, logic, and mathematics

Scientific Attitudes/Habits of Mind

- BTC.5^{4,5,6,7,8,9,10} model and exhibit the skills, attitudes and values of scientific inquiry (e.g., curiosity, logic, objectivity, openness, skepticism, appreciation, diligence, integrity, fairness, creativity) ◇
- BTC.6 demonstrate ethical practices for science (e.g., established research protocol, accurate record keeping, replication of results and peer review) ◇
- BTC.7 apply scientific approaches to seek solutions for everyday problems (e.g., personal, community health, population growth, natural resources, environmental quality, natural and human induced hazards and scientific and technological challenges) ◇

Scientific Processes/Thinking Skills

- BTC.8^{3,4,5,6,7,8,9,10} demonstrate science processes within a problem solving setting (e.g., observing, measuring, communicating, comparing, ordering, categorizing, classifying, relating, hypothesizing, predicting, inferring, and applying) ◇
- BTC.9^{3,4,5,6,7,8,9,10} organize qualitative and quantitative data into tables, diagrams, and/or graphs for analysis ◇
- BTC.10^{3,4,5,6,7,8,9,10} identify, analyze, and infer using patterns and relationships in data (e.g., cause and effect, graphical analysis including interpolation and extrapolation) ◇
- BTC.11 use SI measurement (metric)
- BTC.12 apply rational thinking processes that underlie scientific approaches to problem solving by employing critical thinking skills, imagination, and creativity while working individually and/or cooperatively ◇
- BTC.13 use the tools of science safely, accurately, and appropriately ◇
- BTC.14^{4,5,6,8,9} identify independent and dependent variables in experimental investigations
- BTC.15 manipulate variables to expand experimental activities

BTC.16 design, conduct, evaluate and revise experiments (e.g., identify questions and concepts that guide scientific investigations, design and conduct scientific investigations, use technology and mathematics to improve investigations and communications, formulate and revise scientific explanations and models using logic and evidence, recognize alternative explanations, communicate and defend a scientific argument, and understand about scientific inquiry) ◇

Laboratory Investigations/

Hand-On Learning

- BTC.17** engage in active inquiries, investigations, and hands-on activities for a minimum of 50 percent of instructional time ◇
- BTC.18** properly and safely manipulate equipment, materials, chemicals, organisms, and models ◇
- BTC.19** conduct explorations in a variety of environments (e.g., laboratories, museums, libraries, parks and other outdoors locations) ◇
- BTC.20** use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laser discs) to collect, analyze, and/or report data, interact with simulations, and research ◇

Science Themes/Subject Matter

- BTC.21** trace matter and energy transfers occurring during photosynthesis, cell respiration, and fermentation
- BTC.22** explore diffusion and osmosis
- BTC.23** investigate the nature of light in relation to energy transformation in photosynthesis (e.g. action spectrum of pigments)
- BTC. 24** compare and describe the properties of waves (e.g. sound pollution, sonography, echolocation, and animal vocalization)
- BTC. 25** explain enzymatic processes

- BTC. 26** review condensation and hydrolysis reactions in the synthesis and digestion of important molecules in living organisms (carbohydrates, fats, protein, nucleic acids)
- BTC. 27** investigate biogeochemical cycles
- BTC. 28** explain common problems related to conservation, use, supply, and quality of water
- BTC. 29** investigate recycling in relation to human consumption of natural resources
- BTC.30** describe landfills and sewage treatment facilities and how they work
- BTC.31** review food webs and trophic pyramids
- BTC.32** compare and contrast characteristics of the major biomes
- BTC.33** investigate interspecific and intraspecific competition
- BTC.34** apply sampling techniques to the study of ecosystems
- BTC.35** investigate population biology
- BTC.36** investigate and analyze the impact that humans have on the quality of the biosphere(e.g. locally, regionally, and globally)
- BTC.37** use topographic maps and Geographic Information Systems (GIS) to investigate biological systems and patterns (e.g. land use)
- BTC.38** examine global change over time (e.g. climatic trends, fossil fuel depletion, global warming, ozone depletion)
- BTC.39** investigate the formation of soil and soil organisms
- BTC.40** explain the mechanics of composting
- BTC. 41** investigate acids, bases, and buffering systems in living organisms
- BTC. 42** review foundational concepts including; chemical symbols, ions, formulas, balanced equations, atomic structure, use of periodic table, states of matter, chemical and physical properties, and chemical and physical changes

- BTC. 43 categorize chemical hazards (e.g. flammable, reactive, poisons, corrosive)
- BTC. 44 investigate electric and magnetic forces in nature
- BTC. 45 describe the common components of safe electrical circuits (e.g. switches, bi-metallic strips, resistors, fuses, surge protectors)
- BTC. 46 identify the scientific units for electrical systems (e.g. amperage, potential difference, current, resistance)
- BTC. 47 measure molecular weight through the diffusion of biological stains
- BTC. 48 review the structure and function of cell membranes
- BTC. 49 discuss DNA as it relates to mitosis, meiosis, and protein synthesis
- BTC. 50 apply techniques of biotechnology to phylogenesis, forensics, palenotology, and human genetics
- BTC. 51 compare and contrast the growth mechanisms of hydrophytic, mesophytic, and xerophytic plants
- BTC. 52 investigate the diversity of plants, their habitat, transport system, reproduction, and life cycle
- BTC. 53 investigate methods of plant growth (e.g. culturing techniques, hydroponics, cloning, grafting, vegetative propagation)
- BTC. 54 research forest-management practices (e.g. clear cutting, selective cutting, pruning, fire ecology)
- BTC. 55 research and evaluate the importance of cultivated and wild plants to human society, economics, and the environment
- BTC. 56 compare the characteristics, structures and life cycles of representative organisms from plant and animal kingdoms
- BTC. 57 explore animal behavior (e.g. proximate, ultimate)
- BTC. 58 investigate and analyze animal distribution (e.g. habitat, nutrition, barriers)
- BTC. 59 investigate variations in ocean productivity
- BTC. 60 analyze gene expression and embryonic development
- BTC. 61 research variations in animal reproductive strategies
- BTC. 62 compare the characteristics, structures and life cycles of representative organisms from bacteria, protists, viruses, and fungi (e.g. taxonomic, infections, biotech applications)
- BTC. 63 evaluate the effects of large scale use of fungicides and pesticides on the diversity of organisms
- BTC. 64 **review basic genetics including; incomplete dominance, gene interactions, co-dominance, multiple-alleles, crossing over, genetic recombinations, environmental influences, development, sex, and age**
- BTC. 65 analyze karyotypes and pedigrees as diagnostic tools (genetic diseases, animal husbandry, predicting plant growth)
- BTC. 66 **introduce genetic engineering through current DNA technology and the social and ethical issues that it raises (e.g. bacterial production of human insulin, DNA, cloning, fingerprinting, etc.)**
- BTC. 67 discuss natural selection bioengineering in terms of implications on the development of life on earth (e.g. past, present, future)
- Science History**
- BTC.68 identify contributors to the scientific body of knowledge including their diverse cultures
- BTC.69 trace the historical development of key scientific concepts and principles describing their impact on modern thought and life
- BTC.70 describe the impact of cultural, technological and economic influences on the evolving nature of scientific thought and knowledge
- ◇

Science, Technology and Society

- BTC.71, apply scientific skills and technological tools to address personal and societal needs ◇
- BTC.72 engage in decision making activities and actions to resolve science-technology-society issues ◇
- BTC.73 investigate and analyze the interdependence of science and technology ◇
- BTC.74 describe the scientific concepts underlying technological innovations ◇
- BTC.75 explore occupational opportunities in science and technology including the academic preparation necessary ◇

Computer and Technology

- BTC.76 access, gather, store, retrieve, and organize data using hardware and software designed for these purposes ◇
- BTC.77 collect, analyze and display data using computers and other electronic technology ◇
- BTC.78 access Internet resources for a variety of purposes (e.g., research, exchange data, E-mail, and real-time investigations) ◇
- BTC.79 demonstrate skills in use of word processing, data bases, spreadsheets, graphics and telecommunications ◇
- BTC.80 identify and solve problems with the appropriate technology ◇
- BTC.81 incorporate correct grammar, spelling, vocabulary and graphical representation for both written and oral multimedia presentations ◇

Human Anatomy and Physiology (11/12)

~~This advanced course is designed for those students wanting a depth of~~ This is an advanced level course designed for students who have completed Coordinated and Thematic Science (CATS) 10 and desire a deeper understanding in the structure and function of the human body. The body will be viewed as a whole using anatomical terminology necessary to describe location. Focus will be at both micro and macro levels reviewing cellular functions biochemical processes, tissue interactions, organ systems, and the interaction of those systems as it relates to the human organism. Systems covered include integumentary, skeletal, muscular, respiratory, circulatory, digestive, excretory, reproductive, immunological, nervous, and endocrine. This course will be appropriate for college bound students as well as those choosing a health services career cluster. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities.

Nature of Science

- HAP.1 participate in activities that consider alternate, changing points of view to stimulate the development of a sense of inquiry ◇
- HAP.2 recognize general limitations of science
- HAP.3₁₁ **explain that science is composed of observations set in a testable framework of ideas**
- HAP.4 conclude that science is a blend of creativity, logic and mathematics

Scientific Attitudes/Habits of Mind

- HAP.5_{4,5,6,7,8,9,10} **model and exhibit the skills, attitudes and/or values of scientific inquiry (e.g., curiosity, logic, objectivity, openness, skepticism, appreciation, diligence, integrity, fairness, creativity) ◇**
- HAP.6 demonstrate ethical practices for science (e.g., established research protocol, accurate record keeping, replication of results and peer review) ◇
- HAP.7 **apply scientific approaches to seek solutions for everyday problems (e.g., personal, community health, population growth, natural resources, environmental quality, natural and human induced hazards and scientific and technological challenges) ◇**

Scientific Processes/Thinking Skills

- HAP.8_{3,4,5,6,7,8,9,10} **demonstrate science processes within a problem solving setting (e.g., observing, measuring, communicating, comparing, ordering, categorizing, classifying, relating, hypothesizing, predicting, inferring and applying) ◇**
- HAP.9_{3,4,5,6,7,8,9,10} **organize qualitative and quantitative data into tables, diagrams, and/or graphs for analysis ◇**
- HAP.10_{3,4,5,6,7,8,9,10} **identify, analyze, and infer using patterns and relationships in data (e.g., cause and affect graphical analysis including interpretation and extrapolation) ◇**
- HAP.11 use SI (metric) measurements
- HAP.12 apply rational thinking processes that underlie scientific approaches to problem solving by employing critical thinking skills, imagination and creativity while working individually and/or cooperatively ◇
- HAP.13 use the tools of science safely, accurately and appropriately ◇
- HAP.14_{4,5,6,8,9} **identify independent and dependent variables in experimental investigations**
- HAP.15₉ **manipulate variables to extend experimental activities**

HAP.16₉ **design, conduct, evaluate and revise experiments (e.g., identify questions and concepts that guide scientific investigations, design and conduct scientific investigations, use technology and mathematics to improve investigations and communications, formulate and revise scientific explanations and models using logic and evidence, recognize alternative explanations, communicate and defend a scientific argument, understand about scientific inquiry) ◇**

Laboratory Investigations/

Hands-on Learning

- HAP.17 engage in active inquiries, investigations and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and laboratory skills ◇
- HAP.18 properly and safely manipulate equipment, materials, chemicals, organisms and models ◇
- HAP.19 conduct explorations in a variety of environments (e.g., laboratories, museums, libraries, parks and other outdoors locations) ◇
- HAP.20 use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laserdiscs) to collect, analyze and/or report data, interact with simulations, and research ◇

Science Themes/Subject Matter

- HAP.21_{7,8,9,10} describe the organizational levels, interdependency and the interaction of cells, tissues, organs, organ systems
- HAP.22 **apply the importance of ionic and covalent bonding to the chemical processes in the human body**
- HAP.23 summarize the structure and function of organelles within a typical human body cell

- HAP.24 categorize, by structure and function, the various types of human tissue (e.g., cardiac, epithelial, connective, etc.)
- HAP.25 relate how bone tissue is important to the development of the human skeleton
- HAP.26 relate the various joints to their muscle movement
- HAP.27_{7,8,9,10} recognize the structure and relationship among skeletal, neural, and muscular systems
- HAP.28 classify and describe the structure and function of various types of neurons
- HAP.29 examine how the autonomic nervous system controls other organs and systems
- HAP.30 examine how food provides nutrition to tissues through its breakdown by the digestive system, into carbohydrates, fats, proteins, vitamins, and minerals
- HAP.31 discuss the specific role of enzymes and hormones to bodily functions
- HAP.32_{7,8,9,10} explain how the respiratory system is significant to communication, gas exchange, and cellular respiration
- HAP.33 identify the cellular processes and the energy and nutritional requirements needed to maintain human metabolism
- HAP.34 recognize the relationship of the excretory system to other organs and systems to rid the human body of its wastes
- HAP.35_{7,8,9,10} explain the structure and function of the male and female reproductive systems and how they relate to human growth and development
- HAP.36 trace the transfer of matter and energy in chemical molecular processes in the human body
- HAP.37_{8,9,10} compare and contrast the purposes, processes and outcomes of cellular meiosis and mitosis

HAP.38_{7,9} describe potential system failures in the human body due to genetic, nutritional, operational, disease, or environmental influences

HAP.39_{7,8,9,10} relate the structure of the integumentary system to its function as a sensory organ, environmental barrier, and temperature regulator

HAP.40₁₀ **analyze the change in DNA activity and how it affects the control of protein synthesis and human inheritance**

HAP.41 demonstrate the directional terminology used to locate structures in the human body (e.g., dorsal, bilateral, sagittal, etc.)

HAP.42₁₀ illustrate how transport mechanisms in cells, tissues, and/or organs depend on osmosis and mixture gradients

HAP.43 show the mechanism of muscle contraction on a micro and macro level

HAP.44 apply the knowledge of the structure of the ear and eye to their function/dysfunction of environmental perception

HAP.45_{7,8,9,10} illustrate the structure of the circulatory and lymph systems and the function of blood to the role of transportation, cellular support and defense

Science History

HAP.46 identify contributors to the scientific body of knowledge including their diverse cultures

HAP.47 trace the historical development of key scientific concepts and principles describing their impact on modern thought and life

HAP.48 describe the impact of cultural, technological and economic influences on the evolving nature of scientific thought and knowledge
◇

Science, Technology and Society

HAP.49₉ apply scientific skills and technological tools to address personal and societal needs ◇

HAP.50 engage in decision making activities and actions to resolve science-technology-society issues
◇

HAP.51 investigate and analyze the interdependence of science and technology ◇

HAP.52 describe the scientific concepts underlying technological innovations ◇

HAP.53 explore occupational opportunities in science and technology including the academic preparation necessary ◇

Computer and Technology

HAP.54 access, gather, store, retrieve, and organize data using hardware and software designed for these purposes ◇

HAP.55 collect, analyze and display data using computers and other electronic technology ◇

HAP.56 access Internet resources for a variety of purposes (e.g., research, exchange data, E-mail, and real-time investigations) ◇

HAP.57 demonstrate skills in use of word processing, data bases, spreadsheets, graphics and telecommunications ◇

HAP.58 identify and solve problems with the appropriate technology ◇

HAP.59 incorporate correct grammar, spelling, vocabulary and graphical representation for both written and oral multimedia presentations ◇

Advanced Chemistry Eleven/Twelve (11/12)

~~Chemistry Eleven/Twelve is the advanced study of matter, its composition, and its changes. Chemistry Eleven/Twelve builds on the foundation of chemical concepts developed in CATS Seven through CATS Ten. An advanced level course designed for students who have completed Coordinated and Thematic Science Ten (CATS 10) and desire a broader, in-depth study of the content found in the science field of chemistry. Advanced Chemistry (11/12) is the advanced study of matter, its composition, and its changes.~~ This course is designed to prepare a student for college chemistry, **requiring a strong mathematical base**. The relationship between chemistry concepts and mathematics will be emphasized. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities.

Nature of Science

- C.1 participate in activities that consider alternate, changing points of view to stimulate the development of a sense of inquiry ◇
- C.2 recognize general limitations of science
- C.3 **explain that science is composed of observations set in a testable framework of ideas**
- C.4 conclude that science is a blend of creativity, logic, and mathematics

Scientific Attitudes/Habits of Mind

- C.5_{4,5,6,7,8,9,10} **model and exhibit the skills, attitudes, and/or values of scientific inquiry (e.g., curiosity, logic, objectivity, openness, skepticism, appreciation, diligence, integrity, fairness, creativity) ◇**
- C.6 demonstrate ethical practices for science (e.g., established research protocol, accurate record keeping, replication of results, and peer review) ◇
- C.7 **apply scientific approaches to seek solutions for everyday problems (e.g., personal, community health, population growth, natural resources, environmental quality, natural and human induced hazards and scientific and technological challenges) ◇**

Scientific Processes/Thinking Skills

- C.8_{3,4,5,6,7,8,9,10} **demonstrate science processes within a problem solving setting (e.g., observing, measuring, communicating, comparing, ordering, categorizing, classifying, relating, hypothesizing, predicting, inferring, and applying) ◇**
- C.9_{3,4,5,6,7,8,9,10} **organize qualitative and quantitative data into tables, diagrams, and/or graphs for analysis ◇**
- C.10_{3,4,5,6,7,8,9,10} **identify, analyze, and infer using patterns and relationships in data (e.g., cause and affect, graphical analysis including interpolation and extrapolation) ◇**
- C.11 use SI (metric) measurements
- C.12 apply rational thinking processes that underlie scientific approaches to problem solving by employing critical thinking skills, imagination and creativity while working individually and/or cooperatively ◇
- C.13 use the tools of science safely, accurately, and appropriately ◇
- C.14_{4,5,6,8,9} identify independent and dependent variables in experimental investigations
- C.15₉ manipulate variables to extend experimental activities

- C.16₉ design, conduct, evaluate and revise experiments (e.g., identify questions and concepts that guide scientific investigations; design and conduct scientific investigations; use technology and mathematics to improve investigations and communications; formulate and revise scientific explanations and models using logic and evidence; recognize alternative explanations; communicate and defend a scientific argument; understand scientific inquiry) ◇

Laboratory Investigations/

Hands-on Learning

- C.17 engage in active inquiries, investigations, and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and laboratory skills ◇
- C.18 properly and safely manipulate equipment, materials, chemicals, organisms, and models ◇
- C.19 conduct explorations in a variety of environments (e.g., laboratories, museums, libraries, parks and other outdoors locations) ◇
- C.20 use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laser discs) to collect, analyze and/or report data, interact with simulations, and research ◇

Science Themes/Subject Matter

- C.21_{3,4,5,6,7,8,9,10} review of foundational chemical concepts including chemical symbols representing elements, ions, and formulas; balanced-equations; atomic structure including subatomic particles and atomic models; use of periodic table to locate and classify elements; states of matter; colligative properties; kinetic molecular theory;

chemical and physical properties; and chemical and physical changes

- C.22 evaluate the contributions of Planck, Einstein, and deBroglie to the wave-particle duality of light
- ~~C.22 write electron configurations and complete diagrams for electron position~~
- C.23 relate the position and velocity of an electron to the Heisenberg Uncertainty Principle
- C.24 research the contributions of Schrodinger's work to the development of a mathematical basis for the wave-mechanical view of hydrogen atom
- C.24₅ identify four types of electron clouds (s, p, d, f)
- ~~C.25 evaluate the contributions of Planck, Einstein, and deBroglie to the wave-particle duality of light~~
- ~~C.26 research the contributions of Schrodinger's work to the development of a mathematical basis for the wave-mechanical view of hydrogen atom~~
- C.26 write electron configurations and complete diagrams for electron position
- C.27 describe the quantum number (n, l, m, s) for electrons
- C.28 associate electrons configuration of elements with element location on periodic table
- C.28₉ write electron dot structures for representative elements
- ~~C.29 associate electrons configuration of elements with element location on periodic table~~
- C.30 analyze the periodic table to predict trends in atomic size, ionic size, electronegativity, ionization energy, and electron affinity
- C.31₉ using the periodic table, predict the type of bonding that occurs between atoms and differentiate among properties of ionic, covalent, and metallic bonds

- C.32₁₀ **construct models to explain the structure and geometry of organic and inorganic molecules and the lattice structures of crystals**
- C.33 describe the formation of sigma and pi bonds
- C.334 use hybridization theory to explain bond angles in compounds
- C.345 define and describe the types of van der Waals forces and list the three factors contributing to them
- ~~C.35 describe the formation of sigma and pi bonds~~
- ~~C.36_{7,8,9,10} predict the products and write balanced equations for the general types of chemical reactions~~
- C.376 use the Avogadro constant to define the mole and to calculate molecular and molar mass as well as a molar volume
- C.387 use molar mass to calculate the molarity of solutions, percentage composition, and empirical formulas
- C.398 experimentally determine the formulas of hydrates
- ~~C.39_{7,8,9,10} predict the products and write balanced equations for the general types of chemical reactions~~
- C.40 do stoichiometric calculations including mass-mass, mass-volume, volume-volume to determine percent yield and heat of reaction
- C.41 use the ideal gas equation to calculate the molar mass of a gas
- C.42 identify the limiting reactant and predict the theoretical yield
- C.43 distinguish between the thermodynamic and kinetic stability
- C.44 draw and label an energy-time diagram for both an endothermic and an exothermic reaction
- C.445 experimentally determine the factors that influence the rate of reaction
- C.46 apply LeChatelier's principle to explain the effect of changes in concentration, pressure, volume, and temperature on an equilibrium system
- C.457 calculate equilibrium constants and concentration of products and reactants
- ~~C.46 apply LeChatelier's principle to explain the effect of changes in concentration, pressure, volume, and temperature on an equilibrium system~~
- ~~C.47 draw and label an energy-time diagram for both an endothermic and an exothermic reaction~~
- C.48 name and define acids and bases using Arrhenius, Bronsted-Lowery and Lewis definitions
- C.49 predict the products upon adding water to both acidic and basic anhydrides
- C.50 write and balance net ionic equations and calculate ionization constants for neutralization reactions
- C.51 solve problems using the solubility product constants
- C.52 calculate the pH and/or pOH for various solutions and relate to the pH scale
- C.53 conduct titrations and perform calculations for both acid-base and oxidation-reduction reactions
- C.54 define oxidation and reduction in terms of electron transfer within reactions
- C.55 construct electrolytic and voltaic cells, write and balance the half-cell reactions and calculate the cell voltage
- C.56 calculate the enthalpy change in reactions using the heat of formation
- C.57 evaluate the factors driving chemical reactions including enthalpy and entropy and their interrelationship
- C.58 calculate Gibb's Free Energy using enthalpy and entropy values

- C.59 calculate the rate of radioactive decay and apply to radiometric dating
- C.60 predict nuclear stability using proton-neutron diagrams
- C.61 distinguish between the hazards of ionizing and penetrating radiation
- C.63~~2~~ compare and contrast fusion and fission reactions
- C.62~~3~~ research the application of nuclear technology (e.g., power plants, medicine, weaponry)
- ~~C.63 compare and contrast fusion and fission reactions~~
- C.64 recognize simple organic functional groups and name simple organic compounds

Science History

- C.65 identify contributors to the scientific body of knowledge including their diverse cultures
- C.66 trace the historical development of key scientific concepts and principles describing their impact on modern thought and life
- C.67 describe the impact of cultural, technological and economic influences on the evolving nature of scientific thought and knowledge
◇

Science, Technology, and Society

- C.68₉ apply scientific skills and technological tools to address personal and societal needs ◇
- C.69 engage in decision making activities and actions to resolve science-technology-society issues
◇
- C.70 investigate and analyze the interdependence of science and technology ◇
- C.71 describe the scientific concepts underlying technological innovations ◇
- C.72 explore occupational opportunities in science and technology including the academic preparation necessary ◇

Computer and Technology

- C.73 access, gather, store, retrieve, and organize data using hardware and software designed for these purposes ◇
- C.74 collect, analyze and display data using computers and other electronic technology ◇
- C.75 access Internet resources for a variety of purposes (e.g., research, exchange data, E-mail, on-line chat and real-time, investigations)
◇
- C.76 demonstrate skills in use of word processing, data bases, spreadsheets, graphics and telecommunications ◇
- C.77 identify and solve problems with the appropriate technology ◇
- C.78 incorporate correct grammar, spelling, vocabulary and graphical representation for both written and oral multimedia presentations ◇

Chemistry-Technical/ Conceptual (11/12)

An advanced level course designed for students who have completed Coordinated and Thematic Science Ten (CATS 10) and desire ~~Chemistry-Technical/Conceptual~~ is the study of matter, its composition, and its changes. This course is an alternative to a traditional college preparatory course. It that emphasizes real life applications of chemical principles. Mathematical based problem solving is de-emphasized. Chemistry -Technical Conceptual is the study of matter, its composition, and its changes. Emphasis is placed on the important role chemistry plays in a student's personal life, career opportunities, environment, and society. Students will engage in active inquiries, investigations, and hand-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research laboratory skills. Safety instruction is integrated into all activities.

Nature of Science

- CTC.1 participate in activities that consider alternate, changing points of view to stimulate the development of a sense of inquiry ◇
- CTC.2 recognize general limitations of science
- CTC.3 **explain that science is composed of observations set in a testable framework of ideas**
- CTC.4 conclude that science is a blend of creativity, logic and mathematics

Scientific Attitudes/Habits of Mind

- CTC.5_{4,5,6,7,8,9,10} **model and exhibit the skills, attitudes and/or values of scientific inquiry (e.g., curiosity, logic, objectivity, openness, skepticism, appreciation, diligence, integrity, fairness, creativity) ◇**
- CTC.6 demonstrate ethical practices for science (e.g., established research protocol, accurate record keeping, replication of results and peer review)◇
- CTC.7 **apply scientific approaches to seek solutions for everyday problems (e.g., personal, community health, population growth, natural resources, environmental quality, natural and human induced hazards and scientific and technological challenges) ◇**

Scientific Processes/Thinking Skills

- CTC.8_{3,4,5,6,7,8,9,10} **demonstrate science processes within a problem solving setting (e.g., observing, measuring, communicating, comparing, ordering, categorizing, classifying, relating, hypothesizing, predicting, inferring and applying) ◇**
- CTC.9_{3,4,5,6,7,8,9,10} **organize qualitative and quantitative data into tables, diagrams, and/or graphs for analysis◇**
- CTC.10_{3,4,5,6,7,8,9,10} **identify, analyze, and infer using patterns and relationships in data (e.g., cause and affect graphical analysis including interpretation and extrapolation) ◇**
- CTC.11 use SI (metric) measurements
- CTC.12 apply rational thinking processes that underlie scientific approaches to problem solving by employing critical thinking skills, imagination and creativity while working individually and/or cooperatively ◇
- CTC.13 use the tools of science safely, accurately and appropriately ◇
- CTC.14_{4,5,6,8,9} **identify independent and dependent variables in experimental investigations**
- CTC.15₉ **manipulate variables to extend experimental activities**

CTC.16₉ design, conduct, evaluate and revise experiments (e.g., identify questions and concepts that guide scientific investigations, design and conduct scientific investigations, use technology and mathematics to improve investigations and communications, formulate and revise scientific explanations and models using logic and evidence, recognize alternative explanations, communicate and defend a scientific argument, understand about scientific inquiry) ◇

Laboratory Investigations/

Hands-on Learning

- CTC.17 engage in active inquiries, investigations and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and laboratory skills ◇
- CTC.18 properly and safely manipulate equipment, materials, chemicals, organisms and models ◇
- CTC.19 conduct explorations in a variety of environments (e.g., laboratories, museums, libraries, parks and other outdoors locations) ◇
- CTC.20 use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laser discs) to collect, analyze and/or report data, interact with simulations, and research ◇

Science Themes/Subject Matter

- CTC.21_{3,4,5,6,7,8,9,10} review fundamental chemistry concepts including, parts of the atom, chemical and physical properties, chemical and physical changes, chemical formulas, balancing equations, conservation of matter and energy, transfer or sharing of

electrons during chemical reactions, periodic table, metallic and nonmetallic properties, ionic and covalent bonds, solubility, concentration, colloids, suspensions, acids, bases, neutralization reactions, pH, colligative properties, temperature, pressure, and volume relationships, nuclear fission, nuclear fusion

- CTC.22_{3,5,6,8} discuss the impact of water's unusual physical properties

- CTC.23 illustrate the concept of limiting reagents

- CTC.24_{6,7,8,9,10} identify the parts of the kinetic molecular theory and explain states of matter

- CTC.25 define the term mole, and calculate the molar mass of a compound when provided with its formula and the atomic masses of its elements
- CTC.26 calculate the percent by mass of a specific element in a given compound

- CTC.27 investigate the formation of elements from compounds using electrolysis to demonstrate an oxidation-reduction process as an example of metal purification from ores

- CTC.28 predict reactivity of metals using the activity series of metals

- CTC.29 describe the use of half-reactions to describe electrochemical cells

- CTC.30 show how to apply resource conservation techniques to a limited nonrenewable resource (e.g., reduce, reuse, and recycle)

- CTC.31 investigate the relationship of boiling point, density and viscosity to the number of carbon atoms and side chains in organic compounds
- CTC.32 draw and build structural models of the first ten alkanes

- CTC.33 collect data and calculate the heat of combustion for organic compounds (e.g., candle, food product)

- CTC.34 identify the functional groups for common alcohols, ethers, carboxylic acids, and esters
- CTC.35 model polymerization including addition and condensation reactions (e.g., plastics, esters, polysaccharides, proteins, fats)
- CTC.36 explain the benefits and consequences of energy conservation with respect to petroleum's ability to be used as a building material and/or fuel
- CTC.37 examine examples of nuclear technology that affect daily life
- CTC.38 balance nuclear equations and use them to describe natural radioactive decay
- CTC.39 compare penetrating power of alpha, beta, and gamma radiation and discuss safety factors
- CTC.40 **simulate and explain half-life decay**
- CTC.41 **graph radiation vs. Time illustrating half-life of radioisotopes**

Science History

- CTC.42 identify contributors to the scientific body of knowledge including their diverse cultures
- CTC.43 trace the historical development of key scientific concepts and principles describing their impact on modern thought and life
- CTC.44 describe the impact of cultural, technological and economic influences on the evolving nature of scientific thought and knowledge ◇

Science, Technology and Society

- CTC.45 apply scientific skills and technological tools to address personal and societal needs ◇
- CTC.46 engage in decision making activities and actions to resolve science-technology-society issues ◇
- CTC.47 investigate and analyze the interdependence of science and technology ◇

- CTC.48 describe the scientific concepts underlying technological innovations ◇
- CTC.49 explore occupational opportunities in science and technology including the academic preparation necessary ◇

Computer and Technology

- CTC.50 access, gather, store, retrieve, and organize data using hardware and software designed for these purposes ◇
- CTC.51 collect, analyze and display data using computers and other electronic technology ◇
- CTC.52 access Internet resources for a variety of purposes (e.g., research, exchange data, E-mail, on-line chat and real-time, investigations) ◇
- CTC.53 demonstrate skills in use of word processing, data bases, spreadsheets, graphics and telecommunications ◇
- CTC.54 identify and solve problems with the appropriate technology ◇
- CTC.55 incorporate correct grammar, spelling, vocabulary and graphical representation for both written and oral multimedia presentations ◇

Advanced Environmental Earth Science

Eleven/Twelve (11/12)

As responsible citizens on this planet, students must be able to recognize their role as caretakers of the earth in order to protect its fragile environment. This is possible only if students have a deep understanding of the earth and its processes. **Advanced Environmental Earth Science (11/12)** is designed for students who have completed **Coordinated and Thematic Science Ten (CATS 10)** and desire to build on the fundamentals of geology, oceanography, meteorology and astronomy developed in CATS 7-10 in a **rigorous and integrated manner** with the traditional disciplines of biology, chemistry and physics where appropriate. As stewards of the earth, an emphasis on environment should be included within the traditional earth science disciplines. Ecology, economics, politics and social considerations all combine to help students develop an understanding of how humans effect and are effected by their environment. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities.

Nature of Science

- ES.1 recognize the open-ended structure of science
- ES.2 participate in activities that consider alternate, changing points of view to stimulate the development of a sense of inquiry ◇
- ES.3 recognize the limits of science
- ES.4 recognize science as composed of observations set in a testable framework of ideas
- ES.5 conclude that science is a blend of logic, mathematics, and imagination

Scientific Attitudes/Habits of Mind

- ES.6^{4,5,6,7,8,9,10} model and exhibit the skills attitudes and/or values of scientific inquiry (e.g., curiosity, logic, objectivity, openness, skepticism, appreciation, diligence, integrity, fairness, creativity) ◇
- ES.7 demonstrate ethical practices in science (e.g., established research protocol, accurate record keeping, replication of results, peer review)
- ES.8 realize that science and technology affect the environment
- ES.9 apply scientific information to personal and societal decision making

- ES.10 apply scientific approaches to seek solutions for everyday problems (e.g., personal community health, population growth, natural resources, environmental quality, natural and human induced hazards, and scientific and technological challenges)◇

Scientific Processes/Thinking Skills

- ES.11^{3,4,5,6,7,8,9,10} demonstrate science processes within a problem solving setting (e.g., observing, measuring, communicating, comparing, ordering, categorizing, relating, inferring, and applying)◇
- ES.12^{3,4,5,6,7,8,9,10} organize qualitative and quantitative data into tables, diagrams, and/or graphs for analysis ◇
- ES.13^{3,4,5,6,7,8,9,10} identify analyze and infer using patterns and relationships in data (e.g., cause and effect, graphical analysis including interpretation, interpolation and extrapolation)◇
- ES.14 use SI (metric) measurements

- ES.15 apply rational thinking processes that underlie scientific approaches to problem solving by employing critical thinking skills, imagination and creativity while working individually and/or cooperatively ◇
- ES.16 use the tools of science safely, accurately, and appropriately ◇
- ES.17^{4,5,6,8,9} **identify independent and dependent variables in experimental investigations**
- ES.18₉ manipulate variables to extend experimental activities
- ES.19₉ **design, conduct, evaluate and revise experiments (e.g., identify questions and concepts that guide scientific investigations, design and conduct scientific investigations, use technology and mathematics to improve investigations and communications, formulate and revise scientific explanations and models using logic and evidence, recognize alternative explanations, communicate and defend a scientific argument, understand about scientific inquiry)**

Laboratory Investigations/

Hands-on Learning

- ES.20 engage in active inquiries, investigations and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and laboratory skills ◇
- ES.21 conduct explorations in a variety of traditional and nontraditional educational environments (e.g., laboratories, museums, libraries, parks and other outdoor locations) ◇
- ES.22 use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laserdiscs) to collect, analyze and/or report data, interact with simulations, and research ◇

- ES.23 properly and safely manipulate equipment, materials, chemicals, organisms and models) ◇

Science Themes/Subject Matter

- ES.24 **review the following foundational earth science concepts including rocks and minerals, properties of waves, constructing and interpreting weather maps, surface features found on maps, climatic relationships to biomes, use of data gathering instruments, temperature-phase change relationships**
- ES.25 research theories concerning origins of the universe
- ES.26 **investigate the solar system including origin theories, comparing and contrasting the planets, planetary motions, and other celestial bodies**
- ES.27 explore the Earth-Sun-Moon relationships (e.g., moon phases, eclipses, tides, and the relationship between tilt of the earth and seasonal changes ~~as well as tides~~)
- ES.28 ~~probe and~~ explain stellar evolution, stellar types and distances
- ES.29 compare and contrast the different kinds of galaxies
- ES.30 develop a time line outlining space exploration
- ES.31 investigate celestial bodies (e.g., composition, motions, origins of celestial objects such as quasars, pulsars, and black holes)
- ES.32 explain the relationships between location, navigation and time
- ES.33 summarize various methods used to study astronomy
- ES.34 identify components of the solid earth (e.g., shape, dimensions, and structure)
- ES.35 **identify the lithosphere, the hydrosphere, the atmosphere, and the biosphere**

- ES.36 describe earth's origin as it relates to the lithosphere, hydrosphere, and atmosphere
 - ES.37 identify and describe the natural processes relating to the development of the solid earth ~~from atomic structure through the rock cycle~~
 - ES.38 identify and describe agents and processes of degradation (e.g., weathering by gravity, wind, water, and ice)
 - ES.39 identify and describe tectonic forces relating to internal energy production and convection currents
 - ES.40 **understand the cause and effect relationships of degradational and tectonic forces with respect to the dynamic earth and its surface (e.g., volcanoes, earthquakes)**
 - ES.41 **construct and/or interpret information on topographic maps**
 - ES.42 list, identify, and sequence eras, epochs, and periods in relation to earth history and geologic development
 - ES.43 **identify and describe, ~~and~~ understand properties of our oceans (e.g., water composition, physical features of the ocean floor, and life within the oceans)**
 - ES.44 compare and contrast ocean movements
 - ES.45 identify and describe the structure of the atmosphere
 - ES.46 **investigate and explain heat transfer in the atmosphere and its relationship to meteorological processes (e.g., pressure, winds, evaporation, condensation, and precipitation)**
 - ES.47 **compare and contrast meteorological processes related to air masses, weather systems, and forecasting**
 - ES.48 examine global change over time (e.g., climatic trends, fossil fuel depletion, global warming, ozone depletion)
 - ES.49 describe the relationship between earth processes and natural disasters and draw conclusions concerning their human impact
 - ES.50 explore the relationships between human consumption of natural resources and the stewardship responsibility for reclamations including disposal of hazardous and non-hazardous waste
 - ES.51 investigate and describe in detail the physical and chemical properties of water
 - ES.52 **explain common problems related to the conservation, use, supply and the quality of water**
 - ES.53 explore the relationships between the extraction and use of natural resources and the impact on the environment
 - ES.54 research alternative energy sources ~~and possible impact~~
 - ES.55 understand the fragile nature of the earth ~~'s major spheres (e.g., lithosphere, hydrosphere, atmosphere, and biosphere)~~
 - ES.56 research and explain how the political system influences environmental decisions
 - ES.57 investigate which federal and state agencies have responsibility for environmental monitoring and actions
 - ES.58 develop decision-making skills with respect to addressing environmental problems
- Science History**
- ES.59 identify contributors to the scientific body of knowledge including scientists both past and present as well as contributions from diverse cultures
 - ES.60 recognize the historical development of significant scientific events and their impact on modern thought and life
 - ES.61 be aware of the evolving nature of scientific thought and models by tracing the evolutionary development of several key scientific concepts and principles

- ES.62 understand and appreciate the evolving nature of scientific thought and knowledge and the patterns by which major scientific ideas change

Science, Technology, and Society

- ES.63 apply science and use technology to solve problems ◇
- ES.64 describe the costs and benefits of scientific skills and new technologies needed to address personal and societal needs
- ES.65 engage in decision making activities and actions to resolve science-technology- society issues ◇
- ES.66 recognize the scientific principles in technological applications (the why as well as the how)
- ES.67 explore the connections among science, technology, and career opportunities

Computer and Technology

- ES.68 access, gather, store, retrieve, and organize data using hardware and software designed for these purposes ◇
- ES.69 access Internet resources for a variety of purposes (e.g., research, exchange data, E-mail, and real-time investigations) ◇
- ES.70 demonstrate skills in use of word processing, data bases, spreadsheets, graphics and telecommunications ◇
- ES.71 identify and solve problems with the appropriate technology ◇
- ES.72 incorporate correct grammar, spelling, vocabulary and graphical representation for both written and oral communication ◇

Advanced Physics Eleven/Twelve (11/12)

A college preparatory course, Physics Eleven/Twelve is a **laboratory driven, advanced study** of nature's universal laws with emphasis on process skills. Physics Eleven/Twelve builds on the foundation of physics concepts developed in CATS Seven through CATS Ten. The course is organized around the content **An advanced level course** designed for students who have completed Coordinated and Thematic Science Ten (CATS 10) and desire a broader, **in-depth study** of the content found in the science field of physics. As a college preparatory course, **Advanced Physics (Eleven/Twelve)** is a **laboratory driven, advanced study** of nature's universal laws with emphasis on process skills. This course is designed to build upon and extend the Physics concepts, skills, and knowledge from the CATS 7-10 program. The course emphasizes a mathematical approach to the areas of kinematics, dynamics, thermodynamics, light and optics, electricity and magnetism, and modern physics. ~~SI (metric) units of measurement will be used.~~ Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities.

Nature of Science

- P.1 participate in activities that consider alternate, changing points of view to stimulate the development of a sense of inquiry ♦
- P.2 recognize general limitations of science
- P.3 **explain that science is composed of observations set in a testable framework of ideas**
- P.4 conclude that science is a blend of creativity, logic, and mathematics
- P.5 recognize that science builds models of nature and verifies the models through reproducible experiments
- P.6 recognize that science improves and changes its models when experimental results do not agree with present models
- P.7 stress that the concepts and laws developed in physics are fundamental to the understanding of other sciences (including biology, chemistry, and geology)
- P.8 stress that the processes of learning science are transferable to studies in other disciplines

Scientific Attitudes/Habits of Mind

- P.59_{4,5,6,7,8,9,10} **model and exhibit the skills, attitudes, and/or values of scientific inquiry (e.g., curiosity,**

logic, objectivity, openness, skepticism, appreciation, diligence, integrity, fairness, creativity) ♦

- P.610 demonstrate ethical practices for science (e.g., established research protocol, accurate record keeping, replication of results, and peer review) ♦
- P.711 **apply scientific approaches to seek solutions for everyday problems (e.g., personal, community health, population growth, natural resources, environmental quality, natural and human induced hazards, and scientific and technological challenges) ♦**
- P.12 recognize that knowledge of science is important in a world dependent on science and technology
- P.13 realize that we experience science in our everyday activities and develop a base of preconceptions which must be integrated with science learned in the course
- P.14 investigate learning styles of learners and use appropriate learning cycles which will allow all learners to succeed
- P.15 differentiates between fact and opinion; between cause and effect

Scientific Processes/Thinking Skills

P.816_{3,4,5,6,7,8,9,10} demonstrate science processes within a problem solving setting (e.g., observing, measuring, communicating, comparing, ordering, categorizing, classifying, relating, hypothesizing, predicting, inferring, and applying) ◇

P.917_{3,4,5,6,7,8,9,10} organize qualitative and quantitative data into tables, diagrams, and/or graphs for analysis ◇

P.4018_{3,4,5,6,7,8,9,10} identify, analyze, and infer using patterns and relationships in data (e.g., cause and affect, graphical analysis including interpretation and extrapolation) ◇

P.4419 use SI (metric) measurements

P.4220 apply rational thinking processes that underlie scientific approaches to problem solving by employing critical thinking skills, imagination, and creativity while working individually and/or cooperatively ◇

P.4321 use the tools of science safely, accurately, and appropriately ◇

P.4422_{4,5,6,8,9} identify independent and dependent variables in experimental investigations

P.4523₉ manipulate variables to extend experimental activities

P.4624₉ design, conduct, evaluate and revise experiments (e.g., identify questions and concepts that guide scientific investigations; design and conduct scientific investigations; use technology and mathematics to improve investigations and communications; formulate and revise scientific explanations and models using logic and evidence; recognize alternative explanations; communicate and defend a scientific argument; understand scientific inquiry) ◇

Laboratory Investigations/

Hands-on Learning

P.4725 engage in active inquiries, investigations, and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and laboratory skills ◇

P.4826 properly and safely manipulate equipment, materials, chemicals, organisms, and models ◇

P.4927 conduct explorations in a variety of environments (e.g., laboratories, museums, libraries, parks and other outdoors locations) ◇

P.2028 use computers and other electronic technologies (e.g., computer, CBL, probe interfaces, laser discs) to collect, analyze and/or report data, interact with simulations, and research ◇

Science Themes/Subject Matter

P.21 ~~investigate, analyze, synthesize, and evaluate the concepts of kinematics (e.g., distance, time, velocity, acceleration)~~

P.22 ~~investigate, analyze, synthesize, and evaluate the concepts of dynamics (e.g., force, impulse, gravitation, conservation of energy, conservation of momentum, Newton's Laws)~~

P.23 ~~investigate, analyze, synthesize and evaluate the concepts of thermodynamics (e.g., kinetic molecular theory, heat exchange, work)~~

P.24 ~~investigate, analyze, synthesize, and evaluate the concepts of light and optics (e.g., waves, behavior of light, ray diagrams)~~

P.25 ~~investigate, analyze, synthesize and evaluate the concepts of electricity and magnetism (e.g., electrostatics, circuits, magnetic effects, electronic devices)~~

- P.26 investigate, analyze, synthesize, and evaluate the concepts of modern physics (e.g., atomic structure, nuclear changes, high energy physics)
- P.29 investigate, analyze, synthesize, and evaluate the big bang model of the evolution of the universe
- P.30 investigate, analyze, synthesize, and evaluate the quark model of the elementary particles
- P.31 investigate, analyze, synthesize, and evaluate the historical developments of the models of the atom
- P.32 investigate, analyze, synthesize, and evaluate our solar system
- P.33 investigate, analyze, synthesize, and evaluate the concepts of kinematics (e.g., position, velocity, acceleration, time)
- P.34 investigate, analyze, synthesize, and apply motion along a path using velocity and acceleration vectors (include straight lines, circles and ellipses, parabolas, and arbitrary curved paths)
- P.35 investigate, analyze, synthesize, and apply constant acceleration motion
- P.36 investigate, analyze, synthesize, and evaluate the concept of the fundamental forces and their applications to matter
- P.37 investigate, analyze, synthesize, and apply Newton's dynamic laws of motion
- P.38 investigate, analyze, synthesize, and evaluate applications of Newton's laws.
- P.39 investigate, analyze, synthesize, and apply the concepts of work and energy (include kinetic, gravitational and elastic potential, thermal)
- P.40 investigate, analyze, synthesize, evaluate, and apply the conservation laws of energy and momentum

- P.41 investigate, analyze, synthesize, and evaluate electric and magnetic forces and fields and their natural applications
- P.42 investigate, analyze, synthesize, and evaluate electrical circuits and their applications
- P.43 investigate, analyze, synthesize, and evaluate the concepts of waves and wave motion (include sound, water, and electromagnetic)
- P.44 investigate, analyze, synthesize, and evaluate light as an electromagnetic wave and as a photon and its optical applications (include eye, mirror, lenses, holograms, photoelectric)
- P.45 investigate, analyze, synthesize, and evaluate the quantization of matter and energy and its applications to modern technology
- P.46 investigate, analyze, synthesize, and evaluate Einstein's theory of special relativity and its basic development through assumptions and logical consequences.

Science History

- P.2747 identify contributors to the scientific body of knowledge including their diverse cultures
- P.2848 trace the historical development of key scientific concepts and principles describing their impact on modern thought and life
- P.2949 describe the impact of cultural, technological, and economic influences on the evolving nature of scientific thought and knowledge ♦
- P.50 investigate, analyze, synthesize, and evaluate the history of scientific developments demonstrating how new models depend on the findings of those came before
- P.51 integrate the history of science with cultural history to demonstrate that scientists work within their historical surroundings and are affected by them

P.52 investigate, analyze, synthesize, and evaluate the development of the models of the atom which led to quantum mechanics

Science, Technology, and Society

P.3053, apply scientific skills and technological tools to address personal and societal needs ◇

P.3154 engage in decision making activities and actions to resolve science-technology-society issues ◇

P.3255 investigate and analyze the interdependence of science and technology ◇

P.3356 describe the scientific concepts underlying technological innovations ◇

P.3457 explore occupational opportunities in science and technology including the academic preparation necessary ◇

P.58 investigate, analyze, synthesize, and evaluate the effects on today's economy and standard of living from the understanding of science and technology

P.59 investigate, analyze, synthesize, and evaluate those devices in the home that were developed from the understanding of science and technology

Computer and Technology

P.3560 access, gather, store, retrieve, and organize data using hardware and software designed for these purposes ◇

P.3661 collect, analyze and display data using computers and other electronic technology ◇

P.3762 access Internet resources for a variety of purposes (e.g., research, exchange data, E-mail, and real-time investigations) ◇

P.3863 demonstrate skills in use of word processing, data bases, spreadsheets, graphics and telecommunications ◇

P.3964 identify and solve problems with the appropriate technology ◇

P.4065 incorporate correct grammar, spelling, vocabulary and graphical representation for both written and oral multimedia presentations ◇

Physics - Technical / Conceptual (11/12)

Physics- Technical is a course designed for students who have completed Coordinated and Thematic Science Ten (CATS 10) and desire an in-depth study in physics to prepare them for technical careers. Basic physics principles are dealt with in **a thematic approach**. Principles are applied to four energy systems: mechanical, fluid, thermal, and electrical that make up both simple and complex technological devices and equipment. The course also emphasizes the analogies in mechanical, fluid, thermal, and electrical systems. Incorporated in the instruction is the mathematics needed to understand and apply the principles. PT.21 - PT.24.

Physics- Conceptual is a course designed for students who have completed Coordinated and Thematic Science Ten (CATS 10) and desire an in-depth study in physics that is an alternative to the traditional mathematical approach to physics. Emphasis will be on the concepts which underlie the natural laws of the universe. Mathematics will be de-emphasized. Laboratory work will require traditional physics measurements to be made. SI (metric) units of measurement will be used. PC.25-PC.30.

Students in Physics-Technical or Physics- Conceptual will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities.

Nature of Science

- PTC.1 participate in activities that consider alternate, changing points of view to stimulate the development of a sense of inquiry ◇
- PTC.2 recognize general limitations of science
- PTC.3 **explain that science is composed of observations set in a testable framework of ideas**
- PTC.4 conclude that science is a blend of creativity, logic, and mathematics

Scientific Attitudes/Habits of Mind

- PTC.5^{4,5,6,7,8,9,10} **model and exhibit the skills, attitudes, and/or values of scientific inquiry (e.g., curiosity, logic, objectivity, openness, skepticism, appreciation, diligence, integrity, fairness, creativity) ◇**
- PTC.6 demonstrate ethical practices for science (e.g., established research protocol, accurate record keeping, replication of results, and peer review)◇

- PTC.7 **apply scientific approaches to seek solutions for everyday problems (e.g., personal, community health, population growth, natural resources, environmental quality, natural and human induced hazards, and scientific and technological challenges) ◇**

Scientific Processes/Thinking Skills

- PTC.8^{3,4,5,6,7,8,9,10} **demonstrate science processes within a problem solving setting (e.g., observing, measuring, communicating, comparing, ordering, categorizing, classifying, relating, hypothesizing, predicting, inferring, and applying) ◇**
- PTC.9^{3,4,5,6,7,8,9,10} **organize qualitative and quantitative data into tables, diagrams, and/or graphs for analysis◇**
- PTC.10^{3,4,5,6,7,8,9,10} **identify, analyze, and infer using patterns and relationships in data (e.g., cause**

and affect, graphical analysis including interpretation interpretation and extrapolation)

◇

- PTC.11 use SI (metric) measurements
- PTC.12 apply rational thinking processes that underlie scientific approaches to problem solving by employing critical thinking skills, imagination, and creativity while working individually and/or cooperatively ◇
- PTC.13 use the tools of science safely, accurately and appropriately ◇
- PTC.14_{4,5,6,8,9} identify independent and dependent variables in experimental investigations
- PTC.15₉ manipulate variables to extend experimental activities
- PTC.16₉ **design, conduct, evaluate and revise experiments (e.g., identify questions and concepts that guide scientific investigations; design and conduct scientific investigations; use technology and mathematics to improve investigations and communications; formulate and revise scientific explanations and models using logic and evidence; recognize alternative explanations; communicate and defend a scientific argument; understand scientific inquiry) ◇**

Laboratory Investigations/

Hands-on Learning

- PTC.17 engage in active inquiries, investigations, and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and laboratory skills ◇
- PTC.18 properly and safely manipulate equipment, materials, chemicals, organisms, and models ◇
- PTC.19 conduct explorations in a variety of environments (e.g., laboratories, museums, libraries, parks and other outdoors locations) ◇
- PTC.20 use computers and other electronic

technologies (e.g., computer, CBL, probe interfaces, laser discs) to collect, analyze and/or report data, interact with simulations, and research ◇

Science Themes/Subject Matter

- PT.21 **qualitative and quantitative analysis of mechanical systems (e.g., force, work, rate, resistance, energy, power, force transformations)**
- PT.22 **qualitative and quantitative analysis of fluid systems (e.g., pressure, work, rate, resistance, energy, power, force transformations)**
- PT.23 **qualitative and quantitative analysis of electrical systems (e.g., voltage, work, rate, resistance, energy, power, force transformations)**
- PT.24 **qualitative and quantitative analysis of thermal systems (e.g., temperature, rate, resistance, energy)**
- PC.25 **investigate and analyze the concepts of kinematics (e.g., distance, time, velocity, acceleration)**
- PC.26 **investigate and analyze the concepts of dynamics (e.g., force, impulse, gravitation, conservation of energy, conservation of momentum, Newton's Laws)**
- PC.27 **investigate and analyze the concepts of thermodynamics (e.g., kinetic molecular theory, heat exchange, work)**
- PC.28 **investigate and analyze concepts of light and optics (e.g., waves, behavior of light, ray diagrams)**
- PC.29 **investigate and analyze concepts of electricity and magnetism (e.g., electrostatics, circuits, magnetic effects, electronic devices)**

PC.30 **investigate and analyze concepts of modern physics (e.g., atomic structure, nuclear changes, high energy physics)**

Science History

- PTC.31 identify contributors to the scientific body of knowledge including their diverse cultures
- PTC.32 trace the historical development of key scientific concepts and principles describing their impact on modern thought and life
- PTC.33 describe the impact of cultural, technological, and economic influences on the evolving nature of scientific thought and knowledge
◇

Science, Technology, and Society

- PTC.34, apply scientific skills and technological tools to address personal and societal needs ◇
- PTC.35 engage in decision making activities and actions to resolve science-technology-society issues
◇
- PTC.36 investigate and analyze the interdependence of science and technology ◇
- PTC.37 describe the scientific concepts underlying technological innovations ◇
- PTC.38 explore occupational opportunities in science and technology including the academic preparation necessary ◇

Computer and Technology

- PTC.39 access, gather, store, retrieve, and organize data using hardware and software designed for these purposes ◇
- PTC.40 collect, analyze and display data using computers and other electronic technology ◇
- PTC.41 access Internet resources for a variety of purposes (e.g., research,

exchange data, E-mail, and real-time investigations) ◇

PTC.42 demonstrate skills in use of word processing, data bases, spreadsheets, graphics and telecommunications ◇

PTC.43 identify and solve problems with the appropriate technology ◇

PTC.44 incorporate correct grammar, spelling, vocabulary and graphical representation for both written and oral multimedia presentations ◇

FISCAL NOTE WORKSHEET
(Submit 4 Copies)

HD NO _____ DRAFT NO _____ BILL NO _____ RESOLUTION NO _____

SUBJECT Policy 2520: Instructional Goals and Objectives for WV Schools: Speech I, Journalism, Foreign Languages, Robert C. Beach Vocational Agriculture Credit and Science FUND _____

SOURCE OF REVENUE: ☐ GENERAL FUND ☐ SPECIAL ☐ OTHER (SPECIFY) _____

COST OF ESTIMATE BASED ON: ☐ AN ORIGINAL ESTIMATE ☐ BUDGET BILL ☐ OTHER (SPECIFY) _____

INCOME ESTIMATE BASED ON: ☐ AN ORIGINAL ESTIMATE ☐ BUDGET BILL ☐ OTHER (SPECIFY) _____

SHOW OVER-ALL EFFECT IN ITEMS 1 AND 2 & GIVE EXPLANATION OF BREAKDOWN BY FISCAL YEAR INCLUDING LONG-RANGE EFFECT

EFFECT OF PROPOSAL	ANNUAL		FISCAL YEAR		
	INCREASE	DECREASE	CURRENT	NEXT	THEREAFTER
1. ESTIMATED TOTAL COST	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
PERSONAL SERVICES CURRENT EXPENSES REPAIRS/ALTERATIONS EQUIPMENT OTHER	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
2. ESTIMATED TOTAL REVENUES	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0

3. EXPLANATION OF ABOVE ESTIMATES (INCLUDING LONG-RANGE EFFECT):

NO COST

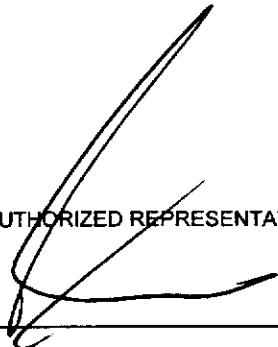
DATE

AGENCY

AUTHORIZED REPRESENTATIVE

November 9, 2000

West Virginia Department of Education



123CSR44

**Policy 2520: Instructional Goals and Objectives
For West Virginia Schools**

Comment Response Form

Please use this form when commenting on proposed Policy 2520. You may attach additional sheets if necessary.

Individual/Organization: _____

Title: _____

Street Address: _____ **City, State, Zip:** _____

Comments/Suggestions

SPEECH I:
Communication Process
Interpersonal Communication
Listening
Research
Public Speaking
Group Discussion/Teamwork

Technology

*Return comments by **December 11, 2000**, to:*

Deborah Harki

West Virginia Department of Education

1900 Kanawha Blvd., East

Building 6 - Room 330

Charleston, WV 25305

Phone: (304) 558-7805

Fax: (304) 558-0459

123CSR44

**Policy 2520: Instructional Goals and Objectives
For West Virginia Schools**

Comment Response Form

Please use this form when commenting on proposed Policy 2520. You may attach additional sheets if necessary.

Individual/Organization: _____

Title: _____

Street Address: _____ **City, State, Zip:** _____

Comments/Suggestions

JOURNALISM:
Oral Communication
Written Communication
Visual Communication
Technology
Business Aspects

Legal and Ethical Aspects
Professional Skills

SPECIALITY COURSES IN JOURNALISM:
Newspaper
Yearbook
Broadcasting
Photojournalism
Desktop Publishing
Public Relations

Return comments by **December 11, 2000**, to:
Deborah Harki
West Virginia Department of Education
1900 Kanawha Blvd., East, Building 6 - Room 330
Charleston, WV 25305
Phone: (304) 558-7805
Fax: (304) 558-0459
E-mail: dharki@access.k12.wv.us

**Policy 2520: Instructional Goals and Objectives
For West Virginia Schools**

Comment Response Form

Please use this form when commenting on proposed Policy 2520. You may attach additional sheets if necessary.

Individual/Organization: _____

Title: _____

Street Address: _____ **City, State, Zip:** _____

Comments/Suggestions

FOREIGN LANGUAGE INSTRUCTIONAL GOALS AND OBJECTIVES:
Introduction
Program of Study: Overview
Foreign Language Instructional Goals
Process/Workplace Skills

EXPLORATORY FOREIGN LANGUAGES:
Introduction
Communication
Cultures
Connections

FOREIGN LANGUAGES LEVEL I:

Communication

Cultures

Connections

FOREIGN LANGUAGE LEVEL II:

Communication

Cultures

Connections

FOREIGN LANGUAGE LEVEL III:

Communication

Cultures

Connections

FOREIGN LANGUAGE LEVEL IV:
Communication
Cultures
Connections

FOREIGN LANGUAGE TECHNOLOGY OBJECTIVES:

FOREIGN LANGUAGE INSTRUCTIONAL PRACTICES:

Return comments by **December 11, 2000**, to:
Deborah Harki
West Virginia Department of Education
1900 Kanawha Blvd., East
Building 6 - Room 330
Charleston, WV 25305
Phone: (304) 558-7805
Fax: (304) 558-0459
E-mail: dharki@access.k12.wv.us

**Policy 2520: Instructional Goals and Objectives
For West Virginia Schools**

Comment Response Form

Please use this form when commenting on proposed Policy 2520. You may attach additional sheets necessary.

Individual/Organization: _____

Title: _____

Street Address: _____ City, State, Zip: _____

Comments/Suggestions

Agricultural Biotechnology

Agriscience 11

Animal and Veterinary Science- Small Animals

Animal and Veterinary Science - Large Animals

Aquaculture

Environmental Technology

Greenhouse Technology

Horticulture

Soil and Plant Science

Return comments by December 11, 2000, to:

Donald Michael

West Virginia Department of Education

1900 Kanawha Blvd., East

Building 6 - Room 243

Charleston, WV 25305

Phone: (304) 558-2347

Fax: (304) 558-3946

E-mail dmichael@access.k12.wv.us

**Policy 2520: Instructional Goals and Objectives
Science
Comment Response Form**

Please use this form when commenting on proposed Policy 2520: Science IGOs. You may attach additional sheets if necessary.

Individual/Organization: _____

Title: _____

Street Address: _____ **City, State, Zip:** _____

Comments/Suggestions

Biology - Technical Conceptual (11/12)
Nature of Science
Scientific Attitudes/Habits of Mind
Scientific Processes/Thinking Skills
Laboratory Investigations/Hands-On-Learning
Science Themes/Subject Matter
Science History
Science, Technology, and Society
Computer/Technology

General Comments:

*Return comments by **December 11, 2000**, to:*
Phyllis Barnhart, Executive Director, Science
West Virginia Department of Education
Building 6 - Room 330, 1900 Kanawha Blvd., East
Charleston, WV 25305
Phone: (304) 558-7805 Fax: (304) 558-0459
e-mail: pbarnhar@access.k12.wv.us