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 practice good speech etiquette∀
SP.13 ask questions in the proper form and tone at the appropriate time (e.g., classroom conversation, panel discussion)∀
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∀

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 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 leader∀
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∀

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 judgment (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)
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 sources, show objectivity, report fairly and accurately, complete assignments, meet deadlines)∀
JN.58 work collaboratively and cooperatively (e.g., teamwork, problem solving, brainstorming, 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 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 basic 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)∀
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

X Beginning in Fall 1998, all counties are encouraged to offer two years of foreign language in grades seven and eight.

X 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*). If native English speakers 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.

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 (equivalent to one year of high school study). 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.

Required elective program of study: Grades 9-12

X A **minimum** of two levels of one foreign language will be required to be offered.

X 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. 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 national *Standards for Foreign Language Learning: Preparing for the 21st Century* and the *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 leads to an awareness of and an appreciation for cultural diversity.
- Foreign language study enhances other areas of study through development of higher order thinking skills and a clearer understanding of one's native language.
- Foreign language skills 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

e **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.

e **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.

ε **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.
- **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).∀

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

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, inter-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)

1.1. 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, 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 Listen to and/or watch culturally relevant multi-media sources with supporting activities.

I.10 Identify people and objects based on oral and/or written descriptions.

I.11 Read isolated words and phrases in a situational context (e.g., menus, signs, schedules, advertisements).

I.12 Read language that the student is able to speak.

Non-interactive Language Production (Presentational)

I.13 Give directions, instructions and short personal communications to listeners and readers.∀

I.14 Recite material and/or sing in the target language.

I.15 Write familiar words or phrases (e.g., colors, dates, simple autobiographical information).

I.16 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 I.3 Use vocabulary, basic inflectional systems and syntax appropriate to the students' reading level.

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 Recite material and/or sing in Latin.

LAT I.7 Write simple phrases and sentences.

CULTURES

Daily Life

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

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

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

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

Contributions

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

Sociolinguistic Applications

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

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

Culture Comparisons

I.24 Recognize similarities and differences between native and target cultures, including
LAT I.15

X contributions
- X cultural viewpoints
- X practices.∀

I.25 Identify differences in cultural practices among same-language cultures.∀

CONNECTIONS

Linguistic Connections

I.26 Recognize similarities and differences, including
LAT.16

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

I.27 Demonstrate an awareness of sociolinguistic conventions in native and target languages (e.g., formal/informal, non-verbal communication, vocabulary choice).

Interdisciplinary Connections

I.28 Recognize information and skills common to the foreign language and other disciplines.∀
LAT 1.17
I.29 Identify the general topic of print and nonprint sources intended for native speakers of the
LAT I.18 language.(e.g., tombstones, monuments, building inscriptions -- *for Latin*).

Global Connections
I.30 Identify opportunities to use the target language outside the classroom.
LAT I.19

I.31 Locate resources in the community which relate to the target culture(s) and/or language.∀
LAT1.20

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 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.I 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 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).∀

II.9 Write short paragraphs on topics of personal interest. ∀

II.10 Prepare brief written reports using primary sources. ∀

II.11 Read aloud a familiar passage with appropriate intonation and comprehensible pronunciation.

II.12 Summarize, in oral or written form, plot and characterization from selected authentic materials.

II.13 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 imitation.

LAT II.6 Respond to questions, statements, commands and other stimuli.

LAT II.7 Write phrases and sentences.

CULTURES

Daily Life

II.14 Describe objects, images, products and symbols of the target culture(s).
LAT II.8

II.15 Identify daily routines, cultural viewpoints and practices in the target culture(s).
LAT II.9

II.16 Identify and discuss generalizations about the target culture(s).
LAT II.10

II.17 Discuss social, geographic, and historical factors that impact cultural practices.
LAT II.11

Contributions

II.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.19 Identify common words, phrases and idioms within a cultural context that reflect the target
LAT II.13 culture(s).

II.20 React to language and behaviors that are/were appropriate to the target culture(s).
LAT II.14

Culture Comparisons

II.21 Discuss similarities and differences between native and target cultures including:
LAT II.15

X contributions
X cultural viewpoints
X practices.

II.22 Explain cultural practices among same-language cultures. ∀
LAT II.16

CONNECTIONS

Linguistic Connections

II.23 With guidance, predict structural similarities and differences between native and target
LAT II.17 languages, including

X sound patterns
X word formation patterns
X connotations and denotations
X sentence structure
X idiomatic expressions
X cognates
X derivatives.∀

II.24 Recognize examples of sociolinguistic conventions in both native and target languages.
LAT II.18

Interdisciplinary Connections

II.25 LAT II.19 With guidance, apply information and skills common to the target language to other disciplines. ∀

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

Global Connections

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

II.28 LAT II.22 Use resources in the community to explore aspects of the target culture and languages.∀

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 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, 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 Support opinions using previously learned vocabulary and grammatical structures.∀

Non-interactive Language Comprehension (Interpretive)

III.3 Understand the main idea and significant details of live and recorded discussions, narratives and presentation(s).

III.4 Gain new information and knowledge and derive the main idea and significant details from authentic written materials (e.g.,personal letter, pamphlets, newspaper and magazine articles, advertisements and selected literary texts).

Non-interactive Language Production (Presentational)

III.5 Give descriptions using more complex grammatical structures.

III.6 Give oral reports on a given topic.∀

III.7 Produce formal and informal written communication.∀

III.8 Complete authentic forms and documents.∀

III.9 Take notes on oral presentations.∀

III.10 Write brief paraphrases of written material.

III.11 Use the language creatively (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 students' 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.12 Explain objects, images, products and symbols of the target culture(s).

LAT III.7

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

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

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

Contributions

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

Sociolinguistic Applications

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

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

Culture Comparisons

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

- X contributions
- X cultural viewpoints
- X practices.∀

III.20 Compare and contrast cultural practices among same-language cultures.∀

CONNECTIONS

Linguistic Connections

III.21 LAT III.14 Discuss structural similarities and differences between native and target languages, including:

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

III.22 Independently identify examples of sociolinguistic conventions in both native and target languages.

Interdisciplinary Connections

III.23 LAT III.15 Identify and transfer information and skills which can be applied to other disciplines.∀

III.24 LAT III.16 Extract the main idea and some supporting details from sources intended for native speakers of the language.

Global Connections

III.25 LAT III.17 Use the target language outside the classroom.

III.26 LAT III.18 Use resources in the community to experience the target culture, and language.∀

Foreign Languages Level IV

In modern foreign languages, level IV students initiate, sustain, and 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 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.1 Initiate and sustain conversations which may include:
X interviews
X extended descriptions
X narrations and
X responses.

IV.2 Exchange opinions 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).∀

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.6 Comprehend the main ideas and significant details in selected authentic texts.

IV.7 Read for comprehension from a variety of longer authentic materials (e.g., short stories, newspapers, magazines, personal correspondence).

IV.8 Make judgments about what is read (e.g., identify cause and effect relationships, predict outcomes).

Non-interactive Language Production (Presentational)

IV.9 Speak and write spontaneously about present, past and future events using learned vocabulary and grammatical structures.

IV.10 Convey pertinent information from authentic materials to an audience. ∀

IV.11 Give oral reports on a given topic.∀

IV.12 Write a well-organized composition on a given topic.∀

IV.13 Use the language creatively (e.g., in writing and presenting poetry, prose, essays).

IV.14 Write a letter or an article describing and analyzing an issue of importance to them.∀

IV.15 Take detailed notes on oral presentations.∀

IV.16 Write a summary of a short story, newspaper or magazine article.∀

LATIN COMMUNICATION

Reading Comprehension

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 students' 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.17 Analyze the cultural significance of objects, images, products and symbols of the target
LAT IV.7 culture(s).∀

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

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

IV.20 Analyze different cultural practices.∀
LAT IV.10

Contributions

IV.21 Analyze and evaluate the development of artistic, scientific and philosophical contributions
LAT IV.11 of the target culture(s) and the historical factors that impacted those contributions.

Sociolinguistic Applications

IV.22 Integrate culturally embedded words, phrases and idioms into everyday communications.
IV.23 Apply language and behaviors appropriate to the target culture in an authentic situation.

Culture Comparisons

IV.24 Explain the significance of similarities and differences between native and target cultures,
LAT IV.12 including
- X contributions
- X cultural viewpoints
- X practices.∀

IV.25 Analyze cultural practices among same-language cultures.∀

CONNECTIONS

Linguistic Connections

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

IV.27 Explain similarities and differences in sociolinguistic conventions between native and target languages.∀

Interdisciplinary Connections

IV.28 Continue to transfer and apply information gathered through foreign language resources for use in other disciplines.∀

IV.29 Extract the main idea and most supporting details from sources in other disciplines intended for native speakers of the language.

Global Connections

IV.30 Continue to use the target language outside the classroom.
LAT IV.14

IV.31 Use resources in the community to internalize aspects of the target culture(s) and
LAT IV.15 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:

- X provide immediate access to authentic language
- X provide meaningful access to cultural resources
- X provide access to unrehearsed, spontaneous discourse in the target language
- X provide venues for practice, review, re-teach, and acceleration to meet each student's individual learning pace
- X enable students to take increasing responsibility for their own learning
- X 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

- X acquire information
- X access libraries
- X identify job-related skills in the target language
- X explore opportunities to live and/or study in a target language country
- X communicate in the target language intra-school and inter-school, inter-city, inter-state, and internationally
- X correspond with a "key pal" ∀

FLT2. use computer software to

- X retrieve information
- X select materials from other disciplines supporting special topics in the target language
- X 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
- X record responses for teacher or self-assessment
- X interact with other students studying the target language through games and software ∀

FLT3. use the VCR and laser discs/DVD, to

- X view and listen to interactions of native speakers in both simulations and culturally authentic situations, and complete assigned tasks
- X prepare presentations on assigned topics
- X gather information to complete classroom assignments ∀

FLT4. use TV/satellite to

- X retrieve specific information by watching news reports, talk shows, documentaries, soap operas, cartoons and commercials
- X glean cultural information ∀

FLT5. use the language laboratory, tape recorder, record player or CD player to

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

FLT6. use cameras and/or camcorders to
X record role plays such as skits, newscasts and interviews for self-assessment
X develop narratives and other descriptive activities∀

FLT7. use various projectors (e.g., overhead, LCD, slide, opaque, filmstrip)
X give presentations on various topics∀

FLT8. use radio/short-wave radio to
X retrieve specific information
X 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.

X Use the target language extensively for classroom communication.

X Provide frequent opportunities for target language use with peers and teacher.

X Include realistic applications of language use whenever possible.

X Provide opportunities to hear native speakers of the target language.

X Incorporate authentic materials as often as possible.

X Create a culturally authentic atmosphere through use of art, literature, crafts, music, food, etc.

X Utilize available technology.

X Use instructional materials that are as diverse as the teaching strategies.

X Tap into students' creative talents to enrich classroom activities.

X Present content through reading and listening first before asking students to use content in writing and speaking.

X Allow opportunities for students to communicate in a low risk environment.

X Match error correction with the objective.

X Reinforce course content through continuous review and application.

X Assign appropriate homework, including both long and short-term projects.

X Provide sufficient opportunities for students to demonstrate achievement so that extra credit is not necessary to compensate for unsatisfactory student performance.

X 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 Agricultural 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 Experimential 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, chair & 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 workingknowledge 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.
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, nitrates, 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

AQUA36 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.

AQUA37 Demonstrate skills in word processing and the use of data bases, spreadsheets, graphics, and telecommunications.

AQUA38 Use TV/satellite, VCR and Laserdiscs/DVD to retrieve information to complete assignments related to aquaculture .

AQUA39 Use cameras and/or camcorders to record activities and progress of special projects in the area of aquaculture .

Process/workplace Skills and Aquaculture

AQUA40 Use computers and other electronic technologies to access, gather, store, retrieve, organize, analyze, and report data.

AQUA41 Explore careers available in aquaculture.(AB)

AQUA42 Use a variety of sources to investigate the educational requirements of various careers in aquaculture and related sciences.(AB)

AQUA43 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.

AQUA44 Demonstrate correct language usage in all oral and written work.

AQUA45 Perform effectively in both leadership and non-leadership roles.

AQUA46 Evaluate information for reliability, completeness, and applicability to various assignments.

AQUA47 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, materia ls, 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).(C0, 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.
SPS51 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)

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.

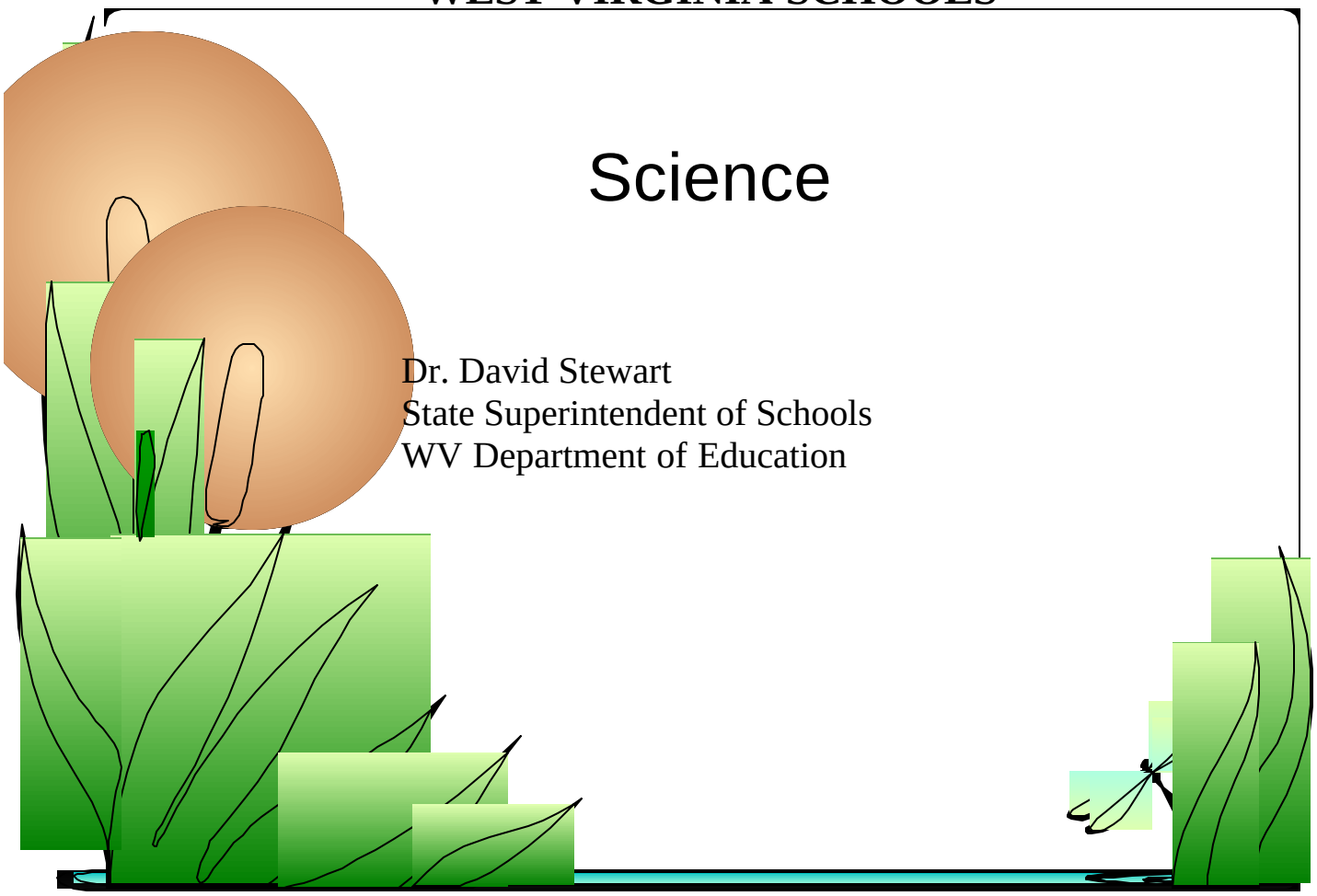
SPS59 Perform effectively in both leadership and non-leadership roles.

SPS60 Evaluate information for reliability, completeness, and applicability to various assignments.

SPS61 Participate as a team member to complete a variety of assignments.

INSTRUCTIONAL GOALS
AND
OBJECTIVES

FOR
WEST VIRGINIA SCHOOLS



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*Instructional materials to be adopted 2001-2002; to be offered 2002-2003

Document Guide

- Boldface font indicates the objectives that will be assessed on the state standardized test.
- Grade Three numerical notations ($6.28_{7,8}$) indicate the objective will be assessed at additional grade level(s).
- ∀ notation indicates the objective is a workplace readiness skill.

Science Curriculum and 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 the 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.

Science Program of Study

Early Childhood K - 2

Science may be taught as separate or integrated program. Components of career awareness and the application of technology shall be included during instruction in all subjects.

Early Childhood 3 - 4

Science shall be taught daily with a reteach component assuring mastery of the instructional objectives. Reteaching is to occur daily for those students needing more help. Components of career awareness and the application of technology shall be included during instruction in all subjects.

Middle Childhood (Grades 5 - 8)

Science shall be taught daily with a reteach component assuring mastery of the instructional objectives. Schools implementing block schedules will provide equivalent instructional time to the core areas. Career awareness and the application of technology shall be taught in all programs of study.

Adolescent (Grades 9 - 12)

Requirements for Graduation — **3 courses**

Coordinated and Thematic Science 9 (CATS 9)
Coordinated and Thematic Science 10 (CATS 10)
One Approved Elective course above CATS 10

Credits for these courses are to be awarded based upon demonstrated mastery of the instructional objectives.

Approved Electives 9 - 12*

Advanced Biology (11/12)
Biology - Technical Conceptual (11/12) *beginning 2002-2003*
Human Anatomy & Physiology (11/12)
Advanced Chemistry (11/12)
Chemistry - Technical Conceptual (11/12)
Advanced Environmental Earth Science (11/12)
Advanced Physics (11/12)
Physics - Technical Conceptual (11/12)
AP Courses
College Courses

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

Science elective offerings not based on West Virginia Board of Education Instructional Goals and Objectives must have written goals and objectives approved by the county board of education. **Approved science electives must address all seven overarching goals of the science curriculum.**

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

K.2 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 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 (e.g., 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

K.12 listen to and be tolerant of different

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K.13 continue probing phenomena until

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K.15 recognize that scientists work alone things, effects of weather) and a part of

K.14 regard science as an integrated whole

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K.17 collect and record information in a w
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Scientific Processes/Thinking Skills

K.16 develop observational skills (e.g., use

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K.18 use a variety of classification systems

K.19 make predictions based on personal preferences (e.g., sorting by color, shape, size, texture, or smell)

r-snow, bud-flowers, metamorphosis of butterflies)

K.20 use mathematical skills in i

		measuring)
K.21	participate in drawing conclusions and	making decisions
K.22	use decision making skills in daily life	
		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 liquidor 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 (

K.35 understand the terms hot and cold,

K.36$_{5}$ demonstrate that heat can be created for rest, pond, field) - models warm

K.37$_{3,5,6,8,10}$ discover magnetic properties of and cool - 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)

K.40[3,5,6,8,10,11] observe various particle sizes (e.g.,

K.41 explore changes in energy (e.g.,

old, light/dark, loud/soft)-changes

K.42 show that objects can be moved in different way

K.43 observe, record, and compare the

length of time it takes to travel from one place to a

K.44 using a color chart, identify the colors-

K.45 observe clouds and know that there

K.46 observe the effects of wind- systems

K.47$_{3}$ name and describe the four seasons-

K.48$_{3,5,8}$ observe the weather and describe it in

K.49$_{3}$ observe air temperature changes

K.50$_{3}$ observe and graph daily changes in

K.51$_{3}$ recognize that there are more stars

K.52$_3$ recognize that the stars, sun, and moon can be seen or counted as changes

K.53 observe and compare the properties of air

K.54 observe the effects of weather on people to move as changing

materials that there are many science-related careers

K.65 recognize that science skills are used in most careers

K.66 observe how technology has benefits as well as draw backs

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$K.55_{3}$ explore the reason for day and night-

$K.56_{3,4,5,7,9}$ observe and describe the evaporation of water - changes

K.57 make a model of the earth to illustrate that the earth has more water than land- models

$K.58_{3}$ use materials to make imprints (e.g., wet sand, clay)- models

$K.59_{3}$ draw and describe models of the sun, moon, and earth- models

$K.60_{3,4}$ use a chart to identify the types of daily weather (e.g., sunny, cloudy)- models

Science History

K.61 listen to the lives and discoveries of scientists

K.62 recognize that science changes over time

K.63 realize that scientists will continue to discover new things (e.g., current events)

Science, Technology, and Society

K.64 recognize through the use of speakers, field trips, audio-visual, and/or printed

K.67 observe that common daily events involve science (e.g., riding bikes, pencil sharpen

K.68 develop respect and responsibility for

onship of living and non-living things and engaging

Computer/Technology

K.69 use appropriate software to practice

instructional objective

K.71 on a keyboard, use special function in science

K.70 on a keyboard, use the letters of his/her name and

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.,

Grade One Science

The Coordinated and Thematic Science (CATS) One objectives build on the process skills and add 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

1.2 recognize the roles of people involved in science careers

1.3 explore objects and events using the five senses

1.4 describe observations as accurately as possible

1.5 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 (e.g., 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 observations of changes in their environment (e.g., life cycles, motion of celestial objects, sun and shadow)

1.11 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 and accept results of

1.13 listen to and be tolerant of different

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in collaborative activities

1.14 continue probing phenomena until questions are resolved

of sun and moon)

1.15 recognize that developing solutions to problems takes time

Scientific Processes/Thinking Skills

1.17 develop observation skills (e.g., use of and patience)

1.18 collect, record, and compare

1.16 recognize that science includes both in

tion (e.g., pie chart, bar graph of height, months

1.19 use a variety of classification systems

iate objects and characteristics (e.g., spirals in s

1.20 measure the length and width of various objects using standard and non-standard

		a r s)
1.21	use mathematical skills in scientific	i n v e s t i g a t i o
1.22	describe trends of data and make	s (e . g . , o r d e r i n g , s e q u e n c i n g , m e a

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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., a system 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

ace, and on land (e.g., birds and airplanes flying,

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1.36$_{3,5,6,7}$ recognize that heat can be produced in

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1.37$_{3,6,7}$ understand energy types and sources

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1.38 compare the effects of force on an

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stopping, slowing down, speeding up) - systems direc

1.39 notice that objects can change

, light off a mirror) - changes motion while moving o

1.40 observe the changes in the object's

1.41 recognize that sound may change as it changes travels through different substances (e.g.,

1.42[3,5,6,8,10] examine objects with magnetic

and iron filings between transparencies)

1.44 record/draw a person's shadow at changes

1.43 draw pictures of objects that produce

1.45 construct a model of a simple machine

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1.46 construct a musical instrument to

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1.47$_3$ compare the day sky with the night

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1.48$_3$ identify stars as very distant objects

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1.49 explain that the moon reflects light

1.50 identify reasons why the sun is

1.51 identify bodies of water and land forms on Earth- systems

1.52$_3$ identify important uses of air- systems

1.53$_3$ 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

1.56$_3$ understand that the sun, moon, and stars appear to move- changes

1.57$_3$ observe that some materials transfer heat better than others- changes

1.58 identify the globe as a model of the Earth- models

1.59$_3$ 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 window)- models

Science History

1.63 study the lives and discoveries of scientists

1.64 recognize that scientific explanations can change over time

1.65 realize that scientists will continue to discover new things (e.g., current events)

t a n t - s y s t e m s

Science, Technology, and Society

1.66 recognize through the use of speakers, field trips, audio-visual, and/or printed

1.67 recognize that science skills are used materials

1.68 develop an awareness of how careers technology has

1.69 recognize that common daily events positively or negatively affect

players, velcro, weather)

1.70 develop respect and responsibility for the environment by recogni

things and engaging in conservation practices

Computer/Technology

1.71 use appropriate software to practice and

1.72 turn on/off a student workstation
1.73 on a keyboard, use letters, numbers, and other special function keys (e.g., shift, de

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
1.79 (using the graphing application of e.g., disk, softw

are, create tables and/or bar graphs

1.80 use a calculator to perform mathematical fu

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

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 describe observations as accurately as possible

2.5 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 (e.g., 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

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 and accept results of

2.13 listen to and be tolerant of different

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2.14 continue probing phenomena until
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2.15 engage in problem-solving activities

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Scientific Processes/Thinking Skills

2.16 recognize that science includes both solutions of individual and cooperative explanations

2.17 observe, collect and record

2.18 use a variety of classification systems

2.19 use mathematical skills in SI (metric) sequencing, measuring (e.g., properties of living a

addition and subtraction

2.20 use data to make predictions and on, measurement of length, wei

ons (e.g., sink and float, magnetic and non-magnetic)

2.21 plan and conduct simple

Laboratory Investigations/Hands-On Learning

2.22 engage in active inquiries,

nvestigations and hands-on activities for a minimum

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; 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 - systems

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

ment, structures, and functions of living 2.33[3,4,5,6,7,8] identify substances, mixtures and things (e.

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2.34$_{3,5,6,8,10}$ demonstrate that a magnet can attract

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2.35 illustrate ways to produce sound-

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2.36$_{4,5,6,7,8,9,10,11}$ explain energy types, sources and

2.37 recognize that sound can change in

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2.38 investigate how matter changes from

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2.40 recognize that some materials conduct
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2.42 recognize that a shadow is cast when

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2.44 identify structural adaptations that

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2.43[3] explain how the Earth rotating on its

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2.45 describe the water cycle and identify various sources of water-systems (e.g., wind move

2.46[5,6,9,11] distinguish changes in the atmosphere

2.47 collect and observe the amount of rain

2.48 examine changes in non-living things

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2.52_3 onstruct and explain models (e.g.,

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2.49_3 understand that the moon has phases -

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2.50_3 describe how fossils are formed -

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2.51_3 identify resources used for heating

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$2.53_{3,4}$ onstruct a chart showing weather

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2.54$_3$ 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

2.56$_3$ match a fossil or a picture of a fossil, with a picture of its original organism (e.g., dinosaur bones, shell, fern) - models

Science History

2.57 study the lives and discoveries of scientists of different cultures and backgrounds

2.58 recognize that scientific explanations can change over time

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

2.61 understand that science skills are used in most careers

2.62 understand how technology has positively or negatively affected the quality of life

Period of time - models

2.63 understand that common daily events involve science

2.64 develop respect and responsibility for the environment by recognizing the

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Computer/Technology

2.65 use appropriate software to practice

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2.66 practice correct keyboarding posture

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2.67 use a mouse to “click and drag”

2.68 execute a science program from disk

2.69 using the graphing application of the spreadsheet program for the home row keys and/or CD-ROM

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2.70 use appropriate software to practice

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2.71 identify the ways technology changes

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2.72 describe the right of an individual to

2.73 identify the function of the various (computer) work components of a computer system (e.g

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 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

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

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 (e.g., 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 in

3.13 listen to and be tolerant of different

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3.14 continue probing phenomena until questions are resolved

3.15 recognize that developing solutions to problems takes time, patience

3.16 recognize that science includes both

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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., or**

3.18$_{3,4,5,6,7,8,9,10,11}$ **given a set of objects, group ,**

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er the objects according to an established scheme (e

3.19$_{6,8,11}$ **given a set of events, objects, actions) shapes, designs,**

3.20$_{4,5}$ **apply mathematical skills and use numbers, find patterns of**

g,

3.21[3,4,5,6,7,8,9,10,11] **establish a data table, graph, map, or diagram and use it to calculations, and measurements of length and volu**

3.22 support statements with facts (e.g., found in reference, science-related 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)**

3.25[7] **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 affect 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., a system 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

ng objects in the natural world integrating living or

3.32 establish connections across the matter curriculum (e.g., integrate science with mat

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3.33[3,4,5,6,8,10,11] **compare, sort, and group objects**

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3.34[4,5,6,7,8,9,10,11] **compare and contrast chemical g**

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3.35$_{3,4,5,6,7,8}$ **identify the structures of living - systems things, including their systems, and explain**

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3.36$_{5,7,9}$ **relate the structures and behaviors**

g., beaks and feet in birds, seed dispersal, camouflage

3.37[5,6,7,8,9,10] **describe the relationships among**

and animals in a closed system of interdependent or

3.38[5,6,7,8,9,10] identify relationships among

nisms in an ecosystem (e.g., sequencing food chains,

ons, predator-prey relationships) -systems

3.39[4,5,6,7] **observe, measure, and recordchanges in living**

within specifies) - changes

3.40$_{3,4,5,6,7,8}$ **manipulate, measure, diagram, construct, arrange, observe and discuss models of plant and anim**

3.41$_{3,5,6,8,10,11}$ **observe chemical reactions (e.g.,**

Alka Seltzer and water) - changes

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 explore the relationship between the strength of the electromagnet 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

3.54$_{4}$ 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 cause day and night - systems**

3.56$_{4,6}$ **explain how the revolution of Earth and the tilt of Earth's axis cause 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**

3.60$_{4}$ **relate changes in the environment to the water cycle -changes**

3.61$_{10}$ **recognize fossils as a record of time**

(e.g., what organism)

3.62$_{10}$ **use a simple time line to illustrate**

3.63$_{5,8}$ describe weather changes by changes on the Earth over the past 50 million years -

3.64$_{4,5,7,10}$ explore the eroding of different

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3.65 describe how volcanoes and

3.66$_{4,6}$ **recognize the movement of the Sun**

s h i p t o t h e e a r t h ' s p o s i t i o n - c h a n g e s

3.67$_4$ recognize the existence of c o n s t e l l a t i o n s

3.68$_{10}$ **make a model of a fossil and review**

3.69$_{6,7}$	**represent pictorially how Earth's**	**l formation - models resources are used in every day**

3.70[7,8,10,11] **identify land features using a topo-graphical model or map (e.g., mountains, ri-**

3.71$_{7,8,9}$ **explain by 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 rec**

Science History

3.74 study the lives and discoveries of

on, wind speed, and precipitation) - models

3.73$_{4,6,7,8,9,10,11}$ **read a weather chart or map -**

models

3.75 recognize that scientific explanations

3.76 realize that scientists will always have an change over time questions about the world (e.g.,

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

3.78 examine that science skills are used in most careers

3.79 research how technology has positively or negatively affected the quality of life

3.80 examine how common daily events involve science

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 t)

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, inter

3.86 use appropriate software to practice and table drawing conclusions, making predictions, an

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3.87 use appropriate software to practice

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3.88 identify the uses of technology in the

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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 tablesand/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 build 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 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 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 investigate natural phenomena by asking and answering questions about the environment

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 (e.g., 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 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

4.11 be in awe and wonder of the patterns, variations, and interactions of objects in the universe

4.12 trust observations of discoveries when trying new tasks and skills

4.13 listen to and be tolerant of different

v i e w p o i n t s

b y

ideas when new and valid information is presented

4.15 Recognize that developing solutions to

4.14 continue probing phenomena until

4.16 recognize that science includes both flexibility, open-mindedness, and alertness for

Scientific Processes/Thinking Skills

4.17[5,6,7,8,9,10,11] **sort, classify, and compare** the

objects, and events based on properties (e.g., mass,

4.18[3,5,6,7,8] given a set of objects, group or

according to an established scheme metric units (e.g.

4.19[5,6,8,10,11] **apply mathematical skills and use**

and volume) in an experiment

4.20$_{5,6,8,9}$ **establish the variables and controls**

4.21$_{3,5,6,7,8,9,10,11}$ **construct a hypothesis when provided a problem (e**

4.22$_{3,5,6,7,8,9,10,11}$ **construct predictions and**

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., a system 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

4.23$_{3,5,6,7,8,9,10,11}$ **test variables (e.g., factors that affect plant growth, action of water in shaping the earth, and cau**

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**

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4.33[3,4,5,6,7,8,9,10,11] **compare, sort, and group objects according to buoyancy, magnetic pro**

u c t i v i t y a n d a b i l i t y t o r e a c t - s y s t e m s

4.34[3,5,6,7,8] **identify the structures of living things**

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e t o n s , t e e t h , p l a n t n e e d l e s a n d l e a v e s) - s y s t e m s

4.35$_{3,5,7,9}$ **describe the different characteristics o**

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4.36[3,5,6,7,8,9,10] **describe the environme nts and**

c o n d i t i o n

(e.g., water, sunlight, soil, food, climate

4.37$_{3,5,6,7}$ **, classify living things according to their**

correc

u r e s a n d f u n c t i o n s (e . g . , t a x o n o m y) - s y s t e m s o r g a n i

4.38[3,5,6,7,8,9,10] **review relationships among**

and terrestrial organisms and habitats

4.39[3,5,6] identify human uses of plants and climate as r

4.40 associate the behaviors of living things to external **, food sources, medicines) - systems**

seasons)

- systems

4.41 identify plant and animal cells using a microscope

- systems

4.42 **identify variations in structures and functions with**

leaves, skeletons, forms of

4.43$_{3,5,6,7}$ recognize, compare, and/or reproduction, animal an

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4.44	describe environmental barriers to the migration of animals - changes	h
4.45	construct and explain models of habitats, food chains, and food webs - models	i
4.46$_{5,6,7,8,9,10,11}$	**observe and investigate how properties can be used to identify substances (e.g., solubility, conductivity, magnetism, acidic, and basic) - systems**	n
4.47$_{3,5,6,7,8,9,10,11}$	**examine simple chemical changes (e.g., tarnishing, rusting, burning) - changes**	g
4.48$_{10}$	understand that materials may be composed of parts that are too small to be seen without magnification - systems	s
4.49	identify different forms of energy and describe energy transformation (e.g., electrical to heat, light to mechanical) - systems	p
4.50	examine types and properties of waves (e.g., transverse, longitudinal, frequency, wavelengths) - systems	h
4.51	relate motion to its properties (e.g., frame of reference, position) - systems	y
4.52$_{3,5,7,9}$	**relate changes in states of matter to energy transformation (e.g., adding heat) - systems**	s
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 time force is applied) - changes**	i
4.54$_{3,5,7,9}$	**identify various changes in states (e.g., solids to liquids, liquids to solids, solids to gas) - changes**	c
4.55$_{5,6,10,11}$	**use models to demonstrate heat, light, and sound (production, how changed, applications to every day living, movement through system) - models**	a
4.56$_{5,10}$	**construct simple electrical circuits (e.g., conductors, non-conductors, complete/ incomplete) - models**	l
		h

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

4.59$_{6}$ **understand that air has mass, takes up space, and is made of molecules**

4.60$_{5,6}$ **identify the sun as a star - systems**

4.61 explain the reason why other planets

4.62$_{4,5}$ **research evidence to discover the - systems**

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4.63$_{10}$ **associate fossils with the periods in**

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4.65$_{4}$ **describe the orbits of the sun and**

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4.64$_{3,5,6,7,8,9,10}$ **locate and identify patterns of**

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4.66$_5$ **compare and explain the relative estimated differences to erode material**

4.67$_4$ **investigate the cause and effects of soil erosion (e.g., sand**

t h q u a k e s , a n d l a n d s l i d e s - c h a n g e s c h a r t s a n d u s e t h

4.68[6,7,8,9,10,11] **enter weather data on weather**

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Science History

4.69 study the lives and discoveries of men

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4.70 mecognize that scientific explanations

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4.71 realize that scientists will continue to over time have questions about the world (e.g., what

humans live in space for a long time)

Science, Technology, and Society

4.72 explain through the use of speakers, field trips

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4.73 explain that science skills are used in

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4.75 research how common daily events involve science

4.76 develop respect and responsibility for the environment by recognizing the interrelationship of living and non-living things and engaging in conservation practices

4.74 explain how technology has positively

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

hypotheses based on data from a map, diagram, chart

4.81 identify and demonstrate ways

4.82 demonstrate understanding that the information violation of copyright law is a crime

4.83 using the graphing application of appropr

4.84 use a calculator to perform mathematical functions in data analysis

4.85 use a variety of instruments (e.g., probes, the

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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

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5.11	process and integrate experiences with personal and appreciation and and joy of scientific
5.12	understand that the study of science is

dynamic process

5.13[6,7,8,9,10,11] formulate conclusions through close and the results are not always defi

perseverance and integrity in data collection (e.g.,

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Scientific Processes/Thinking Skills

5.14 recognize and apply facts, concepts,

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5.15$_{3,4,6,7,8,9,10}$ **compare and contrast objects,**

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f e r e n c e s i n o r d e r t o c l a s s i f y t h e m (e . g . , a t o m s a n d

5.16[3,4,6,7,8,9,10,11] **construct and use charts, graphs, notes) and tables to organize, display, interpret, a**

population)

5.17$_{3,4,6,7,8,9,10}$ **use inferential reasoning to make logical conclusion"**

5.18$_{3,4,6,7,8,9,10,11}$ utilize experimentation to demonstrate

5.19$_{3,4,6,7,8,9,10,11}$ **develop rational thinking processes th**

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 (**

y, solubility, conductivity, magnetism, weight, shap

5.28 **identify and explain common energy conversions in systems (minerals), rocks and**

bond dioxide, and nitrogen, energy conversions including

5.29 demonstrate the processes involved in

of matter (e.g., solid to liquid to gas to liquid to

5.30[3,4,6,7,8,9,10,11] **recognize and explore methods**

s (e.g., evaporating, condensing, boiling, freezing,

5.31[6] **explain the effects of force on motion**

5.32[5.324,7,8,9,10] **explain how the different (e.g., wind currents on hot air balloons)**

them to survive in different niches and environment

5.33$_{4,7,8}$ **identify the structures of living - systems and things and explain their functions (e.g.,**

s m s , c o m m u n i t i e s , e c o s y s t e m s) - s y s t e m s a n d r e p r o d u c

5.34$_{4,6,8,10}$ **compare variations of plant growth**

		duction, needs of growing plants)
5.36	3,4,6,7,8,9,10	**trace the pathways of the sun's energy thro**
5.37		**explain that the mass of a material -systems**
5.35	describe methods that various cells	use to o

5.38	recognize that elements are composed of only one type of matter - 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**
5.44$_{8}$	**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**
5.48$_{10}$	explore how fossils can be used to determine the age of rock layers - systems
5.49$_{6}$	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., amou**

ngesdescribeweatherpatternss(e.g.,temperatures,

5.54$_{3,6,9}$ **collect and display weather data to**

5.55$_{3,4,6,7,8,9,10,11}$ **fabricate and illustrate models**

(e.g., solar system, structure of earth, erosion and

d e l s

Science History

5.56$_{6,7}$ **articulate the historical significance**

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5.57$_{6,7}$ **compare the evolution of science events, personalities, societal issues concepts and**

tics)

5.58$_{6,7}$ **examine the contributions of men and women of diverse cultures to the development of Science, Technology, and Society**

5.59$_{6,7,8,10,11}$ **give examples of how science and**

5.60[6,7,8,10,11] **use the knowledge of science and "technology to** 5.61 **evaluate and critically analyze mass media personal decisions at local and**

pments and events"

5.62[6,7,8,10,11] **critically analyze the effects and impacts of science and technology**

turing, recycling, farming, water quality)

5.63$_{6,7,8,10}$ **explore the connections between science**

5.64$_{6,7,8,10,11}$ **analyze the positive and negative effects of te**

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

art, or table to display a set of data

5.68 using the graphing application of

appropriate

5.69 use a calculator to perform iate s

5.70 use a variety of instruments (i.e. a t i c a l f u n c t i o n s i n d a t a a n a l y s i s p r o b e s , t h e r m o m e t e

5.71 identify database management terms (e.g., data base, file, record, field, rec

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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

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6.11 process and integrate experiences with

6.12 understand that the study of science is

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6.13$_{4,5,7,8,9,10,11}$ formulate conclusions through close a
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6.15 $_{3,4,5,7,8,9,10}$ compare and contrast objects, actions systems) ∀

Scientific Processes/Thinking Skills

6.14 recognize and apply facts, concepts, laws, and theories to explain phenomena a

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6.16[3,4,5,7,8,9,10,11] **construct and use charts, graphs,** l
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tables to organize, display, interpret, analyze an

6.17$_{3,4,5,7,8,9,10}$ **use inferential reasoning to make logical conclusion"**

6.18$_{3,4,5,7,8,9,10,11}$ **utilize experimentation to demonstrat**

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

6.27 $_{4,8,9,10,11}$ **describe the interactions of various** technology,

provide energy and/or materials for growth, repair a

6.28$_{4,5,7,8}$ **identify the structures of living cells, decomposition, photosynthesis, respiration,**

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similarities and differences in organisms, comp

6.29[4,5,6,7] **classify living things according to how closely related groups) - systems their structure**

ion guides) - systems patterns of interdependence among

6.30[4,5,7,8,9,10] **explain changes in common**

6.31 demonstrate changes in populations of **changes** organisms due to limiting environmental factor

6.32$_{4,5}$ **analyze the ecological consequences of human interactions with the environment changes**

6.33$_{5,6,8,10}$ **interpret growth patterns in lists different plants (e.g., mosses, ferns, perennials**

6.34$_{3,4,5,7}$ **demonstrate how the varioussystems provide for the needs of a living organism**

6.35 construct models of plant and animal

show the basic parts (e.g., cytoplasm, cell wall, cell

6.36 3,4,5,7,8,9,10,11 **classify materials according to physical an**
6.37 3,4,5,7,8,9,10,11 **identify processes as physical or**

6.38$_{4,8}$ **identify food as sources of energy in animals - systems**

6.39$_{11}$ 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

6.41$_{10}$ 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**

6.43$_{9}$ 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**

6.45$_{11}$ identify the symbols of elements - models

6.46$_{11}$ using the periodic table, identify elements as metals or non-metals - models

6.47$_{10}$ draw models to represent atoms - models

6.48$_{5,7,8,9,10,11}$ **describe properties of matter (e.g., inertia, specific heat, malleability, melting point, density) -systems**

6.49 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**

6.52$_{11}$ **describe the flow of heat between objects (e.g., hot air rises, absorption and release of heat by metals) -systems**

6.53$_{7}$ **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**

bjects (e.g., inertia, addition and

6.55 describe the relationship between subtraction of f

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6.56$_4$ explain absorption and reflection of s

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textures (e.g., transparent, translucent, opaque, d

6.57$_{3,4,11}$ **explain motion in terms of frames of**

n earth, ball thrown in or from moving vehicle) - ch

6.58_4 **relate the length of a shadow to the**

ials) - changes and magnitude of force - models

6.59 use an arrow to represent direction

6.60 diagram simple parallel and series cir

6.61[5,7,8,9,10] **analyze graphs depicting motion,** u

6.62 relate wave lengths and/or frequency predict future motion (e.g., graphs, tables, charts)

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6.63 **review fundamental earth science concepts including cell**

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6.64$_{4,5}$ **recognize that stars are different**

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6.65$_{3,5,7,8,10,11}$ **identify and investigate Earth's**

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illization affects the environment) - changes composi

6.66[9,10,11] **track atmospheric conditions (e.g.,**

6.67 summarize the forces and results of

6.68 describe the factors involved in g e s c a u s i n g c a t a s t r

6.69 develop an understanding in the p h i c m e t e o r o l o g i c a l a n d g e o l o g i c

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 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

nd master sixth grade instructional objectives in sc

6.83 using the graphing application of

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6.84 using the graphing application of

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6.85 use a calculator to perform

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athematical functions in data analysis

6.86 use a variety of instruments (i.e. probes, therm

6.87 use appropriate software to practice and record data reading, interpreting, analyzing, an

6.88 use appropriate software, practice and diagram extrapolating and interpolating information

6.89 use appropriate software to practice

grams, charts, graphs, and tables

6.90 use appropriate software to practice making predictions

arts, graphs, and tables

6.91 use appropriate software to practice reading

6.92 input data using correct keying, editing

6.93 use a database to sort and search data using an instrument

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 criteria

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 expanded 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

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7.11 process and integrate experiences with an appreciation and joy of scientific inquiry to further the

7.12 understand that the study of science is

dynamic process

7.13[4,5,6,8,9,10,11] **formulate conclusions through close observations, logic, objectivity,** and the results are not always defin

collection (e.g., impact of natural phenomena on the

e m i c a l c o m p o s i t i o n o f l i v i n g t h i n g s)

7.15[3,4,5,6,8,9,10] **compare and contrast objects,**

"

Scientific Processes/Thinking Skills

7.14 recognize and apply facts, concepts, l a w s , a n d t

according to similarities and differences in order to

nisms, characteristics of geological time, models of

7.16$_{3,4,5,6,8,9,10,11}$ **construct and use charts, graphs,**

interpret, analyze, and

7.17$_{3,4,5,6,8,9,10,11}$ **use inferential reasoning to explain data (e.g., extrapo**

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)** "

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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 ∀

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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

7.18[3,4,5,6,8,9,10,11] **utilize experimentations to demonstrate scientific processes (e.g., formulating questions, predicting, forming hypotheses, quantifying,**

7.25 associate hands-on activities to daily life experiences

7.26 express ideas that illustrate the relevance of science, technology,

7.27$_{7,9,11}$ **identify and describe disease**

e s t h e y c a u s e

7.28$_{3,4,5,6,8}$ **(e.g., bacteria, viruses, protozoa, fu-**

evaluate how the different adapta-

nimals help them to survive in different niches and

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7.29$_{8,9,10,11}$ **explain how human body systems**

7.30$_{3,4,5,6,8,9,10}$ **predict the trends of interdepen-**

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7.31$_{5,8}$ **analyze how changes in the i f**

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7.32[6,8,9] evaluate the consequences of the ns (e.g., seed dispersal, egg laying, live birth) -

(e.g., environmental consequences, human health risk

7.33$_{6,8}$ analyze the differences in the

reproduction of plants

7.34 (e.g., flowering and non-flowering

7.35[3,4,5,6] **construct simple keys to** etal, muscular, and integumentary systems of different

ings of similar characteristics - models

7.36 construct and manipulate models

which show

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 (e.g., solutes and solvents, relative concentrations, conductivity, pH) - systems**

7.41$_{9,11}$ **study chemical reactions involving acids and bases 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 - models**

7.43$_{6,8,9,10,11}$ **describe the behavior of individual particles and verify the conservation of matter while exploring the melting and freezing of pure substances - changes**

7.44$_{6,8,9,10,11}$ **trace the energy flow into and out of materials and verify that melting and freezing occurs at the same temperature - changes**

7.45 use pictures to show cyclical processes in nature (e.g., water cycle, nitrogen cycle, and carbon cycle) - 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= 9.8m/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 conservation of matter

7.52[8,9] **explain conservation of energy** water cycle, food chain, chemical reactions) - ch

7.53$_{8,9}$ **recognize that energy can be changed from one form to another form (chemical energy) - changes**

l , 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**

ass, perscopes) - models

7.57 **review fundamental earth science concepts including, motion**

s t e m s

7.58 recognize that stars not only are d i f f e r e n t i n a g e a n d s i z e , b u t a l s o i n c o l o r ,

7.59 **describe and compare the physical**

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7.61 examine the relationships among air

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7.60$_{10}$ **depict and relate causes of tides,**

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7.62 demonstrate how natural phenomena

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7.63 identify and summarize origin of the

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7.64 understand man's responsibility to s - s y s t e m s r e c o g n i z e a n d s o l v e p r o b l e m s i n v o l v i n g t

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 (**

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7.68$_{3,8,10,11}$ t identify land features and elevationsu
n topographical map (e.g., s
mountains, rivers, valleys, lakes, g
glaciers, volcanoes) - models
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Science History

7.69$_{5,6}$ a articulate the historical significance o
f scientific discoveries as i
influenced by technological s
demands, competition, controversy, t
world events, personalities, societal i
ssues

7.70$_{5,6}$ c compare the evolution of science c
oncepts and theories (e.g., cells, p
plate tectonics, atoms, genetics)

7.71$_{5,6}$ e examine the contributions of men a
nd women of diverse cultures to t
he development of science

Science, Technology, and Society

7.72$_{5,6,8,10,11}$ I give examples of how science and t
echnology are used in daily living ∀

7.73$_{5,6,8,10,11}$ I use the knowledge of science and s
echnology to make personal decisions at the local and global levels ∀

7.74 e evaluate and critically analyze mass m
edia reports of scientific d
developments and events ∀

7.75$_{5,6,8,10,11}$ critically analyze the effects and im-
s
pacts of science and technology on p
global and local problems (e.g., i
mining, manufacturing, recycling, l
farming, water quality)

7.76$_{5,6,10}$ e explore the connections between s
science, technology, society, and c
career opportunities

7.77$_{5,6,8,10,11}$ s analyze the positive and negative i
effects of technology on society and t
the influence of societal pressures o
on the direction of technological n
advances)

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Computer/Technology

7.78 use appropriate software, audio-visual, and/or multimedia materials to practice and master

7.79 using the graphing application of

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eate tables, charts, and/or graphs mathematical func

7.82 use a variety of instruments (i.e.

7.81 use a calculator to perform

7.83 nse appropriate software to practice g

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7.84 use appropriate software, practice

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7.85 use appropriate software to practice graphing conclusions from maps, diagrams, charts,

7.86 use appropriate software to practice

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7.87 input data using correct keying,
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7.88 use a database to sort and search data
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7.89 demonstrate a knowledge of how

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7.90 discriminate between ethical and

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7.91	associate	computer/technology	
			a c t i v i t i e s w i t h r e l a t e d c a r e e r s
7.92	retrieve current data from a variety of		
			e l e c t r o n i c s o

are reference

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

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8.11	p	process and integrate experiences with
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		a n a p p r e c i a t i o n a n d j o y o f s c i e n t i f i
8.12	u	understand the study of science is a

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8.13$_{4,5,6,7,9,10,11}$ **formulate conclusions through**
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truction and destruction of topographical features,

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8.15[3,4,5,6,7,9,10] **m compare and contrast objects,**
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Scientific Processes/Thinking Skills

8.14 recognize and apply facts, concepts,

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8.16[3,4,5,6,7,9,10,11] **construct and use charts, graphs, travel through different terrent materials, how to represent**

interpret, analyze, and

8.17[3,4,5,6,7,9,10,11] **use inferential reasoning to explain data (e.g., extrapo**

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

8.18$_{3,4,5,6,7,9,10,11}$ **utilize experimentation to demonstrate scientific processes (e.g., formulating questions, predicting, forming hypotheses,**

8.26 express ideas that illustrate the relevance of science, technology, and societal issues

8.27 summarize problems related to water

u a l i t y a n d q u a n t i t y o f s u r f a c e a n d g r o u n d w a t e r)

8.28$_{10}$ **identify and explain the structures a n d**

e l l m e m b r a n e , n u c l e u s) - s y s t e m s a n d a m o n g o r g a n

8.29$_{10}$ **discuss the interdependencies within**

8.30$_{7,9,10,11}$ **explain how human body systems**

l l e

k t o g e t h e r (e . g . , c i r c u l a t o r y , r e s p i r a t o r y , r e p r o d u c

8.31[3,4,5,6,7,9,10] **analyze how structures, functions**

lead to species continuity (e.g., reproductive/maturation

8.32[3,4,5,6] group unknown organisms based on deductive/

8.33[7,9,10,11] **a. compare the variations in cells, characteristics (e.g., use dichotomous keys) - systems**

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8.34[4,5,6,9,10,11] **e design an environment in which**

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8.35$_{4,6,8,10,11}$ **demonstrate how living cells obtain**

nitials of life (e.g.,

8.36$_{9,11}$ demonstrate the basic principles of transpiration, respiration, ph

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8.37 construct and manipulate models

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8.38$_{11}$ identify elements as metallic, non-metallic or metalloid and locate them on the periodic table - systems

8.39$_{10}$ draw Bohr's Model for elements identifying protons, neutrons, and electrons - models

8.40$_{11}$ assign 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**

8.43$_{6,9,11}$ classify chemical reactions as synthesis, decomposition, single replacement or double replacement - systems

8.44$_{11}$ **write word equations for chemical reaction - models**

8.45$_{9,10,11}$ **identify acid-base reactions and verify that matter is conserved in chemical reactions - systems**

8.46$_{6,7,9,10,11,12}$ **identify chemical reaction factors that might affect the reaction rates including catalysts, temperature changes, light energies, and particle size - changes**

8.47$_{10}$ evaluate gaseous systems noting the variation in diffusion rates - changes

8.48$_{6,7,9,10,11}$ **examine the expansion of gases at elevated temperatures - changes**

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) - systems**

8.50 identify sources of energy (e.g., petroleum refinement, windmills, geothermal) - systems

8.51 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

8.52$_{7,9,10,11}$ **describe how sound is perceived by the ear (e.g., range, frequency, amplitude) - changes**

8.53$_{7,9}$ **apply the conservation of energy theory toenergy transformations (e.g., electrical/ heat, heat/mechanical) - changes**

8.54 quantitatively represent work, power,

P = W / t , pressure = force/area) - models

8.55$_{5,6,7,9,10}$ draw vector quantities (e.g., dis- **placement, velocity, force) - models**
8.56$_{5,6,7,9,10}$ **graph and interpret the relationships**

(e.g., distance

sus time) - models

8.57 describe Newton's Laws of Motion

and identify examples (e.g.,

8.58[9,10] **illustrate qualitatively and**

sail

					titatively Newton's Laws of Motion - models
8.59	illustrate	quantitatively	mechanical		
8.60	**review fundamental earth and space**				advantag

, characteristics

8.61 relate rock formation to the types of of stars, topographic

8.62 summarize and explain the principle sa ps, weathe

8.63 construct and interpret rock layer stratigraphic intervals through models of systems tectonics

8.64 examine energy transfer in Earth models science (e.g., forces in construction of topo

interaction of atmosphere and oceans) - changes

8.65$_5$ **determine the relationship between the**

8.66 describe the factors involved in the construction and use of a compass-

8.68 explore the societal effects of -systems meteorological phenomena a-systems

8.69$_{3,5}$ **relate climatic patterns and change**

8.70 **t**ecognize societal concerns with **e**xploration and colonization of space - systems

8.71$_{3,4,5,6,7,9,10,11}$ **E diagram the motions of the Sun, a 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

8.74$_{5,6}$ **use a variety of instruments to gather data (e.g., mass, temperature, electrical current, air pressure, wind direction, wind speed, and humidity) - models**

Science History

8.75$_{5,6,7}$ **articulate the historical significance of scientific discoveries 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**

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Computer/Technology

8.84 use appropriate software, audio-visual

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8.85 input data using correct keying, e
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8.86 using the graphing applic ation of c
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8.87 using the graphing application of the suitable chart, table or graph software, select

8.88 use a calculator to perform mathematical functions in data

8.89 use a variety of instruments (i.e. charts, and/or graphs)

to perform measurements and record data reading, int

8.90 use appropriate software to practice

ap, chart, graph, table, and diagram

8.91 use appropriate software, practice extrapolating a

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8.92 use appropriate software to practice

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8.93 use appropria te software to practice

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8.94 e use appropriate software to practice
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8.95 s use a database to sort and search data
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		ve a specific problem
8.96	identify various careers in the field of	technology
8.97	discriminate between legal and illegal	use of electronic i

8.98 retrieve current data from a variety of e l e c t r o n i c s o u r c e s w h i c h m i g h t i n c l u d e t h

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 at a level higher than Coordinated and Thematic Science Ten) 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 program 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 (11/12)
Biology - Technical Conceptual (11/12)**
Human Anatomy and Physiology (11/12)
Advanced Chemistry (11/12)
Chemistry - Technical Conceptual (11/12)
Advanced Environmental Earth Science (11/12)
Advanced Physics (11/12)
Physics - Technical Conceptual (11/12)
AP Courses
College Courses

*** A minimun of one 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), Ecology, Microbiology, Organic Chemistry, Physical Geology. The instructional goals and objectives must be approved by the county board of education.

****** Biology - Technical Conceptual (11/12) beginning 2002-2003

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

9.3$_{11}$ 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)∀

9.7$_{11}$ 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**

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9.10$_{3,4,5,6,7,8,10,11}$ **identify, analyze, and infer using**

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9.11 use SI (metric) measurements

9.12 apply rational thinking processes that u n d e r l i e s c i e n t i f i c a p p r

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9.13 use the tools of science safely,

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9.14$_{4,5,6,8}$ **identify independent and dependent**

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9.16$_{11}$ **design, conduct, evaluate and revise**

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9.15 **manipulate variables to extend**

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Laboratory Investigations/Hands-on Learning

9.17 engage in active inquiries,

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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 conduct research ∀

Science 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

9.23$_{11}$ **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 **mathematically illustrate changes in populations of organisms - changes**

9.27$_{7,11}$ **identify and describe microscopic organisms and foreign substances in the environment and their harmful effects (e.g., microorganisms, mutagens, carcinogens) - systems**

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**

9.33 construct and manipulate models **number and production of sperm, egg, and body cells**

9.34[11] review the relationship between excretory, digestive systems) - systems, models

including

9.35.11. determine the number of neutrons, families, metals, nonmetals and metalloids

and average atomic mass number

9.36 associate proton number with type of and relate to the per

tribution with reactivity, and

9.37 list the characteristics of radioactivity number of neutrons wi

9.38 **define and describe the half life of alpha particles, beta particles and gamma rays - sys**

9.39 define a chain reaction and show and

9.41$_{10}$ trace the development of the model of radioactive isotope (e.g., U-235)-changes

9.40 differentiate between fission and fusion-c

Rutherford, Bohr) - models

9.42 write formulas and name compounds given oxidation numbers of

9.43[11] identify and distinguish kinds of

nds including ionic, nonpolar covalent and polar cov

9.44.11. recognize that water has unusual

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9.45[6,7,8,10,11] **recognize that all chemical reactions**

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ctions) - systems of chemical reactions and

9.46$_{11}$ experimentally determine the products

9.47$_{6,7,11}$ **conduct, write equations and** write ba

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

9.49$_{6,7,8,10,11}$ **investigate the relationships among temperature, pressure and volume in gases with respect to Charles' Law (V-T), Boyle's Law (V-P) and Gay-Lussac's Law (P-T) - changes**

9.50$_{10,11}$ diagram the relationship between energy and phase changes (e.g. freezing, boiling, sublimation) - models

9.51$_{11}$ **demonstrate water characteristics including capillary action, surface tension, adhesion and cohesion (e.g. chromatography, meniscus readings) - models**

9.52$_{5,6,7,8,10,11}$ **determine experimentally the density of 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**

9.57 **relate the force between charged objects to the charge on the objects and the distance between them - systems**

9.58 define and solve electrical 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 - 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**

		mass, length)
9.64	define types of waves and their	**will affect the motion of the pendulu**

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9.65 **examine the differences and**

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9.66 use the wave equation to determine

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9.67 **list the characteristics of ps among speed, wavelength, and frequency - mode**

9.68 **demonstrate light as a wave motion s**

9.69 **review characteristics of light (e.g.,**

.g., ripple tank) - models reflection, refraction, d

9.70 **relate wavelength to color and**

9.71 **interpret how sound travels through**

a t e r i a l s (e . g . , t r a n s m i t t e d , a b s o r b e d) - c h a n g e s

9.72[4,6,10,11] **analyze and describe a common rock**

9.73[4,6,10,11] **employ tests to identify rocks and a m**

9.74 **examine how scientists use nerates (e.g., streak, color, hardness, cleavage) - mo**

and composition of the Earth's interior

9.75[10] **examine geologic time emphasizing**

9.76[3,5,,6] **estimate the age of materials using existing rad**

9.77 investigate formation and destruction

systems

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9.78$_{8,10}$	g	**ead and interpret topographic**
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		e a r t h q u a k e s , v o l c a n o e s , p l a t e

9.80 **relate temperature, air pressure, nearer distance-models**

9.79[3,4,5,,6,7,8,10,11] **describe how warm air can hold more water vapor than cold air**

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**

9.83$_{10}$ **describe the movements of subsurface water -changes**

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

9.85 explore the properties and motions of oceans -systems

9.86 research uses and values of natural resources -systems

9.87$_{10}$ 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**

9.89 **explain and compare motions of the sun and moon -systems**

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

Science History

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

weather -systems

9.92 trace the historical development of key historical concepts and principles

9.93 describe the impact of cultural, descriptive t

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Science, Technology, and Society

9.94 apply scientific skills and

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9.95 engage in decision making activities

9.96 investigate and analyze the interdependence of science and

9.97 describe the scientific concepts ∀ underly

9.98 explore occupational opportunities in technology

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Computer/Technology

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9.100 collect, analyze, and display data

9.101 access Internet resources for a variety ∀ using computers and other electronic

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9.102 demonstrate skills in the use of word

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9.103 identify and solve problems with the ∀ appropriate technology

9.104 incorporate correct grammar, spelling, ∀ vocabulary, a

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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, 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

10.3$_{11}$ 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)∀

10.7$_{11}$ 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 technolo gical 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**

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10.10[3,4,5,6,7,8,9,11] **identify, analyze, and infer using**

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10.11 use SI (metric) measurements

10.12 apply rational thinking processes that u n d e r l i e s c i e n t i f i c a p p

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10.13 use the tools of science safely,

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10.15$_{9}$ manipulate variables to expand

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10.14$_{4,5,6,8,9}$ identify independent and dependent

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10.16$_{9,11}$ design, conduct, evaluate and revise

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Laboratory Investigations/Hands-on Learning

10.17 engage in active inquiries, communicate and defend a scientific argument, and underster

Hands-on activities

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/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$_{4,5,6,8,f1}$ **review the needs of growing plants and the environments supplying those needs - systems**

10.24$_{8}$ **identify and explain the structures and functions of cell organelles (e.g., Golgi bodies, endoplasmic reticulum, mitochondria, chloroplasts, 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, 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

10.29$_{11}$ **relate the role of DNA analysis to genetic disorders, forensic science, molecular genetics, and biotechnology (e.g., protein synthesis, heredity, cell division, and cellular functions) - systems**

10.30$_{3,4,5,6,7,8,9,11}$ **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**

10.31$_{8}$ **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**

10.32$_{7,8,9,11}$ **compare the variations in cells, tissues, and organ**

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10.33	**compare**	**the**	**embryonic**	**d e v e l o p m e n t o f i n v e r t e b r**

geny, diversity, taxonomy) - changes

10.34$_{3,4,5,6,7,8,9}$ **relate the role of natural selection**

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10.35$_{7,8,9,11}$ **depict the interdependence of cells, develop**

, organs, and systems

10.36 construct and manipulate models to the life functions of the w

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10.37$_{3,5,6,8,11}$ **investigate the properties of**

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10.38$_{11}$ use polarity, molecular shape, and solubility, concentration, pH, and colligative prop

er is considered the "universal solvent" - systems

10.39[6,7,8,9,11] **interpret graphs showing the**

e i n g a s e s w i t h r e s p e c t t o C h a r l e s ’ L a w , B o y l e ’ s L a w

10.40[4,5,6,7,8,9,11] **differentiate between physical,**

ear changes - changes

10.41 measure the change in heat gained or lost during chemical reactions

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10.42$_{11}$ **investigate the relationship between**

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10.43 recognize that the equation $E=mc^2$ can

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10.44$_{11}$ validate the law of conservation of matter in chemical reactions - changes

10.45$_{6,7,9,11}$ use chemical equations to represent chemical and biochemical reactions (e.g., photosynthesis) - models

10.46$_{9}$ predict the isotope or radiation particle emitted during nuclear reactions - models

10.47 complete simple nuclear equations given all but one of the materials involved in the reaction - models

10.48 **illustrate how scientists used the electromagnetic spectrum to show the energy levels of electrons within atoms -models**

10.49 **apply Newton's Laws of Motion to living systems (e.g., walking) - models**

10.50 **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

10.53 **summarize the relationship between frequency and speed (e.g., Doppler effect) - systems**

10.54$_{8,9}$ **determine the effect of different forces on vibrating systems (e.g., pendulums, springs) - systems**

10.55$_{9}$ **qualitatively explain the relationship between electricity and magnetism (e.g., the electromagnetic field) - systems**

10.56$_{4,5}$ **describe how components of an electric circuit function individually and as a component in an electric circuit - systems**

10.57$_{3,9,11}$ s demonstrate qualitative and quantitative

- understanding of pressure in various systems (e.g., water pipes, circuits, blood vessels) - systems

10.58$_{3,4,5,6,7,8,9,11}$ h **qualitatively and quantitatively**

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describe the conservation of energy (e.g., thermal, chemical, mechanical) - changes

10.59$_{5,6,7,8,9,11}$ **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.

10.62 **explain the relationship between**

10.63 **differentiate between the movement of water particles**

10.64 explain the cause of tides - models

10.65 **compare and contrast the in a wave and the movement of wa**

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10.66. calculate the frequency of a

10.67. measure the rate of absorption of

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10.68 **review fundamental earth science**

10.69$_3$ **investigate fossils (e.g., origins, use systems in establishing geological time, types of p**

10.70$_{11}$ **investigate the effects of natural c o m p a r e f o s s i l s t o p r e s e n t t o d a y o r g a n i s m s) - s y s t e**

10.71$_3$ **investigate characteristics of the , meteorologic) - systems atmosphere (e.g., relation**

10.72. compare and contrast the state that air has mass and exerts pressure - sy

- systems

10.73$_{8,9}$ **illustrate methods to recover subsurface water for**

10.75$_{7}$ **describe factors determining the human use**

- systems

10.74$_{9}$ **relate electromagnetic fields to the**

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10.77$_4$ **explore and explain the energy of tides - systems**

10.76 **identify and describe the effects of ocean currents on climate - chan**

10.78 research current environmental issues

attention, electronics, height and frequency of waves) - chan

10.80$_{4,7}$ **utilize a stream table to observe the effects of water on the earth's surface (e.g., changes in particle size, slope, velocity) - change**

10.81$_{11}$ construct and interpret topographic and **meteorological 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 ∀ illustration) - change

10.79$_{8}$ **review physical changes in earth materials due to temperature variations and relate those changes to earth's natural processes - change**

Science, Technology and Society

10.87 apply scientific skills and technological tools to address personal and social

10.88 engage in decision making activities

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10.89 investigate and analyze the

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10.90 describe the scientific concepts

10.91 explore occupational opportunities in

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Computer and Technology

10.92 access, gather, store, retrieve, and

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10.93 collect, analyze and display data using

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access Internet resources for a variety

10.95 demonstrate skills in use of word search, exchange data, E-mail, and real-time investiga

10.97 incorporate correct grammar, spelling, punctuation and telecommunications conventions;

10.96 identify and solve problems with the appropriate technology;

written and oral multim

Advanced Biology (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**

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B.11 se SI measurement (metric)
B.12 apply rational thinking processes that
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problem solving by employing critical thinking skills,

B.13 use the tools of science safely, ∀ accurately, and appropriately

B.14$_{4,5,6,8,9}$ identify independent and dependent variables and/or cooperatively

B.15$_{9}$ manipulate variables to expand

B.16$_9$ **design, conduct, evaluate and revise**

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Laboratory Investigations/Hand-On Learning

B.17 engage in active inquiries, investigations, and hands-

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B.18 properly and safely manipulate

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B.19 ponduct explorations in a variety of
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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 via the Internet
Science Themes/Subject Matter	
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**

tion, codominance, multi-alleles, crossing over, gen

development, sex, and age.

B.36 discuss sex determination;

B.37 discuss human genetic anomalies such as sickle cell anemia, PK

		rosis, and Tay-Sacs;
B.38	explore the discovery of DNA and its	structure by constructing a mod

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B.39 **identify the function of DNA in**

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B.40 **identify the function of the RNAs;**

the transcription and translation process

B.41 discuss the regulatory process in

B.42 **introduce genetic engineering of protein**

		nt DNA technology practices and the social issues th
B.43	discuss gene mutations in relation to	

DNA; such as substitutions, additions, deletions, a

B.44 provide evidence of evolution and

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B.45 research pioneers of evolution such as

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B.46	review current authors of evolutionary	
B.47	discuss modern and past hypotheses	
B.48	present overview of the taxonomy and	i d e a s , s u c h a s G o u l

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B.49 compare characteristics that place individuall

B.50 discuss reasons why viruses are not living organisms in the modern classific

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.

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Science History

B.62 identify contributors to the scientific body of knowledge including their diverse cultures

B.63 trace the historical development of

their impact on modern thought and daily life

B.64 describe the impact of cultural, technological

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Science, Technology and Society

B.65$_9$ apply scientific skills and

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B.66 engage in decision making activities

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B.67 investigate and analyze the issues to resolve science-technology-society issues

B.68 describe the scientific concepts

B.69 explore occupational opportunities in ∀ science and technology innovations ∀ science and technology

B.70 access, gather, store, retrieve, and organize data using

B.71 collect, analyze and display data using hardware and software designed

technology

B.72 access Internet resources for a variety of purposes (e.g., research, exchange d

B.73 demonstrate skills in use of word

B.74 identify and solve problems with the

B.75 incorporate correct grammar, spelling,

graphical representation for both writt

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 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.

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 quan-

titative

BTC.10$_{3,4,5,6,7,8,9,10}$ **identify, analyze, and infer s i s " u s i n g p a t t e r n s a n d r e l a t i o n s h i p s i n d a t a (e . g .**

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BTC.11 use SI measurement (metric)
BTC.12 apply rational thinking processes that u n d e r l i e s c i e n t i f i c

thinking skills, imagination, and creativity

BTC.13 use the tools of science safely, while

ly, and appropriately

BTC.15$_{9}$ manipulate variables to expand

BTC.14$_{4,5,6,8,9}$ identify independent and dependent variables in

BTC.16$_{9}$ design, conduct, evaluate and revise experimental i

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Laboratory Learning	**Investigations/Hand-On**
BTC.17	engage in active inquiries,

	activities	
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)

BTC. 42 preview foundational concepts
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BTC.39 investigate the formation of soil and
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BTC.40 explain the mechanics of composting
BTC. 41 investigate acids, bases, and buffering

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BTC. 44 investigate electric and magnetic

BTC. 43 categorize chemical hazards (e.g.

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BTC. 45 describe the common components of

tricalcircuits (e.g. switches, bi-metallic strips,

BTC. 46 identify the scientific units for

ms (e.g.

BTC. 47 measure molecular weight through the

mperage, potential difference,

BTC. 48 review the structure and function of

current, re

BTC. 49 discuss DNA as it relates to mitosis, meiosis, and protein synthesis

BTC. 50 apply techniques of biotechnology to phylogenesis, for

BTC. 51 compare and contrast the growth

of hydrophytic, mesophytic, and xerophytic plants

BTC. 52 investigate the diversity of plants, th

BTC. 53 investigate methods of plant growth e cycle (e.g. cultur ing techniques, hydroponics, clo

BTC. 54 research forest-management practices

cutting, selective cutting, pruning, fire ecology)

BTC. 55 research and evaluate the importance o

mics, and the environment and lifecycles of reptiles

BTC. 56 compare the characteristics, structures

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

BTC.69 trace the historical development of key scientific concepts and principles

BTC.70 describe the impact of cultural, descripting t

and economic influences on the evolving nature of s

Science, Technology and Society

BTC.71$_9$ apply scientific skills and technological

personal and societal needs ∀ and ∀ actions to resolv

BTC.72 engage in decision making activities

BTC.73 investigate and analyze the

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BTC.75 explore occupational opportunities in t e c h n o l o g y

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BTC.74 describe the scientific concepts

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Computer and Technology
BTC.76 access, gather, store, retrieve, and

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BTC.77 collect, analyze and display data using computers and other electronic technology

BTC.78 access Internet resources for a variety of

real-time investigations)

BTC.79 demonstrate skills in use of word ∀ processing, data bases,

BTC.80 identify and solve problems with the

BTC.81 incorporate correct grammar, spelling, ∀ vocabulary and graphical representation technology appropriate

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Human Anatomy and Physiology (11/12)

This **advanced** course is designed for those students wanting a **deeper understanding** of 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, investigation, 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.3_{11} **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 quantit**

HAP.10[3,4,5,6,7,8,9,10] **identify, analyze, and infer analysis" using patterns and relationships in data (**

interpretation and extrapolation)"

HAP.11 use SI (metric) measurements
HAP.12 apply rational thinking processes that underlie scient

ical thinking skills, imagination and creativity

HAP.13 use the tools of science safely, why

HAP.15$_{9}$ manipulate variables to extend appropriately and appropriately

HAP.14$_{4,5,6,8,9}$ identify independent and dependent variables in

HAP.16$_{9}$ **design, conduct, evaluate and revise** experimental

(e.g., identify questions and concepts that guide sc

ic investigations, use technology and mathematics to

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Laboratory Learning | **Investigations/Hands-on**

HAP.17 engage in active inquiries,

ions and hands-on activities for a minimum of 50 per

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 ∀

HAP.21 demonstrate knowledge of directional terminology necessary for anatomical location such as proximal, dorsal, medial, lateral, visceral, superficial, and deep.

HAP.22 review of foundational chemical concepts including atomic structure, bonding, chemical reactions, water, and pH as they relate to living systems

HAP.23 trace the transfer of energy in chemical molecular processes in the human body (e.g., glycolysis, Krebs cycle, electron transport system)

HAP.24 identify the role of DNA in transcription and relate to types of RNA and protein synthesis

HAP.25 identify the structure, functions, and interactions of eukaryotic cell organelles and their products.

HAP.26$_{7,8,9,10}$ describe the organizational levels, interdependency and the interaction of cells, tissues, organs, organ systems.

HAP.27 categorize, by structure and function, the various types of human tissue (e.g. muscle, epithelial, connective, and nervous)

HAP.28 relate the structure of the integumentary system to its function as a sensory organ, environmental barrier, and temperature regulator.

HAP.29 relate how bone tissue is important to the development of the human skeleton

HAP.30 investigate the structure and function of the skeletal system, including identification of bones, markings on bones, and articulations.

HAP.31 show the mechanism of muscle contraction on micro and macro levels.

HAP.32$_{7,8,9,10}$ recognize the relationship between

Science Themes/Subject Matter

HAP.33 research the musculature system

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HAP.34 classify, describe, and investigate the various types of neurons emphasizing structure

HAP.35 trace and describe a nervous impulse

HAP.36 locate, identify, and discuss the potassium pump. structure and

HAP.37 fllustrate the nerves and functions of unction of the parts

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HAP.38 **apply the knowledge of the**

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relationship to environmental perception. and hormo

HAP.40 explore the endocrine system

HAP.39 discuss the specific role of enzymes

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HAP.41$_{7,8,9,10}$ investigate the male and female re-

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HAP.42$_{7,8,9,10}$ relate the male and female reproductive systems to their function

HAP.43$_{8,9,10}$ compare and contrast the purposes, processes and outcomes of cellular and

HAP.44 research the formation of gametes, human growth

and embryonic development.

HAP.45$_{7,9}$ describe potential system failures in the human body due to gene

HAP.46$_{10}$ **analyze the change in DNA activity and how it affects the control of protein**

HAP.47 relate Mendel's laws of inheritance

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HAP.48 identify the cellular processes and the ase etc. energy and nutrition

HAP.49[10] illustrate how transport mechanisms in cells, tissues, and/or organs depend on osmosis and mixture gradients

HAP.50 examine the role of the digestive system in supplying nutrients (carbohydrates, proteins, lipids, vitamins, minerals, water)

HAP.51[7,8,9,10] explain how structures of the respiratory system are significant to communication, gas exchange, and cellular respiration

HAP.52 illustrate the structure of the circulatory and lymphatic systems and the function of blood to the role of transportation, cellular support and defense.

HAP.53 investigate the composition of blood and compatibility of blood types

HAP.54 investigate the immunological system emphasizing its role in defense of the human organism.

HAP.55 investigate and research the causative factors, symptoms, prevention, and treatment of diseases

HAP.56 describe the relationship of the excretory system to other organs and systems.
HAP.57 identify disorders with each system
HAP.58 explore current literature and research related to human anatomy and physiology

Science History

HAP.59 identify contributors to the scientific body of knowledge including their diverse cultures
HAP.60 trace the historical development of key scientific concepts and principles describing their impact on modern thought and life
HAP.61 describe the impact of cultural,

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Science, Technology and Society

HAP.62$_9$ apply scientific skills and

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HAP.63 engage in decision making activities

HAP.64 investigate and analyze the needs and actions to resolve science-technology-soc

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HAP.65 describe the scientific concepts ∀ underlying technological innovations

HAP.66 explore occupational opportunities in ∀ science

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Computer and Technology

HAP.67 access, gather, store, retrieve, and

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HAP.68 collect, analyze and display data using

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electronic technology ∀ of purposes (e.g., research

HAP.69 access Internet resources for a variety

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HAP.70 demonstrate skills in use of word ∀ processing, data bases, spreadsheets, graphics

HAP.71 identify and solve problems with the

HAP.72 incorporate correct grammar, spelling,

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Advanced Chemistry (11/12)

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 (Eleven/Twelve) is **the advanced study** of matter, its composition, and its changes. This course is designed to build upon and extend the Chemistry concepts, skills, and knowledge from the CATS 7-10 program. 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**

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C.10$_{3,4,5,6,7,8,9,10}$ **identify, analyze, and infer using**

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C.11 use SI (metric) measurements
C.12 apply rational thinking processes that

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C.13	use the tools of science safely, ls, imagination and creativity while working individual

C.14$_{4,5,6,8,9}$ identify independent and dependent variables in experimental investigations

C.15$_{9}$ manipulate variables to expand

C.16$_{9}$ **design, conduct, evaluate and revise**

ons and concepts that guide scientific investigation

technology and mathematics to improve investigation

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Laboratory Investigations/Hands-on Learning

C.17 engage in active inquiries, defend a scientific argument; and understand scientific

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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 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 de Broglie to the wave-particle duality of light

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.25 identify four types of electron clouds (s, p, d, f)

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.29 write electron dot structures for representative elements

C.30 ∀ **analyze the periodic table to predict trends in atomic size, ionic size, electronegativity, ionization energy, and electron affinity**

C.31$_{9}$ **using the periodic table, predict the type of bonding that occurs between atoms and differentiate among properties of ionic, covalent, and metallic bonds**

C.32$_{10}$ **construct models to explain the**

organic and inorganic molecules and the lattice structure

C.33 describe the formation of sigma and pi

C.34 use hybridization theory to explain

C.35 define and describe the types of van

C.36 Walls for use and list the three factors contributing

C.37 use molar mass to calculate the molar mass as well as a molar volume molarity of solut

C.38 experimentally determine the formulas of hydrates

C.39[7,8,9,10] **predict the products and write balanced equations for the general type**

C.40 do stoichiometric calculations

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C.41 lse the ideal gas equation to calculate
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C.42 identify the limiting reactant and

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C.43 distinguish between the thermodynamic and kinetic stability of a reaction

C.44 draw and label an energy-time theoretical yield

C.45 experimentally determine the factors that influence the rate of reaction

C.46 apply LeChatelier's principle to explai

volume, and temperature on an equilibrium system

C.47 calculate equilibrium constants and

C.48 name and define acids and bases using

stated-Lowry and and Lewis definitions

C.49 predict the products upon adding water to both acidi

C.50 write and balance net ionic equations

C.51 solve problems using the solubility 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 Gibbs 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.62 compare and contrast fusion and fission reactions

C.63 research the application of nuclear technology (e.g., power plants, medicine, weaponry)

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 evolution of

Science, Technology, and Society

C.68$_9$ apply scientific skills and

C.69 engage in decision making activities technological tools to address personal and societal n

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C.71 describe the scientific concepts
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C.70 investigate and analyze the
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C.72 explore occupational opportunities in
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Computer and Technology

C.73 access, gather, store, retrieve, and

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C.75	access Internet resources for a variety
	p o s e s ∀
C.74	collect, analyze and display data using
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C.76 E-demonstrate skills in use of word
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C.77 identify and solve problems with the

C.78 incorporate correct grammar, spelling,

for both written and oral m

Chemistry-Technical Conceptual (11/12)

An advanced level course designed for students who have completed Coordinated and Thematic Science Ten (CATS 10) and desire **an alternative** to a traditional college preparatory course **emphasizes real life applications of chemical principles**. Mathematical based problem solving is de-emphasized. Chemistry -Technical Conceptual is the study of matter, its compostion, 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 (**

interpolation and extrapolation)"

CTC.11 use SI (metric) measurements

CTC.12 apply rational thinking processes that underlie scient

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CTC.13 use the tools of science safely,

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CTC.15$_{9}$ p manipulate variables to expand

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CTC.14$_{4,5,6,8,9}$ identify independent and dependent

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CTC.16$_{9}$ **design, conduct, evaluate and revise**

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(e.g., identify questions and concepts that guide sc

ic investigations, use technology and mathematics to

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Laboratory Investigations/Hands-on Learning

CTC.17 engage in active inquiries,

igations and handsons activities for a minimum of 50

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 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 electons 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 **discuss the impact of water's unusual physical properties**

CTC.23 illustrate the concept of limiting reagents

CTC.24 **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 resouce (e.g., reduce, reuse, and recycle)

CTC.31 investigate the relationship of boiling

int, density and viscosity to the number

CTC.32 draw and build structural models of f carbon a

CTC.33 collect data and calculate the heat of combustion for alkanes

CTC.34 identify the functional groups for organic compounds (e.g.,

CTC.35 model polymerization including oxylic acids, and esters addition and condensation r

CTC.36 explain the benefits and consequences of energy conservation with respect to proteins, fats)

CTC.37 examine examples of nuclear technology that affect daily life and/or fuel

CTC.38 balance nuclear equations and use

CTC.39 compare penetrating power of alpha,

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Science History

CTC.42 identify contributors to the scientific

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CTC.40 **simulate and explain half-life decay**
CTC.41 **graph radiation vs. time illustrating**

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CTC.43 trace the historical development of r d i v e r s e c u l t u r e s k e y s c i e n t i f i c c o n c e p t s a n d p r i n c

CTC.44 describe the impact of cultural, life technological and economic influences on the ev

Science, Technology and Society

CTC.45$_9$ apply scientific skills and technological tools to address personal and societal

CTC.46 engage in decision making activities

- s o c i e t y

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.47 investigate and analyze the

CTC.50 access, gather, store, retrieve, and organize data using hardware and software designed for these purposes

- d e p e n d e n c e

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- t e c

CTC.51 collect, analyze and display data using computers and other electronic technology ∀

CTC.52 access Internet resources for a variety of purp

chat and real-time, investigations) ∀ processing, d

CTC.53 demonstrate skills in use of word

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CTC.54 identify and solve problems with the

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CTC.55 incorporate correct grammar, spelling,

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Advanced Environmental Earth Science (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**

h s f o r a n a l y s i s "

ES.13$_{3,4,5,6,7,8,9,10}$ **identify, analyze, and infer**

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ES.14 use SI (metric) measurements
ES.15 apply rational thinking processes that

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olving by employing critical thinking skills, imagin

or cooperatively ∀

ES.16 use the tools of science safely, accurately, and appropriately ∀

ES.18$_{9}$ manipulate variables to expand

ES.17$_{4,5,6,8,9}$ **identify independent and dependent**

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ES.19$_9$ **design, conduct, evaluate and revise**

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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 conduct research ∀

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

Science Themes/Subject Matter

ES.24 **review 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)

ES.28 explain stellar evolution and stellar types

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

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ES.35 **identify lithosphere, hydrosphere,**

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ES.37 identify and describe the natural

ES.36 describe earth's origin as it relates to

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ES.38 identify and describe agents and the development of the solid earth processes of deg

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ES.39 identify and describe tectonic forces

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ES.40 **understand the cause and effect**

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ES.41 **e construct and/or interpret a r t h**

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ES.43 **identify and describe properties of**

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ES.44 u compare and contrast ocean

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ES.45 identify and describe the structure and evolution of the atmosphere

ES.46 **investigate and explain, heat transfer in the atmosph**

(e.g., pressure, winds, evaporation, condensation,

ES.47 compare and contrast

to air masses, weather systems, and forecasting

ES.48 examine global change over time (e.g

rming, ozone depletion) earth processes and natural

ES.49 describe the relationship between

ES.50 explore the relationships between human consumption of natural resources and

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

ES.55 understand the fragile nature of the Earth

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

hazardous waste

ES.62 understand and appreciate the evolving nature of scientific thought and knowledge

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Science, Technology, and Society

ES.63 apply science and use technology to

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ES.64 describe the costs and benefits of

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ES.65 engage in decision making activities needs and actions

ES.66 recognize the scientific principles in resolve science-technology-soci

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Computer and Technology

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ES.67 explore the connections among

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ES.69 access Internet resources for a variety of purposes (e.g., designed for these purposes)

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ES.70 demonstrate skills in use of word

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ES.71 identify and solve problems with the

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ES.72 incorporate correct grammar, spelling, ∀ vocabulary and graphical representatio

Advanced Physics (11/12)

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. 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.9$_{4,5,6,7,8,9,10}$ **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.10 demonstrate ethical practices for science (e.g., established research protocol, accurate record keeping, replication of results, and peer review)∀

P.11 **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

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P.13 realize that we experience science in our everyday activities and develop a base of pre

P.14 investigate learning styles of learners and use appropriate learning cyc

P.15 differentiates between fact and

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Scientific Processes/Thinking Skills
P.16$_{3,4,5,6,7,8,9,10}$ **demonstrate science processes**

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P.17$_{3,4,5,6,7,8,9,10}$ **organize qualitative and quantitative data**

P.18$_{3,4,5,6,7,8,9,10}$ **identify, analyze, and infer using into tables, diagrams, a**

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P.19 **a** use SI (metric) measurements
P.20 **l** apply rational thinking processes that

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creativity

P.21 use the tools of science safely, accurately, and appropriately ∀

P.22$_{4,5,6,8,9}$ identify independent and dependent variables in experimental investigations

P.23$_{9}$ manipulate variables to extend experimental activities

P.24$_{9}$ **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.25 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.26 properly and safely manipulate equipment, materials, chemicals, organisms, and models ∀

P.27 conduct explorations in a variety of environments (e.g., laboratories, museums, libraries, parks and other outdoors locations)∀

P.28 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.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 vel**

e s , c i r c l e s

P.35 **investigate, analyze, synthesize, and a n d e l l i p s e s , p a r a b o l a s , a n d a r b i t r a r y c**

P.36 **investigate, analyze, synthesize, and**

u a t e t h e c o n c e p t o f t h e

P.37 **investigate, analyze, synthesize, and f u n d a m e n t a l f o r c e s a n d t h e i r**

of motion evaluate applications of Newton's laws.

P.38 **investigate, analyze, synthesize, and**

P.39 **investigate, analyze, synthesize, and ap**

, gravitational and elastic potential, thermal)

P.40 **investigate, analyze, synthesize ,** **eval**

momentum

P.41 **investigate, analyze, synthesize, and evaluate electric and magnetic**

P.42 **investigate, analyze, synthesize, and forces and f**

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P.43 **investigate, analyze, synthesize, and**

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P.44 **investigate, analyze, synthesize, and**

e v a l u a t e l i g h t a s a n e l e c t r o

P.45 investigate, analyze, synthesize, and **ations (include eye, mirror, lenses, holograms, phot**

nergy and its applications to modern technology

P.46 investigate, analyze, synthesize, and evaluate

basic development through assump

Science History

P.47 identify contributors to the scientific body of knowledge including their diverse cultures

P.48 trace the historical development of key scientific concepts and principles describing their impact on modern thought and life

P.49 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.53$_9$ apply scientific skills and technological tools to address personal and societal needs ∀

P.54 engage in decision making activities and actions to resolve science-technology-society issues ∀

P.55 investigate and analyze the interdependence of science and technology ∀

P.56 describe the scientific concepts

P.57 explore occupational opportunities in

P.58 technology including the academic preparation necessary to investigate, analyze, synthesize, and

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P.59 investigate, analyze, synthesize, and
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Computer and Technology

P.60 access, gather, store, retrieve, and

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twared designed for these purposes

P.61 collect, analyze and display data using ∀ computers and

P.62 access Internet resources for a variety

P.63 demonstrate skills in use of word search, exchange data, E-mail, and real-time investigat

P.65 incorporate correct grammar, spelling, and telecommunications ∀

P.64 identify and solve problems with the appropriate technology ∀

itten and oral multime

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**

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PTC.9$_{3,4,5,6,7,8,9,10}$ **organize qualitative and**

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PTC.10$_{3,4,5,6,7,8,9,10}$ **identify, analyze, and infer**

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PTC.11 use SI (metric) measurements
PTC.12 apply rational thinking processes that

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	nation, and creativity
PTC.13	use the tools of science safely, while working individually and an

PTC.14$_{4,5,6,8,9}$ identify independent and dependent variables in experimental investigations

PTC.15$_{9}$ manipulate variables to expand experimental activities

PTC.16$_{9}$ **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 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**

PC.25 **investigate and analyze the concepts of kinematics (e.g., distance, time, energy)**

PC.26 **investigate and analyze the**

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PC.27 **investigate and analyze the concepts o f e n e r**

PC.28 **investigate and analyze concepts of molecular dynamics (e.g., kinetic molecular theory, heat exc**

PC.29 **investigate and analyze concepts of light, ray diagrams) electricity and magnetism (**

electronic devices)

PC.30 **investigate and analyze concepts of modern physics (e.g., atomic structure**

Science History

PTC.31 identify contributors to the scientific

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PTC.32 trace the historical development of

PTC.33 describe the impact of cultural, action on modern thought and life technological, and ec

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Science, Technology, and Society

PTC.34$_9$ apply scientific skills and

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PTC.35 engage in decision making activities

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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 ∀ s e s s o n s

Computer and Technology

PTC.39 access, gather, store, retrieve, and organize data using hardware and software designed for these purposes ∀ s c i e n c e - t e c h n o l o g y - s o c i e t y i s s u e s ∀

PTC.40 collect, analyze and display data using computers and other electronic technology ∀ of purp

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PTC.42 demonstrate skills in use of word ∀

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PTC.43 identify and solve problems with the

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PTC.44 incorporate correct grammar, spelling,

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Process/Workplace Goals

In addition to the core academic areas of English language arts, mathematics, science and social studies, six key areas of process 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 successfully, work with others, apply sound judgement, establish clear objectives for advancing career interest and utilize technology to assist with specific tasks. Throughout the 7 - 12 curricula the ∀ mark those academic learning objectives that particularly lend themselves to the development of process skills. The instructional practices section of this document also incorporates practices that support the development of these skills. The six goals are as follows:

Problem Solving
These process skills reflect one's ability to organize, plan, reason, and use information to solve problems. Time management; the ability to prioritize; understanding cause and effect relationships; and evaluating, summarizing, and communicating information are skills embedded throughout the core subjects K-12.

Communication
Effective communication is fundamental to achieving a desired result whether in the workplace or advancing one's education. The goal is to communicate effectively both orally and in writing. Correct grammar, punctuation, spelling and an extensive vocabulary equip students to deal effectively with various audiences, publics and individuals. Listening is also a significant skill in the area of communication.

Working With Others
The development of these skills gives the individual the ability to: function in both leadership and non-leadership roles, to deal with conflict effectively, to motivate individuals or teams of people, to understand the concept of "customer service", to participate in work-related decisions and acknowledge the contributions of others.

Technology
The ability to understand and utilize technology to solve problems is a mandate in today's world. Students will learn to: set-up and operate computer equipment and assorted peripherals, use on-line sources to obtain or exchange information; select and use multiple software packages; and demonstrate skills in the use of word processing, databases, spread sheets, graphics and telecommunications.

Self Management
Students will acquire the attributes of motivation, promptness, perseverance, honesty and reliability in word and action. Well developed self management skills also reflect pride in work effort, attention to detail and accuracy and a focus on personal wellness and grooming.

Career Development
This area establishes a process to assist students in planning and preparing for a career. The formal initiation begins at the end of eighth grade when the student, the parents, and counselor begin assessing and discussing the students career interest and choose some corresponding career clusters to be explored in grades nine and ten. Upon completion of the tenth grade, students, parents and the counselor select a career major. Flexibility for changing clusters and majors remains throughout. Another objective is to assist students in developing and reviewing career goals and plans, to evaluate personal interest and aptitudes, to master skills needed to prepare job applications, resumes, cover and follow-up letters and to speak with confidence and composure about one's own skills and qualifications in an interview setting. A culminating step in the area of career development is the workplace experience that all students will have during ninth through twelfth grades.

Process/Workplace Objectives

Although these objectives are reflected throughout the core subjects K-12 and identified with a ∀ in grades 7-12, a listing of highly focused process skill objectives provides additional guidance for teachers in developing experiences and opportunities for students. These objectives may also be used by the school and employer to determine if the workplace experience merits awarding unit(s) of credit.

Problem Solving

PW.1 systematically analyze the component parts of a given situation or process and then plan, organize, and implement a concept to improve that situation or process

PW.2 given a set of rules, directions, or instructions, apply them to solve a problem or accomplish a task

PW.3 given multiple tasks, prioritize them according to importance and prepare a time frame and schedule to accomplish the tasks

PW.4 identify and analyze a problem by stating causes and effects

PW.5 given an event or activity, identify the resources needed and develop a plan of action

PW.6 provided several sources of information relative to the workplace assignment, evaluate the information for reliability, completeness and applicability

PW.7 establish a procedure and method for maintaining and retaining information relative to the workplace assignment

PW.8 demonstrate an understanding of oral, visual, and written information by summarizing it and following through with appropriate action

Communication

PW.9 use correct grammar when speaking and writing

PW.10 use correct punctuation, spelling, vocabulary and grammar in all written work

PW.11 given a situation or circumstance, take a position and communicate ideas to justify the position

PW.12 compose correspondence for a variety of audiences that is grammatically correct, easily understood, and reflects all necessary information

PW.13 using multi-media, prepare an oral presentation that has a specific message, that is effective and then alter the presentation for a different audience

PW.14 perform a task after listening to oral information

PW.15 use active listening and observation

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Working With Others

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PW.17 given an assignment with two or more roles, communications, and

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PW.18 e perform effectively in both leadership
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PW.19 placed in situations of conflict,

rship roles demonstrate ability to mediate and resolve

PW.20 analyze verbal and non-verbal

given situation or process (e.g., supervisors, peers,

PW.21 provide effective, corrective, and

PW.22 given a complaint, understand the appropriate to others in the appropriate situation appropriate

PW.23 understand the different functional areas in an organization and take appropriate action

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PW.24 be able to participate effectively in

making group decisions, and be able to support those decide

PW.25 given a circumstance where there is a

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Technology

PW.26 demonstrate the ability to set up computer equipment

PW.27 demonstrate the ability to operate computer equipment

PW.28 demonstrate the ability to obtain and exchange information by using on-line sources

PW.29 demonstrate the ability to select and use multiple software packages for specific purposes

PW.30 demonstrate the ability to use word processing

PW.31 demonstrate the ability to create and use databases, spreadsheets, and graphics

PW.32 demonstrate the ability to use telecommunications

PW.33 given a problem, assignment, or task, select and use the appropriate technology and procedures for a resolution or solution

Self Management

PW.34 understand what is expected of a person in a given situation or process, and be able to clarify, modify, and/or meet those expectations

PW.35 be punctual with appointments and completion of work assignments, and be able to handle appropriately unavoidable delays

PW.36 stay with an assignment or task to completion

PW.37 demonstrate self-motivation

PW.38 work independently without direct supervision

PW.39 take steps appropriate to developing or implementing new ideas or concepts to improve a given situation or process

PW.40 choose ethical courses of action and exhibit honesty and reliability in words and action

PW.41 given a fixed amount of funds, create

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PW.42 dress appropriately to maximize

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PW.44 be able to check the details and quality functions) and respond appropriately

PW.43 demonstrate sound safety practices

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Career Development

PW.45 establish career clusters and majors

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PW.46 identify multiple career options and making into consideration self assessment and career assess

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PW.47 prepare a job or college application,

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PW.48 practice interview strategies

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PW.49 provide community service and assesses entr

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PW.50 discuss with the workplace supervisor the legal an

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Kindergarten - Twelve Instructional Practices

IP.1 continually monitor students' daily work, provide feedback to students on progress, and reteach skills before introducing new ones

IP.2 provide opportunities for students demonstrating grade level mastery of skills to advance to the next grade level of skills

IP.3 nclude in the structure of the lesson preteaching, reviewing of prerequisite learning, sharing the objectives, presenting new material in small steps with practice after each step and checking for understanding; then after initial instruction provide guided practice under direct teacher supervision, assign homework to reinforce classroom learning, and conduct periodic reviews

IP.4 increase time for teaching and learning by establishing rules, procedures and consequences and communicating them to students; enforcing behavioral expectations consistently and uniformly; planning lessons well in advance; reducing transition time between lessons and activities; setting an appropriate pace in teaching the lesson; giving students alternate or ongoing assignments; using "self- instructional" activities; giving additional work that builds desired skills; and making instructions focused and clear

IP.5 match instructional methodologies to learning styles; differences in students' achievement levels; and emotional, social, and physical characteristics of students

IP.6 encourage students to think systematically, critically, and analytically about issues and events by using effective questioning techniques and other strategies (e.g., the Socratic method, "what if" questions, graphic organizers, creating a time capsule, human timeline, or opinion continuum)

IP.7 make teaching student-centered, utilizing a variety of participatory strategies and materials. (e.g., cooperative learning, role playing, small group exploration, manipulatives, calculators)

IP.8 provide feedback to students on

IP.9 establish a grading procedure that reflects assessment of the required

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IP.10 use a variety of print sources in h

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IP.11 incorporate writing into all curricular

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IP.12 encourage students to engage in r s , p o e t r y , f i c t i o n , n e w s p a p e r a r t i c l e s , l e t t e r s p r e

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Fairs, press conferences, plays, oral interpretati

Give students practice in communicating their knowle

IP.13 show students linkages among all the positive and negative subject areas by organizing them

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IP.14	provide constant opportunities for	j o u r n a l w r i t i n g a s p a r t o f a c h e

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model for students what is expected of them

IP.15 teach students how to work effectively on a team by assuming both leadership and non-leadership roles, by understanding differences of opinion, by dealing appropriately with conflict, and by motivating and acknowledging others' conributions

IP.16 help students understand their individual roles in larger organizations (e.g., team, class, school) as active participants in decision making, accepting supervision, and cooperating with authority. Provide practice in effective work habits as part of instruction and assist students in realizing that it is their job to learn, so that students become "workers" in their own education

IP.17 use classroom management techniques (e.g., in the formulation of rules and procedures) to foster cooperation, self-control, independence, perseverance, honesty, and reliability in word and action in students. Recognize the potential of each individual learner and his/her worth as a human being;

IP.18 build skills and encourage attitudes in students which will lead to life-long learning by s

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IP.20 alternate instructional strategies within each lesson and use computers an

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IP.22 work and plan with other teachers and

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