

## CSTA Web Repository of K-12 Computer Science Teaching Resources Classification System

This list shows the repository **Collections** to which resources may be submitted. Each resource may be classified in multiple ways, if appropriate.

### Notes:

- Categories in shaded rows are **Communities** (groupings) of **Collections**; resources must be classified at the lowest level (non-shaded rows).
- Refer to detailed instructions on <http://csta.acm.org/Resources/sub/WebRepository.html>.

Collection		Description
<b>L1</b>	<b>Level 1: Preparation for Computer Science</b>	Level 1: Preparation for Computer Science (K-8)
L1 A	Basic operations and concepts	Students demonstrate a sound understanding of the nature and operation of computers, and are proficient in their use.
L1 B	Social, ethical, and human issues	Students understand the ethical, cultural, and societal issues related to computers; practice responsible use of computers, information, and software; and develop positive attitudes toward computer uses that support lifelong learning, collaboration, personal pursuits, and productivity.
L1 C	Productivity tools	Students use tools to enhance learning, increase productivity, and promote creativity; and use productivity tools to collaborate in constructing models, prepare publications, and produce other creative works.
L1 D	Communication tools	Students use telecommunication to collaborate, publish, and interact with others; and use different media and formats to exchange information and ideas effectively with various audiences.
L1 E	Technology research tools	Students use computers to locate, evaluate, and collect information from a variety of sources; use technology tools to process data and report results; and evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.
L1 F	Technology problem-solving and decision-making tools	Students use technology resources for solving problems and making informed decisions; and employ technology in the development of strategies for solving problems in the real world.
L1 G	Algorithmic problem-solving tools	Students use appropriate programming languages, simulators, and robots to discover and analyze multi-step algorithmic solutions to problems.
<b>L2</b>	<b>Level 2: Computer Science in the Modern World</b>	This is a one-year course (or the equivalent) that would be accessible to all students, whether they are college-bound or workplace-bound. The goal of this course is to provide all students with an introduction to the principles of computer science and its place in the modern world. This course should also help students to use computers effectively in their lives, thus providing a foundation for successfully integrating their own interests and careers with the resources of a technological society.
<b>L2 A</b>	<b>Topics</b>	A major outcome of this course is to provide students with general knowledge about computer hardware, software, languages, networks, and their impact in the modern world.
L2 A 01	Computer Organization & Major Components	Principles of computer organization and the major components (input, output, memory, storage, processing, software, operating system, etc.)
L2 A 02	Algorithmic Problem Solving	The basic steps in algorithmic problem solving (problem statement and exploration, examination of sample instances, design, program coding, testing and verification)
L2 A 03	Networks	The basic components of computer networks (servers, file protection, queues, routing protocols for connection/communication, spoolers and queues, shared resources, and fault-tolerance)
L2 A 04	Internet Elements	Organization of Internet elements, Web page design (forms, text, graphics, client- and server-side scripts), and hypermedia (links, navigation, search engines and strategies, interpretation, and evaluation).
L2 A 05	Hierarchy & Abstraction	The notion of hierarchy and abstraction in computing, including high-level languages, translation (compilers, interpreters, linking), machine languages, instruction sets, and logic circuits.
L2 A 06	Mathematics & Computer Science	The connection between elements of mathematics and computer science, including binary numbers, logic, sets, and functions.
L2 A 07	Models of Intelligent Behavior	The notion of computers as models of intelligent behavior (as found in robot motion, speech and language understanding, and computer vision), and what distinguishes humans from machines.

L2	A	08	Examples of utility & problem solving	Examples (like programming a telephone answering system) that identify the broad interdisciplinary utility of computers and algorithmic problem solving in the modern world.
L2	A	09	Ethical Issues	Ethical issues that relate to computers and networks (including security, privacy, intellectual property, the benefits and drawbacks of public domain software, and the reliability of information on the Internet), and the positive and negative impact of technology on human culture.
L2	A	10	Careers in Computing	Identification of different careers in computing and their connection with the subjects studied in this course (e.g., information technology specialist, Web page designer, systems analyst, programmer, CIO).
L2	A	11	Programming Languages	Introduction to some basic issues associated with program design and development, to establish an appreciation of the work being done by software.
L2	A	12	Web Design & Development	Planning and coding simple Web pages, and checking for usability.
L2	A	13	Multimedia	Basic file formats for audio, video, and graphics, creation of multimedia objects and their appropriate use.
L2	A	14	Applications	Analytical selection and use of appropriate tools (ex: word processing, spreadsheets, databases, and presentation software) to solve problems. New concepts in the use of productivity software will be introduced such as macros, multi-table database design, creation, and maintenance, integration between applications, and importing/exporting data.
L2	A	99	Miscellaneous	Miscellaneous
L2	B		Syllabi	Syllabi
L2	C		<b>Multi-Topic Assessments</b>	Multi-Topic Assessments
L2	C	01	Rubrics	Rubrics
L2	C	02	Test questions	Test questions
L2	C	03	Miscellaneous	Miscellaneous
L3			<b>Level 3: Computer Science as Analysis and Design</b>	This is a one-year course (or the equivalent) that should earn curriculum credit (e.g., science or math). The goal of this course is to continue the study of computer science, placing particular emphasis on its features as a scientific and engineering discipline. In this course, high school students can go beyond a fundamental understanding of the operation of computers and explore more complex and interesting topics of computer science. This course also helps students improve their problem-solving and programming skills in preparation for the Advanced Placement A course. As in higher level math and science curricula, students will be able to see the connection between the fundamentals they have learned in Levels I and II to integrate programming and design with complex "real world" projects.
L3	A		<b>Topics</b>	The major goal of this course is for students to develop the computer science skills of algorithm development, problem solving, and programming while using software engineering principles. While the emphasis of the course will be on programming, students will also be introduced to other important topics, such as interface design, the limits of computers, and societal and ethical issues of software engineering.
L3	A	01	Fundamental ideas about the process of program design & problem solving	Fundamental ideas about the process of program design and problem solving, including style, abstraction, and initial discussions of correctness and efficiency as part of the software design process.
L3	A	02	Simple data structures and their uses	Simple data structures and their uses.
L3	A	03	Discrete mathematics	Topics in discrete mathematics: logic, functions, sets, and their relation to computer science
L3	A	04	Design for usability	Design for usability: Web page design, interactive games, documentation
L3	A	05	Fundamentals of hardware design	Fundamentals of hardware design.
L3	A	06	Levels of language, software, and translation	Levels of language, software, and translation: characteristics of compilers, operating systems, and networks.
L3	A	07	Limits of computing	The limits of computing: what is a computationally "hard" problem? (e.g., ocean modeling, air traffic control, gene mapping) What kinds of problems are computationally unsolvable? (e.g., the halting problem)
L3	A	08	Principles of software engineering	Principles of software engineering: software projects, teams, the software life cycle.
L3	A	09	Social issues	Social issues: Software as intellectual property, professional practice
L3	A	10	Careers in Computing	Careers in computing: computer scientist, computer engineer, software engineer, information

		technologist.
<b>L3 B</b>	<b>Programming Component</b>	Programming Component
L3 B 01	Methods (functions) and parameters	Methods (functions) and parameters
L3 B 02	Recursion	Recursion
L3 B 03	Objects & classes	Objects and classes: arrays, vectors, stacks, queues, and their uses in problem solving
L3 B 04	Graphics programming	Graphics programming
L3 B 05	Event-driven and interactive programming	Event-driven and interactive programming
<b>L3 C</b>	<b>Hardware and Software Engineering</b>	Hardware and Software Engineering
L3 C 01	Hardware & systems	Hardware and systems: logic, gates and circuits, binary arithmetic, machine and assembly language, operating systems, user interfaces, compilers.
L3 C 02	Software engineering	Software engineering: requirements, design, teams, testing and maintenance, documentation, software design tools.
L3 C 03	Societal issues in software engineering, limits of computing, levels of languages, computing careers	Societal issues in software engineering, limits of computing, levels of languages, computing careers.
L3 D	Syllabi	Syllabi
<b>L3 E</b>	<b>Multi-Topic Assessments</b>	Multi-Topic Assessments
L3 E 01	Rubrics	Rubrics
L3 E 02	Test questions	Test questions
L3 E 03	Miscellaneous	Miscellaneous
<b>L4</b>	<b>Level 4: Topics in Computer Science</b>	At this level, interested and qualified students should be able to select one from among several electives to gain depth of understanding or special skills in particular areas of computer science. All of these electives will require the Level II course as a prerequisite, while some may require the Level III course as well. Most important, these courses provide students with an opportunity to explore topics of personal interest in greater depth, and thus prepare themselves for the workplace or for further study at the post-secondary level.
<b>L4 A</b>	<b>Advanced Placement Computer Science (A &amp; AB levels)</b>	The AP computer science curriculum is well established, and is offered at many secondary schools for students planning to continue their education in a two- or four-year college or university, possibly in computer science, business, or a related field. Students taking an AP course should have completed Levels I and II. Students entering an AP Computer Science course need to be familiar with the basic algorithmic concepts introduced at those levels. The programming concepts covered in Level III overlap somewhat with the AP course, so some of the AP course can serve as a review if students have had the Level III course.
L4 A 01	Object-Oriented Program Design [AP Topic Outline I]	The overall goal for designing a piece of software (a computer program) is to correctly solve the given problem. At the same time, this goal should encompass specifying and designing a program that is understandable, can be adapted to changing circumstances, and has the potential to be reused in whole or in part. The design process needs to be based on a thorough understanding of the problem to be solved.
L4 A 02	Program Implementation [AP Topic Outline II]	The overall goals of program implementation parallel those of program design. Classes that fill common needs should be built so that they can be reused easily in other programs. Object-oriented design is an important part of program implementation.
L4 A 03	Program Analysis [AP Topic Outline III]	The analysis of programs includes examining and testing programs to determine whether they correctly meet their specifications. It also includes the analysis of programs or algorithms in order to understand their time and space requirements when applied to different data sets.
L4 A 04	Standard Data Structures [AP Topic Outline IV]	Data structures are used to represent information within a program. Abstraction is an important theme in the development and application of data structures.
L4 A 05	Standard Algorithms [AP Topic Outline V]	Standard algorithms serve as examples of good solutions to standard problems. Many are intertwined with standard data structures. These algorithms provide examples for analysis of program efficiency.
L4 A 06	Computing in Context [AP Topic Outline VI]	A working knowledge of the major hardware and software components of computer systems is necessary for the study of computer science, as is the awareness of the ethical and social implications of computing systems. These topics need not be covered in detail but should be

		considered throughout the course.
L4 A 07	Syllabi	Syllabi
L4 A 08	Multi-topic assessments	Multi-topic assessments
<b>L4 B</b>	<b>Projects-Based Courses</b>	This kind of course would be available to all students who have completed the Level I and II curricula. Some variants of this course would also require completion of Level III (see below). This could be either a half-year or a full-year course.
L4 B 01	Desktop Publishing	This course introduces planning, page layout, and the use of templates to create flyers, documents, brochures, and newsletters. Word processing and graphical editing fluency (Level I) will help insure student success. Methods of distribution of these documents in both written and electronic formats should be included. This will necessitate understanding of Internet concepts and network connectivity (Level II).
L4 B 02	Presentation Design	The ability to communicate and share ideas should be a core requirement for all high school graduates. Communication can be written and/or oral. This type of project focuses on planning a presentation – including outlining, converting the outline into a document, and generating the presentation. Concepts covered include appropriate use of text, colors, graphics, sound, and animations on slides as well as linking within and outside the presentation. Ultimately, students will present to an audience. Fluency with word processing software (Level I) and multimedia concepts (Level II) is required.
L4 B 03	Multimedia	The use of multimedia is increasing steadily at the user level, fueled by more efficient hardware and the availability of digital cameras and digital audio equipment. However, multimedia is often abused when incorporated into programs, Web pages, and presentations. This project will provide instruction in the use of digital audio and video equipment and related editing software. A major focus will be deploying multimedia in a responsible fashion. Basic software skills (Level I) and an understanding of multimedia concepts (Level II) are required.
L4 B 04	Graphics	This class explores bitmap and vector-based graphics. The discussion includes benefits and limitations of each type of software and hands-on experience with both. CAD, CAM, and 3-D design software should be explored as well as bitmap software for creation and editing of graphics. Availability of a digital camera and scanner is required. Responsible deployment of graphics including style and legal issues needs to be investigated. The discussion of vector-based graphics will be facilitated by completion of Level III – limits of computers and design for usability.
L4 B 05	Design & Development of Web Pages	At Level II, students are exposed to Internet concepts and HTML. This course presents a more in-depth view of the design and development issues that need to be considered for a multi-platform international implementation. A focus issue is the standardization of Web page development using the recommendations of the WWW Consortium. Web page development is presented and evaluated using text editors, HTML editors, converters, and Web authoring programs.
L4 B 06	Web Programming	Students who have successfully completed Level III but do not wish to take an AP course might nevertheless enjoy applying their programming skills to the WWW. To be successful, a solid understanding of Internet concepts, Web page design and development issues, and basic programming concepts will be required. Topics in this course can include client-side and server-side scripting languages. Students will need to write scripts and deploy them within Web pages or on the Web server.
L4 B 07	Emerging Technologies	This project can include several distinct topics, and its content is expected to change on a regular basis. An example topic for upcoming years might be XML/XSL and wireless connectivity. These areas can be tied together with a discussion of requirements for the same data to be represented on a PC, personal digital assistant (PDA), and cell phone. Curriculum and materials for this topic would need to be developed from current resources on the Web, perhaps in conjunction with local colleges and universities, and with input from the professional sector of the Business Community.
L4 B 08	The Computer & Animation	The Computer and Animation (prereq: Level II)
L4 B 09	Networking Technologies	Networking Technologies (prereq: Level III)
L4 B 10	Programming Simulations	Programming Simulations (e.g. a computer-controlled chemistry experiment) (prereq: Level III)
L4 B 11	Object-oriented design & coding	Object-oriented design and coding (prereq: Level IV -- AP CS)
L4 B 12	Effective use of Computer Applications	Effective use of Computer Applications (prereq: Level II)
L4 B 99	Miscellaneous	Miscellaneous
<b>L4 C</b>	<b>Courses Leading Toward Industry Certification</b>	Such courses are primarily geared toward students planning on entering the workforce, continuing their education in a post-secondary technical school, or entering a two-year college AAS program. Students taking this course should have completed the Level I and Level II courses. More detailed information about these and other certification programs, both vendor-specific and vendor-neutral, can be found at the Web site <a href="http://www.computer-certification-">http://www.computer-certification-</a>

		training.com/index.html.
L4 C 01	Vendor-Neutral	Vendor-neutral certifications.
L4 C 02	Vendor-Sponsored	Vendor-sponsored curricula need to be evaluated carefully. While rich in content, some of these courses are structured to emphasize proprietary products rather than general concepts.
<b>SI</b>	<b>Strategies for Implementation</b>	Strategies for Implementing a computer science program
<b>SI A</b>	<b>Promotional ideas</b>	Promotional ideas
SI A 01	Recruiting students	Recruiting students
SI A 02	Parents' nights	Parents' nights
SI A 99	Miscellaneous	Miscellaneous promotional ideas
SI B	Clubs	Clubs: starting a club, rules, activities, etc.
<b>SI C</b>	<b>Equity Issues</b>	Equity Issues
SI C 01	Gender	Gender-related equity issues
SI C 02	Under-represented populations	Under-represented populations.
SI D	Classroom Strategies	General teaching strategies, not specific to a particular curriculum level.