Computer Science Guidance

The Wisconsin Computer Science (405/1405) license is issued to an applicant who has completed an approved educator preparation program leading to licensure in Computer Science. It allows the educator to teach Computer Science courses. Often, there is confusion between "Computer Science" and other areas of computing, such as "computer literacy" and "educational technology." The purpose of this guidance is to provide clarity on what constitutes a Computer Science course. This guidance will allow school districts to:

- Ensure appropriately licensed Computer Science (405/1405) teachers for Computer Science courses,
- Identify Computer Science courses in their district when entering data into the Wisconsin Coursework Completion System (CWCS), and
- Recognize what is meant by "Computer Science" course as a mathematics credit within Wisconsin State Statute 118.33 (1) (a) 1. c.

Wisconsin State Statute 118.33 (1) (a) 1. c. -- High school graduation standards
c. *At least 3 credits of mathematics. The school board shall award a pupil up to one mathematics credit for successfully completing in the high school grades a course in computer sciences that the department has determined qualifies as computer sciences according to criteria established by the department.*

What is Computer Science in Wisconsin?

For many years, the Wisconsin Computer Science (405) licensure program requirements included: (1) the study of problem solving techniques including structured system analysis, design, implementation and evaluation; structured algorithm design, coding, documentation, and testing; programming languages; data structures and their application; (2) the study of computer organization and system software including digital logic, internal representation of information, operating environments, and data-flow and exchange; and, (3) the study of the effects and applications of computers and computing in all areas of society. Consequently, guidance to school districts in the past has been that Computer Science is any course whose content is at least 25% programming.

With the widespread adoption of computers and related devices, however, a broad range of computing areas has emerged, and the definition of computing has evolved. The following list identifies general definitions of some of the most common computing areas currently used in schools:

Technology/computer literacy and fluency*:* A spectrum of curricula ranging from literacy (understanding how to use technology) to fluency (the ability to express ideas creatively, reformulate knowledge, and synthesize new information and technology).

Educational technology or computing across the curriculum*:* The integration of technology into teaching in order to advance student learning across academic disciplines.

Information technology (IT)*:* A broad and diverse set of topics, but typically focused on applying the components of computing to the acquisition and/or analysis of information, in order to solve a business information problem, such as network or database administration.

Computer Science*:* An academic discipline that encompasses the study of computers and algorithmic processes, including their principles, their hardware and software designs, their applications, and their impact on society.

Computer Science IS NOT:

Technology/Computer Literacy and Fluency, which is concerned with informing and acclimating users to the benefits of using computing machines, software, and devices. This area includes keyboarding, desktop publishing, using and understanding educational technology, using and understanding information technology, and using apps on tablets or similar devices.

- *While computer literacy concentrates on learning computing machines, software, and devices,* ***computer science*** *is concerned with developing the application software and designing the computer devices.*

Computer Science IS NOT:

Educational Technology, which can be defined as using computers across the curriculum, or more specifically, using computer technology (hardware and software) to learn about other disciplines. For example, the science teacher may use pre-existing computer simulations to provide students with a better understanding of specific physics principles, or an English teacher may use word processing software to help students improve their editing and revision skills.

- *While educational technology is concerned with using these tools,* ***computer science*** *is concerned with designing, creating, testing, modifying, and verifying these tools.*

Computer Science IS NOT:

Information technology (IT) is "the proper use of technologies by which people manipulate and share information in its various forms." While Information Technology involves learning about computers, it emphasizes the technology itself. Information Technology specialists assume responsibility for selecting appropriate hardware and software products, integrating those products with organizational needs and infrastructure, and installing, customizing, and maintaining those resources. Information Technology courses, therefore, focus on:

- installing, securing, and administering computer networks;
- installing, maintaining, and customizing software;
- managing and securing data in physical and virtual worlds;
- managing communication systems;
- designing, implementing, and managing Web resources; and
- developing and managing multimedia resources and other digital media.

IT is an applied field of study, driven by the practical benefits of its knowledge, while computer science adds scientific and mathematical, as well as practical, dimensions. Some of the practical dimensions of computer science are shared with IT, such as working with text, graphics, sound, and video.

- *While IT concentrates on learning how to use and apply these tools,* ***computer science*** *is concerned with learning how these tools are designed and why they work.*

Computer science and IT have a lot in common, but neither one is fully substitutable for the other. For example, the complexity of algorithms is a fundamental idea in computer science but would probably not appear in an IT curriculum.

For information on who can teach courses in these areas, please see:
http://tepdl.dpi.wi.gov/licensing/what-can-i-teach

Computer Science IS:
Computer Science, on the other hand, spans a wide range of computing endeavors, from theoretical foundations to robotics, computer vision, intelligent systems, and bioinformatics. The work of computer scientists is concentrated in three areas:

- designing and implementing software,
- developing effective ways to solve computing problems, and
- devising new ways to use computers.

The original definition of computer science was provided in the original ACM/CSTA Model Curriculum for K–12 Computer Science and has the most direct relevance to high school computer science education. "Computer science (CS) is the study of computers and algorithmic processes, including their principles, their hardware and software designs, their applications, and their impact on society."

Criteria that make a course a Computer Science course:

- Algorithmic Problem Solving: Systematic study algorithms or processes that underlie the acquisition, representation, processing, storage, communication of, and access to information.
- Applications development: Applications development and applications design through coding, programming, and software engineering.
- Computational Design and Computational Intelligence: Study of the design of computational systems, understanding how computational systems work -- and hands on application of mathematical processes within computational systems.
- Computational Thinking: Scientific and practical approach to computation and its application.
- Management Information Systems: Study of the access to information generated through computer systems (programming, databases, application development)-coding, database development, and the understanding of the applications used for computational processing and applications development.

Specific Courses identified as Computer Science Courses for Wisconsin:
Currently, several courses have been developed and are used nationally. Upon reviewing the course content against the Wisconsin criteria for a Computer Science course, school districts may consider the following courses as Computer Science: AP Computer Science, College Board; International Baccalaureate Computer Science, International Baccalaureate Organization.

Wisconsin Coursework Completion System
Upon reviewing the Wisconsin Coursework Completion System (CWCS) courses, the following chart of NCES course titles and definitions also fit the Wisconsin criteria for Computer Science. School districts that have developed and offer computer science courses in the following CWCS titles and definitions chart will be considered Computer Science Courses. These courses are taught by a Computer Science (405/1405) teacher. For more information on CWCS codes, please see: http://lbstat.dpi.wi.gov/lbstat_datacoursecode

Computer Science Courses and Math Credit
2013 Act 63 provides additional options for students to earn math credit through Computer Science courses. Courses that fit the Coursework Completion System definitions in the following chart are considered approved by DPI as a Computer Science course, and a local school board may award math credit to students who complete them. For more information, please see: http://cal.dpi.wi.gov/cal_grad-guidance.

WI Coursework Completion System (CWCS) Computer Science Course Codes (based on NCES Course Titles and Definitions)
Computer Programming 10152 Computer Programming courses provide students with the knowledge and skills necessary to construct computer programs in one or more languages. Computer coding and program structure are often introduced with the BASIC language, but other computer languages, such as Visual Basic (VB), Java, Pascal, C++, and COBOL, may be used instead. Initially, students learn to structure, create, document, and debug computer programs, and as they progress, more emphasis is placed on design, style, clarity, and efficiency. Students may apply the skills they learn to relevant applications such as modeling, data management, graphics, and text-processing.
Visual Basic (VB) Programming 10153 Visual Basic (VB) Programming courses provide an opportunity for students to gain expertise in computer programs using the Visual Basic (VB) language. As with more general computer programming courses, the emphasis is on how to structure and document computer programs and how to use problem-solving techniques. These courses cover such topics as the use of text boxes, scroll bars, menus, buttons, and Windows applications. More advanced topics may include mathematical and business functions and graphics.
C++ Programming 10154 C++ Programming courses provide an opportunity for students to gain expertise in computer programs using the C++ language. As with more general computer programming courses, the emphasis is on how to write logically structured programs, include appropriate documentation, and use problem solving techniques. More advanced topics may include multi-dimensional arrays, functions, and records.
Java Programming 10155 Java Programming courses provide students with the opportunity to gain expertise in computer programs using the Java language. As with more general computer programming courses, the emphasis is on how to structure and document computer programs, using problem-solving techniques. Topics covered in the course include syntax, I/O classes, string manipulation, and recursion.
Computer Programming - Other Language 10156 Computer Programming—Other Language courses provide students with the opportunity to gain expertise in computer programs using languages other than those specified (such as Pascal, FORTRAN, or emerging languages). As with other computer programming courses, the emphasis is on how to structure and document computer programs, using problem-solving techniques. As students advance, they learn to capitalize on the features and strengths of the language being used.
AP Computer Science A 10157 Following the College Board's suggested curriculum designed to mirror college-level computer science courses, AP Computer Science A courses provide students with the logical, mathematical, and problem-solving skills needed to design structured, well-documented computer programs that provide solutions to real-world problems. These courses cover such topics as programming methodology, features, and procedures; algorithms; data structures; computer systems; and programmer responsibilities.
IB Computer Science 10159 IB Computer Science courses prepare students to take the International Baccalaureate Computer Science exams at either the Subsidiary or Higher level. The courses emphasize problem analysis, efficient use of data structures and manipulation procedures, and logical decision-making. IB Computer Science courses also cover the applications and effects of the computer on modern society as well as the limitations of computer technology.
Particular Topics in Computer Programming 10160 These courses examine particular topics in computer programming other than those already described.
Computer Programming-Independent Study 10197 Computer Programming—Independent Study courses, often conducted with instructors as mentors, enable students to explore topics related to computer programming. Independent Study courses may serve as an opportunity for students to expand their expertise in a particular specialization, to explore a topic in greater detail, or to develop more advanced skills.
Computer Programming-Workplace Experience 10198 Computer Programming—Workplace Experience courses provide students with work experience in fields related to computer programming. Goals are typically set cooperatively by the student, teacher, and employer (although students are not necessarily paid). These courses may include classroom activities as well, involving further study of the field or discussion regarding experiences that students encounter in the workplace.
Computer Programming Other 10199 Other Computer Programming courses.

If you have questions, please contact: ***Updated on February 23, 2015***

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