This white paper is a companion to the "Idaho K-12 Computer Science Standards." This document provides motivation and rationale for the standards and describes their development process. This document also adds transparency for the standards development process by providing historical reference and rationale for the content of the standards. It is intended to provide context and guidance for the standards usage.

What is Computer Science?

Computer Science is an established discipline at the collegiate and postgraduate levels. It is best defined as "the study of computers and algorithmic processes, including principles, their hardware and software designs, their applications, and their impact on society." The foundational concepts of Computer Science permeates all work and play in the digital world that we live in. Although its name contains the word science, Computer Science is usually considered to be a branch of engineering. This is in sharp contrast to most of the physical sciences, which separate the understanding and advancement of the science from its practical applications. Science is a technique for learning about the natural world by applying the principles of the scientific method (which includes making empirical observations, proposing hypotheses to explain those observations, and then testing those hypotheses); engineering is the application of science.

Computers are virtually indispensable to the field of computer science. Yet, as Edsger Dijkstra, a pioneering computer scientist, so aptly put it, "Computer science is no more about computers than astronomy is about telescopes." Some of the major subspecialties of computer science are algorithms and data structures, programming methodology and languages, software engineering, computer architecture, operating systems, database systems, distributed systems, networks and communications, parallel computing, human-computer interaction, artificial intelligence, computer graphics.

The Idaho K-12 Computer Science standards are organized by grade bands (K-2, 3-5, K-5, 6-8, 9-10, 11-12, and 9-12) and the five Core Computer Science Concepts as referred to by the CSTA (Computer Science Teachers Association). The seven Computational Thinking Framework Practices (CSTA) are included to frame the different standards. Also included is a column for the designation of ISTE (International
The 5 Core Computer Science concepts:
1. Devices
2. Networks and Communication
3. Data and Analysis
4. Algorithms and Programming
5. Impact of Computing

The 7 Computational Thinking practices:
1. Recognizing and Representing Computational Problems
2. Developing and using Abstractions
3. Creating Computational Artifacts
4. Testing and Iteratively Refining
5. Fostering an Inclusive Computing Culture
6. Communicating about Computing
7. Collaborating around Computing

International Society for Technology Education (ISTE Standards):
1. Creativity and Innovation
2. Communication and Collaboration
3. Research and Information Fluency
4. Critical Thinking, Problem Solving, and Decision Making
5. Digital Citizenship
6. Technology Operations and Concepts

The Purpose of the Standards

Computer Science is a field of study that will help to prepare students for future college and career goals. There are many jobs that require the understanding of Computer Science concepts and skills, however, all Idahoans can benefit from the computational thinking that is incorporated into these standards. The development of the Computer Science standards will move the students from being consumers of technology to being able to understand and create new technologies of the future.

The standards prioritize, clarify, and build upon frameworks developed by professional organizations, educators, and industry. It is not an exhaustive list of everything in Computer Science that can be learned within a K-12 pathway but instead describes what it means to be literate in Computer Science.

The standards are not curriculum. Curriculum is determined by the LEA (Local Education Agency). The standards clarify the learning outcomes of students. The standards inform teachers of what students should know, understand, or be able to do. Teachers can create “I can” statements with student friendly language from the standards. These are the minimum standards for Computer Science education. The LEA may include additional standards when writing curriculum depending on course offerings and the needs of students. Educators can use the standards in a variety of creative ways.
Current Status of Computer Science in Idaho

Idaho’s current state of Computer Science is unstructured, disjointed, and uneven. As a result of not having a cohesive set of Idaho Computer Science Standards, teachers grasp from various resources and standards, which may not align across the state. This causes a lack of parity and equality for Idaho’s students, as well as their access to Computer Science education. Having a uniform set of Computer Science standards will provide continuity of K-12 Computer Science education offerings throughout the state. Benefits will continue through higher education, and ultimately industry, business, and commerce of Idaho as more competent and well-educated graduates fulfill positions throughout the state.

According to the Conference Board (used by the Idaho Department of Labor), there are currently around 1300 unfilled open jobs in the state of Idaho for computer science related professions, many of which can be attributed to a lack of qualified candidates. Not only is this challenging for potential employers, but also affects our state revenues in potential taxes with salaries averaging around $70,000. For the benefit of our citizens, students’ education, as well as the future of computer science and the technology industry in our state, creating these standards is an important step.

The Standards Creation Process

The standards were built on a progression of skills that can be accomplished using a variety of tools and in some cases limited access. Several existing Computer Science and related standards from CSTA (Computer Science Teachers Association), ISTE (International Society for Technology in Education), Florida Department of Education, Idaho CTE Programming Standards, Teacher Preparation Standards for Initial Certification in Computer Science, and Idaho Core Standards were reviewed and considered.

The working group chose the CSTA 2016 Computer Science draft standards as the starting point for the following reasons:

- The working group felt that the CSTA draft standards were the best match for Idaho.
- They were the most up to date standards with input from a variety of educators, industry, and professional organizations.
- The CSTA draft standards were created by the following participants:
  - Several states (MD, CA, IN, IA, AR, UT, ID, NE, GA, WA, NC)
  - Large school districts (NYC, Chicago, San Francisco)
  - Technology companies (Microsoft, Google, Apple)
  - Organizations (Code.org, ACM, CSTA, ISTE, MassCAN, CSNYC), and individuals (higher ed faculty, researchers, K-12 teachers, and administrators)
  - Idaho representation within the CSTA group

The working group evaluated and adapted the 2016 draft of the CSTA K-12 CS Standards with consideration of the following:

- Is the standard appropriate for Idaho?
- Is the standard appropriate for the given grade level?
- Is the standard measurable?
- Are there areas that we want to add that are not covered in the standards?
- Does the standard need an example for clarification?
- What needs to be removed, rewritten, or repositioned?
- Do the standards parallel what occurs in disciplines such as science, mathematics, and language arts?
The working group customized the CTA standards for Idaho using the above questions as a guide. This was done over four days of intense face to face discussion as well as offline email exchanges. The working group made several improvements and changes in the draft CSTA standards. These modification were also submitted back to the CSTA for incorporation into the national standards.

Once the a draft of the proposed standards was ready, a survey was sent to individuals in industry, elementary, secondary and postsecondary educators, and other interested parties to solicit input. The working group received over fifty surveys. The working group assessed and modified the standards based on the feedback.

**Supporting Resources and References**

CSTA K-12 CS Standards (2016)
ISTE Standards

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