



STATE of WYOMING LEGISLATURE

Memorandum

DATE September 29, 2017

TO Members, Select Committee on School Finance Recalibration

FROM Senator Henry H.R. "Hank" Coe, Co-chairman
Representative David Northrup, Co-chairman

SUBJECT Wyoming's Educational Program: Computer Science Recommendations

At the Joint Education Committee's (Committee) June 20-21, 2017 and September 27-28, 2017 meetings, the Committee received testimony from the Wyoming Department of Education (WDE) on expanding computer science education in Wyoming's public schools. Two memoranda from WDE to the Committee are referenced below so the Select Committee on School Finance Recalibration (Select Committee) may review background information presented to the Committee, along with recommendations of WDE. The first memorandum discusses the reasons WDE views expanding computer science education as an important goal, examines the current state of computer science education in Wyoming, and provides recommendations.¹ The second memorandum discusses the work of a task force created by the WDE to create a framework to expand computer science education in Wyoming and provides recommendations to change statute.² The WDE's recommended statutory changes are:

1. Incorporate computational thinking and computer science into the State's educational program;
2. Allow computer science courses to count toward high school graduation requirements;
3. Require the State Board of Education to promulgate computer science standards; and
4. Temporarily limit the Wyoming Education Trust Fund Grant (W.S. 21-22-106) of approximately \$250,000 annually to professional development for computer science teaching.

The Committee directed Legislative Service Office staff draft a bill to implement these recommendations. The Committee will review the bill draft at its November 14, 2017 meeting in Casper. The Committee also recommends the Select Committee consider these recommendations as part of the Select Committee's review of the educational program through the recalibration process.

Attachments (2)

Cc: Members, Joint Education Committee

¹ See Attachment F to the Committee's June 20-21, 2017, meeting materials index:

www.wyoleg.gov/InterimCommittee/2017/04-06202017AppendixF.pdf

² See Attachment G to the Committee's September 27-28, 2017, meeting materials index:

www.wyoleg.gov/InterimCommittee/2017/04-09272017AppendixG.pdf



WYOMING
DEPARTMENT OF EDUCATION

*Creating Opportunities
for Students to Keep
Wyoming Strong*

Jillian Balow
Superintendent of Public Instruction

Dicky Shanor
Chief of Staff

Brent Bacon
Chief Academic Officer

Lisa Weigel
Chief Policy Officer

Dianne Bailey
Chief Operations Officer

Cheyenne Office
Hathaway Building, 2nd Floor
2300 Capitol Avenue
Cheyenne WY 82002-2060
Phone: (307) 777-7675
Fax: (307) 777-6234

Riverton Office
320 West Main
Riverton, WY 82501
Phone: (307) 857-9250
Fax: (307) 857-9256

On the Web
edu.wyoming.gov
wyomingmeasuresup.com

Date: June 5, 2017

To: Co-Chairmen Coe and Northrup
Joint Education Interim Committee

From: Dicky Shanor, Chief of Staff
Laurel Ballard, Student & Teacher Resources
Team Supervisor
Jill Stringer, Math/STEM Consultant

Subject: Computer Science Education (Priority #3)

Thank you for selecting computer science education as an interim topic, it is absolutely essential in preparing our students for a 21st century economy. Developing these skills in our youth not only prepares them for the current and future workforce, but also fosters innovation that can drive Wyoming's future economy.

EXECUTIVE SUMMARY

i. Interim Priority #3

Computer science and computational thinking is critical in today's workforce. The work completed during this interim session on computer science will have long lasting impacts on students' success and opportunities as they move into the workforce. The WDE, in coordination with multiple partners, is putting together a task force to create and implement Wyoming's long-term plan for expanding computer science education.

ii. Why is computer science/computational thinking important?

Our economy is driven by technology. All of our industries: retail, construction, agriculture, mining, medical, etc. are not just using technology, but are driven by it to create efficiency and gain competitive advantage. The future of Wyoming's economy depends on a workforce with this knowledge and skill set. This is not just a skill anymore, it is a literacy for the 21st century.

iii. Where is Wyoming on this issue?

In 2015-16, Wyoming ranked as one of the lowest of the 50 states in the number of students taking AP Computer Science exams, with six students taking the exam and only three students passing. In the prior two years, there were no students who took the AP

Computer Science exam. Statewide we have an extremely limited number of educators in our schools who are certified to even teach computer science. In the 2015-16 school year, there were only eleven teachers with a computer science endorsement teaching a computer science course. With such limited opportunities for students to take computer science courses and the numerous opportunities for students to enter the workforce if they possess these skills, we have a disconnect between the needs of industry and our K-12 priorities. This interim topic and plan will help us close this gap.

iv. How do we go from the bottom to being a national leader?

The work and coordination required to quickly move Wyoming to being a national leader in computer science education will be a heavy lift with tremendous benefits for both students and Wyoming's economy. This work will require Wyoming to engage teachers, school districts, postsecondary institutions, state agencies, economic development groups, industry partners, and national partners, along with aligning to efforts such as ENDOW, the Wyoming Workforce Development Council, and the Wyoming Career Readiness Council.

v. What is specific to the JEC?

The Legislature has the ability to drive home the importance of preparing Wyoming's students for tomorrow's workforce. The foundation of so much work requires the skills learned in computer science. By phasing computer science into the common core of knowledge and skills, it becomes elevated to the level of importance in schools that will help to ensure all of Wyoming's students have access to this critical information.

DISCUSSION

i. Interim Priority #3

“The Committee will develop a multi-pronged strategy for increasing the number of opportunities across the state for students to take classes in computer science/computational thinking. This may include an analysis of graduation requirements, accountability indicators, Professional Teaching Standards Board credentialing practices, funding mechanisms, the common core of knowledge and skills, and public-private partnerships.”

The WDE intends to convene a stakeholder group of experts on this issue to create this strategic plan. We intend to include an analysis of all the topic areas mentioned and much more. This will be a heavy lift but one that is imperative for the future of our students and state.

ii. Why is computer science/computational thinking important?

Computer Science underlies most innovation today, from health care, roads and transportation, agriculture to national security; however, the majority of U.S. schools only require students use computers. Seldom do schools prepare students to innovate and create the new technologies that drive local and national economies. This ability to innovate with technology is also important for students' future success and ability to make a difference in a global economy. Statewide efforts like ENDOW will only be successful if we have a skilled workforce that can meet the technology needs of any industry wishing to develop and expand in Wyoming.

What are Computational Thinking and Computer Science?

Computational thinking is a core skill learned through studying computer science. Google Education states, “Computational thinking (CT) is a problem solving process that includes a number of characteristics, such as logically ordering and analyzing data and creating solutions using a series of ordered steps (or algorithms), and dispositions, such as the ability to confidently deal with complexity and open-ended problems. CT is essential to the development of computer applications, but it can also be used to support problem solving across all disciplines, including math, science, and the humanities. Students who learn CT across the curriculum can begin to see a relationship between subjects as well as between school and life outside of the classroom.”

Computer science is about logic, problem solving, and creativity. Students learn how to think differently about problems they are trying to solve in any context. Students learn how to create digital artifacts and how those artifacts impact the world around them by looking at issues such as privacy and security. Thinking simply about computer science is that student are taught how to create new technologies instead of only being consumers of technology.

Just as important as recognizing what computer science is, is recognizing what it is not. It is not basic HTML design, it is not learning to use applications like Word or Excel or a Photoshop course. Although these can be part of a computer science course, they are not the foundation of the curriculum. When students learn computer science, they become the creators of technology instead of just the consumers.

As schools have begun spending more time teaching computer science, they have started putting an effort toward teaching students programming. We should be clear that coding and computer science are not exactly the same thing. Coding is an important tool for computer science like arithmetic is a tool for doing mathematics, and words are a tool for English. Coding allows for the development of software, while computer science is a broad field encompassing deep concepts that go well beyond coding.

Computer Science by the Numbers

- 71% of new STEM jobs will be in computing but only 8% of college graduates are in computer science.
- 1.1 million **unfilled programming jobs** by 2022
- There are currently 500,000 computing related job openings in the US. These jobs are in every industry, every state, and they’re projected to grow at twice the rate of all other jobs.
- Only 8 states have computer science standards. In 33 states plus DC, computer science can count towards high school graduation math or science requirements - up from 12 states in 2013.
- 93% of parents say they want their student learning computer science, but most schools do not offer it.

Please also see the attachment “Following the Path” for more data.

iii. Where is Wyoming on this issue?

In 2015-2016, Wyoming had a total of seven districts teaching computer sciences courses at the secondary level. There were an additional eleven districts who had staff with a computer science endorsement, but did not offer computer science classes. Throughout the entire state, there were eleven teachers with a computer science endorsement teaching a computer science course, while there were an additional 27 teachers endorsed to teach computer science but not teaching any computer science courses. There are fewer AP exams taken in computer science than in any other STEM subject area. Wyoming is ranked last in the nation for numbers of students taking and passing the AP Computer Science Exam.

AP Computer Science in Wyoming

Year	Number of AP Computer Science Courses	Number of Teachers Teaching AP Computer Science	Number of Students Taking AP Computer Science	Number Students Taking AP Computer Science Exam	Number of Students Passing AP Computer Science Exam
2013-2014	0	0	0	0	0
2014-2015	2	2	7	0	0
2015-2016	3	3	9	6	3

The College Board, AP Program Participation and Performance Data

Wyoming currently has 210 open computing jobs (2.8 times the average demand rate in Wyoming); however, Wyoming had only 25 computer science graduates in 2015 and only 8% were female. The average salary for a computing occupation in WY is \$61,953, which is significantly higher than the average salary in the state of \$45,850. The existing open jobs alone represent a \$13,010,130 opportunity in terms of annual salaries.

iv. How do we go from the bottom to being a national leader?

To become a national leader in computer science education, build the workforce pipeline needed to diversify Wyoming’s economy, and successfully prepare students for jobs when they graduate, it is imperative for Wyoming to develop and implement a comprehensive strategy focused on computer science education. This work requires building and aligning sustainable partnerships between WDE, school districts, State Board of Education, PTSB, higher education, Department of Workforce Services, economic development entities and industry.

Steps to Becoming a National Leader in Computer Science Education

1. Create a state plan for K-12 computer science education
Current Actions: The WDE is in the process of putting together an extensive computer science education task force with a goal of developing a state plan focused on improving and expanding K-12 computer science education, aligning of K-12 and postsecondary computer science education with the needs of industry to develop a sustainable workforce pipeline. These efforts will assist with meeting the identified needs of the current industry along with supporting new and emerging industries developed through ENDOW.
2. Develop state-level initiatives to address diversity in computer science education
Current Actions: To ensure all students have access to equitable educational opportunities, the WDE is addressing equitable access to excellent educators through the educator equity in Wyoming's Every Student Succeeds Act (ESSA) State Plan.
3. Define computer science and establish K-12 computer science standards
Current Actions: The Math Standards Review Committee, meeting this summer, has been tasked with recognizing and strengthening computational thinking within the standards.
4. Allocate funding for rigorous computer science teacher professional learning and course support
Current Actions: The WDE is in contract negotiations to provide a K-20 learning management system (LMS) for districts and colleges to utilize in offering online computer science courses that students across the state can take. The WDE has cultivated partnerships with Park #1 and Gannett Peak Technical Services to build an online introductory computer science that can be offered to students across the state in Fall 2017. The University of Wyoming has been and will continue to offer professional development over the summer around computer science education to K-12 educators.
5. Implement clear certification pathways for computer science teachers
Current Actions: The WDE and PTSB have begun working with partners from Code.org to provide information and lessons learned from other states around teacher certification in computer science education. Over the summer of 2017, PTSB will be pulling together a committee to assist in making recommendations to their Board in September 2017.
6. Create and refine programs at institutions of higher education to offer computer science to preservice teachers
7. Establish dedicated computer science positions at the state and local school districts
8. Require all schools offer computer science education with appropriate implementation deadlines
Current Actions: The WDE is partnering with school districts, Wyoming State Library, and postsecondary partners to develop and make available high quality open source digital content for all districts in the state. Computer science will be one of the content

areas included in this system. The WDE is partnering with Park #1 and Gannett Peak Technical Services to develop and teach an online introductory computer science course to be offered to students across the state. This course is being designed in coordination with an industry partner to ensure what students are learning meet the needs of industry when these students enter the workforce.

9. Allow computer science to satisfy a core graduation requirement
10. Provide opportunities for students to participate in work-based learning experiences beginning in high school
Current Actions: An innovative pilot program designed to create a statewide model for project-based learning for the technology industry connecting industry partners with students in K-12 and higher education. Students across Wyoming work side by side with technology professionals on a full life cycle IT project. The pilot is geared towards students learning about the technology industry, the opportunities that are available and gaining valuable skills needed to be successful in the industry.
11. Allow computer science to satisfy an admission requirement at institutions of higher education.

v. What is specific to the JEC?

Common Core Knowledge and Skills

W.S. 21-9- 101 defines the know ledge and skills all districts m ust provide. In the com m on core of skills, districts are required to teach students about computer applications and keyboarding. The knowledge students need to be successful in life and careers goes far beyond these minimal requirements. Below is one way the common core of knowledge could be adjusted, with the changes in red:

W.S. 21-9- 101. Educational programs for schools; standards; core of knowledge and skills; special needs programs; class size requirements; cocurricular activities.

(a) The board of trustees of each school district within the state shall cause the schools under its jurisdiction to provide an educational program in accordance with uniform standards defined under this section and rules and regulations promulgated by the state board of education pursuant to W.S. 21-2- 304 (a).

(b) Each school district within the state shall provide educational programs sufficient to meet uniform student content and performance standards at the level established by the state board of education in the following areas of knowledge and skills:

- (i) Common core of knowledge and skills:
 - (A) Reading/language arts;
 - (B) Social studies;
 - (C) Mathematics;
 - (D) Science;
 - (E) Fine arts and performing arts;
 - (F) Physical education;
 - (G) Health and safety;
 - (H) Humanities;
 - (J) Career vocational education;
 - (K) Foreign cultures and languages;
 - (M) Applied technology;
 - (N) Government and civics including state and federal constitutions pursuant to W.S. 21-9- 102 ;
 - (O) Computer science and computational thinking.

Graduation Requirements

Twenty-three states and the District of Columbia require computer science be allowed to fulfill a core graduation credit. Additionally, policies in four states—Arizona, California, Kentucky, and New York—delegate the decision to districts as to whether CS can count toward a core graduation requirement. These states permit but do not require districts to allow CS to fulfill a mathematics or science credit for high school graduation. These four states will be joined by a fifth state, Colorado, pending state board action (by July 2018) to adopt CS standards that will form the foundation for CS courses that may fulfill mathematics or science requirements.

In Wyoming this can be accomplished by adding computer science into the common core knowledge and skills. This change can also be accomplished through adding a statutory requirement for school districts to allow for computer science courses to fulfill graduation requirements or allow for computer science courses to fulfill a mathematics or science credit for high school graduation.

Support for Advancing Computer Science Education

1. **Statewide K-20 Learning Management System (LMS):** Many districts have found it difficult to hire computer science teachers since there so few certified computer science educators. Even those that might be able to hire a certified teacher struggle because they do not have the numbers of students taking the computer science classes to justify hire a full-time computer science teacher. This makes finding ways to offer online computer science courses so critical since teachers in one district can then teach students across the

state. Providing a statewide K-20 LMS to districts makes it possible not only for students to access these online courses from another district, students could also take advantage of virtual education course opportunities provided by postsecondary institutions. For instance, a professor at the University of Wyoming is teaching an AP Computer Science course for K-12 students in Fall 2018.

Additionally, the use of a statewide K-20 LMS would allow computer science educators who have already created online courses to share those courses to other teachers across the state. Since we will be working to train more teachers to be able to teach computer science, the sharing of resources like this makes it possible for these teachers to come on board and be ready to teach much quicker.

While the WDE is actively working through the contract negotiation process, no funding for the statewide LMS was provided when the statutory mandate to provide this system was passed in 2017. The lack of funding for the statewide LMS is forcing the WDE to pass the costs of the system on to school districts.

2. **Statewide Computer Science Education Professional Development:** As districts continue to move forward with providing students opportunities to take computer science courses, it is important for professional development to be offered across the state. Partnerships between postsecondary institutions, national organizations, industry partners and the WDE have created new opportunities for educators to receive professional development; however, these opportunities are limited and without funding are likely not sustainable in the long run.

Wyoming needs to create an extensive and sustainable professional development plan to support educators throughout Wyoming to develop the knowledge and skills need to teach computer science. The field of computer science changes rapidly. Programming languages widely used today may not have existed even a year ago. Funding for ongoing professional development becomes critical not only for new computer science educators, but also for those current educators to be able to maintain an updated skill set to ensure students are prepared to enter the workforce.

Thank you for your time and consideration and we look forward to chatting with you more at your meeting in June.

COMPUTER SCIENCE AND CODING: FOLLOWING THE PATH

CAREER

COMPUTER SCIENCE,
ENGINEERING,
PROGRAMMING,
DESIGN, THE
POSSIBILITIES
ARE ENDLESS!

HIGH SCHOOL
EXPLORATION OF
COMPUTER
SCIENCE

POST-SECONDARY
CAREER
PREPARATION

ELEMENTARY SCHOOL
INTRODUCTION
TO CODING

MIDDLE SCHOOL
INTEGRATION
OF STEM



COMPUTER SCIENCE AND CODING: FOLLOWING THE PATH



COMPUTER SCIENCE COURSES (SECONDARY LEVEL) FOR 2015-16

- 11 Computer Science Teachers
- 27 Staff Members with Computer Science PTSB endorsement **not** teaching computer science
- 7 districts with Computer Science courses
- 11 districts with Computer Science endorsed staff but no courses

COMPUTER SCIENCE IN WYOMING'S SCHOOLS

Number of AP Computer Science courses, teachers and students reported for 2013-14 to 2015-16

YEAR	COURSES	STUDENTS	TEACHERS
2013-14	<i>No Courses Reported</i>		
2014-15	2	7	2
2015-16	3	9	3

COMPUTER SCIENCE ADVANCED PLACEMENT COURSES

Only **4** schools in WY (11% of WY schools with AP programs) offered the AP Computer Science course in 2015-2016. There are fewer AP exams taken in computer science than in any other STEM subject area.

Only **6** high school students in Wyoming took the AP Computer Science exam in 2016; only 2 were female; only 1 student was Hispanic or Latino; no students were Black; no students were Native American or Alaska Native; no students were Native Hawaiian or Pacific Islander.

STUDENTS PASSING AP CS IN 2015 - 2016: **3**

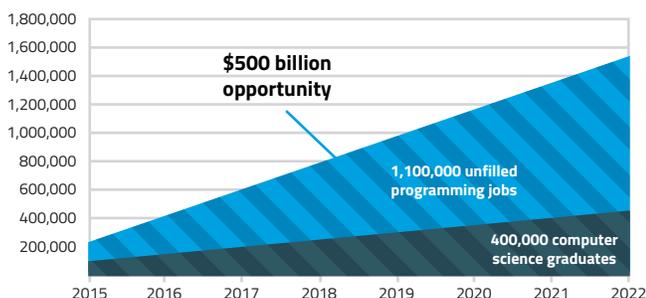
COMPUTER SCIENCE IN WYOMING

THERE ARE CURRENTLY **210** OPEN COMPUTING JOBS IN WYOMING (**2.8** TIMES THE AVERAGE DEMAND RATE).

THE AVERAGE SALARY FOR COMPUTING OCCUPATIONS IN WYOMING IS **\$61,953** COMPARED TO THE AVERAGE SALARY IN THE STATE (\$45,850). THE EXISTING OPEN JOBS ALONE REPRESENT A **\$13,010,130** OPPORTUNITY IN TERMS OF ANNUAL SALARIES.

WYOMING HAD ONLY **25** COMPUTER SCIENCE GRADUATES IN 2015; ONLY **2** WERE FEMALE.

1.1 MILLION UNFILLED JOBS BY 2022



Sources: BLS, NSF, Bay Area Council Economic Institute (2015)



RESOURCES AT:
[EDU.WYOMING.GOV/
TECHNOLOGY/CS](http://EDU.WYOMING.GOV/TECHNOLOGY/CS)



WYOMING
DEPARTMENT OF EDUCATION

*Creating Opportunities
for Students to Keep
Wyoming Strong*

Jillian Balow

Superintendent of Public Instruction

Dicky Shanor

Chief of Staff

Brent Bacon

Chief Academic Officer

Megan Degenfelder

Chief Policy Officer

Dianne Bailey

Chief Operations Officer

Cheyenne Office

Hathaway Building, 2nd Floor
2300 Capitol Avenue
Cheyenne WY 82002-2060
Phone: (307) 777-7675
Fax: (307) 777-6234

Riverton Office

320 West Main
Riverton, WY 82501
Phone: (307) 857-9250
Fax: (307) 857-9256

On the Web

edu.wyoming.gov
wyomingmeasuresup.com
twitter.com/WYOEducation
facebook.com/WYOEducation

Date: September 13, 2017

To: Co-Chairmen Coe and Northrup
Joint Education Interim Committee Members

From: Dicky Shanor, WDE Chief of Staff
Laurel Ballard, WDE
Jill Stringer, WDE

Subject: Computer Science Education (Priority #3)

INTRODUCTION

Computer science and computational thinking is critical in today's workforce. The work completed during this interim session on computer science will have long lasting impacts on students' success and opportunities as they move into the workforce. The WDE, in coordination with multiple partners, is putting together a task force to create and implement Wyoming's long-term plan for expanding computer science education. Motion from June 20-21 Joint Education Interim Committee:

“Senator Rothfuss, moved, seconded by Representative Bovee, the Joint Education Committee requests the Department of Education to work with Wyoming school districts, the Professional Teaching Standards Board, community colleges, and the University of Wyoming, as necessary, to develop a roadmap, milestones, and a timeline towards achieving:

- 1) Access to an Advanced Placement Computer Science course or dual/concurrent enrollment equivalent for all Wyoming High School Students;
- 2) Access to at least two semesters of coding courses or dual/concurrent enrollment equivalent for all Wyoming high school students; and
- 3) Five hundred annual Advanced Placement Computer Science tests taken or dual/concurrent enrollment earned credit equivalent with broad student demographic participation.

The Committee further requests the Department of Education recommend any necessary statutory changes needed to achieve these objectives and report back to the Joint Education Committee at the September 27-28 meeting.”

Current data related to the three goals identified by the JEIC is as follows:

- 1) In the 2016-17 school year, three AP Computer Science courses were offered in three school districts, one IB Computer Science course was offered in one school district, and dual/concurrent Computer Science courses were offered in three school districts.
- 2) In the 2016-17 school year, six of 16 school districts with certified staff offered Computer Science courses, utilizing nine of the 34 total certified staff in the state.
- 3) Six students took the AP Computer Science test in the 2015-16 school year (the College Board has not yet released data for the 2016-17 school year). In the 2016-17 school year, four students enrolled in a dual/concurrent Computer Science course.

COMPUTER SCIENCE EDUCATION TASK FORCE

To achieve the goal of increasing access to computer science education throughout Wyoming's education system, it will take support from many different partners. The WDE built a task force in July 2017, focused on developing a roadmap, milestones, and timeline towards achieving the goals set forth by the Joint Education Interim Committee. The task force consists of membership from the Wyoming Legislature, Department of Education, Professional Teaching Standards Board, State Board of Education, University of Wyoming, community colleges, Wyoming school districts, and industry partners. Attachment A provides a full list of task force members.

The Computer Science Education Task Force has met three times to develop the Wyoming Roadmap for Computer Science Education, which includes guiding principles, milestones as listed below, timelines, and goals to address the three goals identified by the JEIC in June 2017. A summary of the draft roadmap can be found in Attachment B.

Milestones related to JEIC computer science goals 1 & 2:

- Publicly elevate and highlight the importance of computer science education
- Define computer science education and develop state content standards
- Train 500 teachers and assure appropriate certification to teach computer science

Milestones related to JEIC computer science goal 3:

- Develop and implement programs targeted at equity in computer science education
- Increase student engagement through industry partnerships

The task force will be meeting again in October, and the roadmap will continue to be refined to meet the needs of students, schools, and industry. It will be vetted with various education organizations across the state. Additional feedback from the Joint Education Interim Committee will also be considered by the task force.

RECOMMENDED STATUTORY CHANGES

1. Incorporate computational thinking/computer science into the state "basket of goods," officially known as the common core of knowledge and skills (W.S. 21-9-101(b)).
2. Allow computer science to count toward high school graduation requirements (W.S. 21-2-304(a)(iii)). It is already incorporated into Hathaway requirements.
3. Request the State Board of Education to promulgate computer science standards either as stand alone or integrated across the current content standards.

4. Temporarily limit the Wyoming Education Trust Fund Grant (W.S. 21-22-106) of approximately \$250,000 annually to professional development for computer science teaching.

Attachments:

- Attachment A - Computer Science Education Task Force Membership
- Attachment B - Draft Wyoming Roadmap Summary

ATTACHMENT A:

Computer Science Education Task Force Membership

Name	Organization	Representing Role
Allyson Anderson	University of Wyoming	Postsecondary/College of Engineering and Applied Science
Julie Arp	ETS	IT Industry
Nick Bellack	PTSB	Educator Certification
Gerry Chase	Johnson #1	District Administrator
John Drescher	Apple	IT Industry
Tighe Fagan	Gannett Peak	IT Industry
Ryan Fuhrman	State Board of Education	Board Member
Keith Harris	Big Horn #1	District Administrator
Carla Hester Croff	Western Wyoming Community College	Postsecondary/Community College
John Lyttle	Laramie #1	School District Administrator
Gary New	NCAR	IT Industry/Workforce Development Council
Zac Opps	Park #1	School District Computer Science Teacher
Sean Roberts	Code.org	National Partner
Karen Rogers	Wyoming Game & Fish	GIS Industry
Carmalee Rose	Department of Workforce Services	Workforce/IT Sector Strategy
Chris Rothfuss	Wyoming Legislature	Senator
Darren Schmidt	Johnson #1	School Principal
Julie Snyder	Johnson #1	School District Computer, Teacher/Integration Specialist
Eric Trowbridge	The Array School of Technology and Design	Postsecondary/CS Education
Jim Wall	Microsoft	IT Industry
Rebecca Watts	University of Wyoming	Teacher Education Initiative
Brian Worthen	Mammoth Networks	IT Industry

Wyoming Department of Education Support		
Dicky Shanor	WDE	Chief of Staff
Brent Bacon	WDE	Chief Academic Officer
Shelley Hamel	WDE	Director of School Support Staff
Laurel Ballard	WDE	Task Force Co-Chair/Facilitator
Jill Stringer	WDE	Task Force Co-Chair
Alicia Vonberg	WDE	Personalized Learning Consultant
Karen Bierhaus	WDE	21st CCLC Program Consultant
Randall Butt	WDE	Career Technical Education Consultant
Robin Grandpre	WDE	Project and Performance Manager

ATTACHMENT B: Draft Wyoming Roadmap for Computer Science Education Summary

Guiding Principles:

1. Computer science knowledge is essential for an engaged citizenry.
2. Computer science, particularly coding, is a highly valued skill for today's jobs and is projected to be even more so in the future.
3. Districts and schools have a responsibility to provide and promote access to computer science skills and knowledge, including advanced opportunities/pathways, for every Wyoming student regardless of geography, background, or circumstance.
4. Schools should provide opportunities that empower every Wyoming student to become an innovator of technology.
5. Early access to computer science knowledge and skills in grades K-8 is necessary to achieve advanced opportunities in computer science.
6. In addition to computer science being taught as a stand-alone subject, schools should take advantage of the many meaningful opportunities to integrate computer science across content areas throughout K-12.
7. The state's role is to define computer science and to support districts with resources for meeting district responsibilities.

IEIC Computer Science Goals 1 & 2

- 1) *Access to an Advanced Placement Computer Science course or dual/concurrent enrollment equivalent for all Wyoming High School Students;*
- 2) *Access to at least two semesters of coding courses or dual/concurrent enrollment equivalent for all Wyoming high school students;*

Milestone 1: Publicly elevate and highlight the importance of computer science education

December 2017-March 2018

- Announce computer science education as a priority for the state and launch statewide informational campaign
- Educate districts on ways to integrate computer science education into current courses and programs
- Increase participation in Computer Science Education Week to show public support for and celebrate computer science-related activities
- Partner with industry and economic development organizations to develop a long-term plan to align computer science education with Wyoming workforce needs

- Incorporate computational thinking/computer science into the state “basket of goods” and allow computer science to count toward high school graduation requirements

Milestone 2: Define computer science education and develop state content standards

April 2018 - July 2019

- Create a definition for computer science education
- Develop a K-12 computer science education framework mapping out knowledge and skills foundation needs
- Promulgate computer science standards either as stand alone or integrated across the current content standards

Milestone 3: Train 500 teachers and assure appropriate certification to teach computer science

August 2017-August 2022

- Create an educator certification pathway to allow educators to teach computer science and coding along with model professional development plan
- Provide extensive professional development throughout K-12
- Support K-6 teachers with integrating computer science into other content areas
- Encourage school districts to utilize federal Title IIA funds to provide computer science professional development
- Temporarily restrict the use of the Wyoming Education Trust Fund Grant to incentivize teachers to gain certification and districts to offer computer science courses.

JEIC Computer Science Goal 3

- 3) *Five hundred annual Advanced Placement Computer Science tests taken or dual/concurrent enrollment earned credit equivalent with broad student demographic participation.*

Milestone 1: Develop and implement programs targeted at equity in computer science education

March 2018

- Establish state funding to support students in taking AP CS exams
- Introduce K-8 computing concepts to encourage early interest in each student’s education pathway
- Develop and deliver intentional, targeted outreach to historically underrepresented student populations in computer science

- Partner with afterschool programs to provide additional opportunities for students

Milestone 2: Increase student engagement through industry partnerships

September 2017 - September 2019

- Provide career development opportunities for students to learn where computer science is used in various industries
- Create job shadowing and internship opportunities applying computer science knowledge and skills
- Work with communities and industry partners to create community spaces, such as makerspaces, for students, community members and industry to meet and collaborate
- Support industry-sponsored opportunities where students can compete using their computer science knowledge and skills