

DRAFT
North Dakota
Computer Science and Cybersecurity Plan
15 July 2021

In 2016, Klaus Schwab introduced the phrase “4th Industrial Revolution” (also called Industry 4.0) at the World Economic Forum. He expects this era to be marked by breakthroughs in robotics, artificial intelligence, 5th generation wireless (5G), Internet of Things (IoT) and Industrial Internet of Things (IIot).

In 2018, North Dakota created the PK-20W Initiative to bring together stakeholders (including K12 and state government agencies, post-secondary, workforce and strategic state and national private sector partners). The goal is to provide development pathways to grow a properly trained workforce for current and emerging industries.

Computer Science and Cybersecurity (CSC) are key to developing and integrating 21st Century Skills (e.g., technology, communication, collaboration, critical thinking, problem solving, innovation, creativity, persistence). NDDPI believes that all North Dakota public schools must provide challenging and rigorous programs of study in CSC across all grade levels.

In 2019, NDDPI brought together a group of North Dakota teachers, administrators, and higher education faculty, along with industry partners to draft CSC standards. As a result, the North Dakota Computer Science & Cybersecurity Standards were adopted.

In 2021, members of the PK-20W Initiative completed the North Dakota CSC Plan to provide a statewide roadmap to guide actions so all North Dakota PK–12 students are provided high-quality computer science and cybersecurity education. The plan encompasses items identified by Code.org as the “Nine Policy Ideas to Make Computer Science Fundamental to K-12 Education” (https://code.org/files/Making_CS_Fundamental.pdf). The North Dakota CSC Plan covers key policy and implementation issues related to standards, certification, course pathways, graduation requirements, Institutions of Higher Education (IHE) entrance requirements, and professional learning. Bringing this plan to scale will require a coordinated effort by multiple stakeholders as well as oversight to ensure success.

Vision Statement

By 2025, all PK-12 students in North Dakota will have the opportunity to obtain a foundational understanding of Computer Science and Cybersecurity (CSC) fundamentals based on set of CSC standards offered by qualified teachers by direct course work and the integration of CSC fundamentals into other aspects of curriculum.

Partnerships *(CS and Cyber have a far-reaching impact in multiple areas, we continue to partner with different groups to give the students of North Dakota every advantage. We tried to list as many as we could below, but that list continues to grow, and we may have inadvertently left some off)*

North Dakota Department of Public Instruction (NDDPI)

ND Career and Technical Education (ND CTE)

ND Center for Distance Education (ND CDE)

North Dakota Dept. of Commerce

North Dakota Job Service

Palo Alto Networks

Bloomboard

North Dakota's Gateway to Science

Cyber Future Foundation

FenWorks (eSports)

uCodeGirl

NCWIT Aspirations in Computing

North Dakota Information Technology – EduTech

ND Education Standards and Practices Board (ESPB)

North Dakota University System (NDUS)

North Dakota Workforce Development

Code.org

Microsoft TechSpark and TEALS

CYBER.ORG

Safal Partners

ESRI

Marketplace for Kids

Girls Who Code

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Revision History

Version 0.6 (<i>19 Oct 2021</i>)	Draft version with input from various members of PK-20W Council

Section 1 – Data Collection and Display

Current Landscape

The first step in developing a path forward is to gather data on where we currently stand.

Landscape Report					
<p>Goal:</p> <p>Measure current state of Computer Science and Cybersecurity (CSC) education in North Dakota to inform goals. Establish a ‘dashboard’ to indicate current status.</p> <p>This will be a ND maintained list to augment the other publicly available ‘report cards’ (access report Tableau Public and Promote Computer Science Code.org)</p>					
Strategies / Steps	Start	End	Who?	Progress	Evidence of Completion
Draft a list of classes that qualify as CS/Cyber (also list those classes that are specifically excluded from the list (i.e., general computing skills or CTE related courses))			NDDPI	In Work	Will be part of report
Obtain list of schools offering courses in CSC by demographics/grade (should also include info on CTE courses) (<i>from NDDPI</i>)			NDDPI	In work	Will be part of report
Obtain list of students taking AP CSC exams by demographics (<i>from NDDPI</i>)			NDDPI	In work	Will be part of report
Obtain information on students taking CSC courses in post-secondary (<i>from NDUS</i>) and include other training paths for students			NDDPI	Not Started	Will be part of report
Identify workforce needs related to CSC (<i>from job service, Indeed, Monster, etc.</i>)			NDDPI; TechND; PK20W)	Not Started	Will be part of report
Draft report - <i>Once published, we’ll need an approval process for routine updates</i>			NDDPI; EduTech	Not Started	Posted to DPI website

- <i>Make sure the report has points of contact for program questions</i>					
Work with NDIT to place report on SLDS or Insights dashboard (??)			NDDPI; EduTech	Not Started	Part of Insights dashboard (??)
Make landscape report widely (publicly) available and updated annually			NDDPI; EduTech	Not Started	Part of Insights dashboard (??)
Make the CSC State is plan publicly available (Code.org #1)			NDDPI	In Draft	Posted on DPI website
Further Areas to Explore: <ul style="list-style-type: none"> - <i>To Do: Need to follow up the MS Digital Equity Report</i> - Can we include CS/Cyber clubs or other non-traditional groups or competitions (girls who code, cyber challenge, other state and national competitions) <ul style="list-style-type: none"> - farming program in Fargo? - Can we include extra curriculum activities (i.e., robotics)? - American Council on Education reviews credentials and recommended education levels - There is an NSA grant to look at non-traditional trainings and education credit - FYI, the American Council on Education 'National Guide' that lists the credential that they have reviewed for college-level credit is at https://www.acenet.edu/National-Guide/Pages/default.aspx (The actual content (the search the national guide section) is about halfway down the page 					

Section 2 – Standards and Certification Pathways

Develop Standards					
Goal: Develop Computer Science and Cybersecurity (CSC) standards at all grade levels					
Strategies / Steps	Start	End	Who?	Progress	Evidence of Completion
Develop K12 CSC standards with fidelity at all grade bands. (Code.org #2)				100%	CSCS2019.pdf (nd.gov)

Develop Certification Pathway

Goal:

Secure credentialing authority and pathway to certification

Establish a method for teachers to apply for credentials

Strategies / Steps	Start	End	Who?	Progress	Evidence of Completion
Secure credentialing authority and pathway to certification (Code.org #4)				100%	NDCC 67-11-22
Develop online system allowing qualified teachers to apply for credentials. (Code.org #4)		30 Jul 2022	NDDPI (MIS)		Will be part of NDTeach application

Further Areas to Explore:

- Look into evidence-based criteria standardized for credential
- Can we make improvements to the online teacher licensure /credentialing online application to make it more like a Amazon experience?

Establish Micro-Credentialing Certification Pathway

Goal:

Establish a micro-credential pathway for teaches to qualify for CSC credentialing

Strategies / Steps	Start	End	Who?	Progress	Evidence of Completion
Establish method to review/approve micro-credentials			NDDPI; EduTech	In Work	
Establish CSC micro-credentialing pilot program (may require on-going funding) (Code.org - #4)			NDDPI; EduTech; CYBER.ORG, Bloomboard	In Work	

Further Areas to Explore:

- Need mechanism for entities to collaborate in providing professional development for CS / Cyber credentials (such as BSC and NDIT-EduTech)
- Need a place to show choices for professional development
- Teacher upskilling and having teachers be mentored and/or going through apprenticeships in CS and Cyber

Section 3 – Student CSC Education

Have a qualified teacher for every grade band in every school					
Goal: Implement professional development system to train an appropriate number of teachers on Computer Science and Cybersecurity (CSC) standards at each grade band so there is approximately 1 qualified teacher per 300 students					
Strategies / Steps	Start	End	Who?	Progress	Evidence of Completion
Establish CSC professional development training program / pathway (may require on-going funding) (Code.org - #4)			NDDPI / EduTech	100 %	Credentials and Certificates Will require on-going review and updates
Develop list of approved CSC courses, classes, programs and make publicly available			NDDPI	100 %	Credentials and Certificates Will require on-going review and updates
Provide guidance to districts on how to incorporate CSC into student success plans		27 May 2022	NDDPI	Not Started	
Provide incentives and/or recognition to districts and/or teachers for participating in CSC PD learning - Publish this to our DPI site			NDDPI, EduTech	100%	IgniteND Conference Teachers will receive Stipend as part of IgniteND after completing required course hours
Establish relationship with BIE schools to provide PD for CS / Cyber to their staff			NDDPI, EduTech		
Further Areas to Explore: <ul style="list-style-type: none"> - What is the eligibility to teach dual credit in K12 at both the K12 and post-secondary? - How can we add time to teacher's day (MS Teals to supplement time and then provide the teachers PD)? - Develop reusable resources (videos, training plans,) - Digital hive (1 million cups at BSC – Dr Jensen) 					

Develop alternative student training programs

Goal:

Work with external organizations to assist schools with providing CSC course work

Work with external organizations to help encourage students to take CSC course work

Strategies / Steps	Start	End	Who?	Progress	Evidence of Completion
Review / align state CSC standards with external programs			NDDPI; external organizations (Market Place for Kids, FenWorks – eSport provider, etc)	In Work	
Establish MS Teals program in North Dakota			NDDPI; MS TEALS; EduTech; ND Schools	100%	
Review / align state CSC standards with external clubs/competitions (i.e., Gen Cyber Camps, Robotics/STEAM clubs, CyberStart America, NGA Cyber Competition, Collegiate Cyber Competitions, Cyber Patriot, uCodeGirl, College Camps, etc.)			NDDPI; NDIT; EduTech	Ongoing	

Further Areas to Explore:

- Establish a framework for non-traditional training
- What about HS credit for a student taking certifications (A+ for instance)
- Mobile tech labs for schools that can't afford a full-blown program

Increase diversity in Computer Science and Cybersecurity (CSC)					
Goal: By 2025, Increase the percentage of students in underrepresented groups participating in CSC courses					
Strategies / Steps	Start	End	Who?	Progress	Evidence of Completion
Establish CSC professional development training program at tribal schools			NDDPI; EduTech; Tribal Schools	In Work	Discussed at 2021 Indian Education Summit On-going meetings with Tribal schools
Reduce by half, the gap in number of female students taking CSC classes (will require funding to incentivize)		27 May 2025	NDDPI; ND Schools	Not Started	
Reduce by half, the gap in number of Native American students taking CSC classes (will require funding to incentivize)		27 May 2025	NDDPI; ND Schools	Not Started	
Reduce by half, the gap in number of minorities students taking CSC classes (will require funding to incentivize)		27 May 2025	NDDPI; ND Schools	Not Started	
Increase the number of students taking AP level CSC courses by 20%		27 May 2025	NDDPI; ND Schools	Not Started	
Further Areas to Explore: - We will establish a base year report (landscape report) and work to reduce gap					

Integrate Computer Science and Cybersecurity (CSC) into course offerings and graduation requirements					
Goal: Integrate CSC into North Dakota graduation requirements					
Strategies / Steps	Start	End	Who?	Progress	Evidence of Completion
Allow CSC credit to satisfy a core high school graduation requirement. (Code.org #8)		27 May 2022	NDDPI; Legislature	100%	Diploma and Scholarship Information North Dakota Department of Public Instruction
Allow CSC to satisfy admission requirements at in-state post-secondary institutions. (Code.org - #9)		27 May 2022	NDUS	Not Started	
Utilize CSC courses as feeders into more advanced/area specific Career and Technical Education course plans (draft a student progression pathway??)		27 May 2022	NDDPI; CTE	Not Started	
Incorporate CSC fundamentals into all course standards.		27 May 2025	NDDP; ND Schools	Not Started	
Update required course offerings at ND public schools			NDDPI; Legislature		
Further Areas to Explore: <ul style="list-style-type: none"> - Can we have dual credit CSC courses? - Do we need to require? (other states do) ND schools offer CSC courses (Code.org #7)? (legislation) - The ‘Student Progression Pathway’ should include Awareness (grades K-5) – DPI, Exploration (grades 6-8) – DPI and CTE, Preparation (grades 9-12) – CTE - Do we need to look at alternative pathways for students? (i.e., school credit for intern programs, on-the-job training, pre-apprenticeships, apprenticeships, etc.) (CTE, LRSC) - Does cyber.org and/or Cyber.org have CS K12 pathways - Align pathways with workforce requirements - What does industry want from the K-20 graduates? 					

Section 4 – Teachers Preparation

Establish pre-service CSC requirements for teachers					
<p>Goal: Include CSC training into Pre-Service training for teachers</p> <p>NOTE: EduTech has begun working with some of the Pre-service programs EduTech has past success in providing PD to pre-service teachers, i.e. NDSU, United Tribes Technical College, Jamestown College, BSC; there are plans to continue this work.</p>					
Strategies / Steps	Start	End	Who?	Progress	Evidence of Completion
Establish pre-service teacher preparation programs at in-state institutions to qualify teachers prior to graduation. (Code.org - #5) - Need to develop standards for pre-service			NDDPI; NDUS; EduTech, ESPB	Not Started	
Work with external organizations to provide funding opportunities for teacher training			NDDPI		
Further Areas to Explore:					

Section 5 – Ongoing Support

Provide ongoing support for Computer Science and Cybersecurity (CSC)					
Goal: Provide on-going support for CSC					
Strategies / Steps	Start	End	Who?	Progress	Evidence of Completion
Secure on-going funding to implement the State CSC Plan (Code.org - #3)		On-Going	NDDPI; Legislature		
Advertise relevant PD offerings on appropriate organizational websites and include in official correspondences		On-going	NDDPI; EduTech, REAs, NDCEL	In Progress	Add to Blast/office newsletters; add to EduTech marketing and social media; add on agency websites
Publish positive stories (<i>examples below</i>) <ul style="list-style-type: none"> - Highlight success stories on DPI and other appropriate sites - Highlight 1st graduate to have CSCyber offered throughout the school career - Number of teachers that earned the CS Cyber credential - Non-student (parent/teacher) participate in any of the competitions 		On-Going	NDDPI; EduTech	In Progress	Add to Blast/office newsletters;
Identify opportunities and build partnerships to implement the state plan		On-Going	NDDPI; EduTech; PK-20W Council, NDUnited, REAs and NDCEL	In Progress	Add to Blast/office newsletters; add on agency websites
Advertise and/or sponsor CSC events, training opportunities (professional learning), competitions that have a focus on underrepresented student populations *Teachers combined with Industry space-		On-Going	NDDPI; EduTech, NDIT Cybersecurity Team	In Progress	Add to Blast/office newsletters; add on agency websites

workforce-speakers					
Message CSC effectively across all stakeholder groups in ND		On-Going	NDDPI; EduTech	In Progress	Add to Blast/office newsletters; add on agency websites
Advertise relevant PD offerings on appropriate organizational websites and include in official correspondences		On-going	NDDPI; EduTech	In Progress	Add to Blast/office newsletters; add on agency websites
Add student voice to this plan (why it's important, what do they hear, what do they know) - Can we ask graduates about the 9-12, and high school for input about 6-8, and middle school about K-5? - How are today's freshman who didn't receive CSCyber training coping with college and workforce?					
Further Areas to Explore: <ul style="list-style-type: none"> - How can we get parents involved? - Can the students provide tech support to the schools (and get credit for IT) - Expand apprenticeships (stackable? Moving from help desk to networking, to servers, etc.) - Can we add badges to schools that offer CS and Cyber in school on their website? - 'Shark Tank' type of competition for app development - CS (not Cyber) competitions (Skills USA at CTE) - GameON competition – coding challenge 					