



NOVA SCOTIA DEPARTMENT OF EDUCATION
AND
EARLY CHILDHOOD DEVELOPMENT

CODING STRATEGY

RAISING THE NEXT GENERATION

Last year, over 19,000 Nova Scotians told us that when students graduate, many of them are not ready for the “real world”. They do not have strong enough math and literacy skills, and we want to build strong critical thinking and problem solving skills for all students.

Nova Scotia responded to concerns and released the Action Plan for Education in January 2015. A commitment was made to Nova Scotians that our students will have the very best learning opportunities that a modern education system can provide. Work is already underway to increase our math and literacy skills at all grades and will continue for the next five years. Part of any modern education system is the opportunity for students to learn about coding. And, the roots of coding can be found in mathematics. In our Action Plan we committed to provide all student with an introduction to the basics of coding, technology and design. This the plan that actions that commitment.

THE ACTION PLAN ON EDUCATION

In the Action Plan for Education, a commitment was made to Nova Scotians that our students will have the very best learning opportunities that a modern education system can provide. In the plan we commit to:

- offering online learning opportunities to middle school students to prepare them for online courses in high school
- providing students with hands-on learning activities for developing their technology skills
- providing more hands-on learning activities for students in grades 4 to 8 through computer programming
- providing all student with an introduction to the basics of coding, technology and design
- providing students with varied learning opportunities with school technology, including the use of digital learning resources, and completion of online courses offered by the Nova Scotia Virtual School.
- providing more time for teaching both mathematics and literacy in the early years
- extending grade 11 Academic Mathematics to a full year
- requiring students to complete three high school mathematics courses as a graduation requirement in 2020

We have already started implementing the plan and have provided more time in the 2015/16 school year for Primary to Grade 3 students to spend on math and literacy.

WHY A FOCUS ON CODING

Coding, is recognized around the world as an essential part of the curriculum.^{1 2}

The talent gap in Nova Scotia needs to be closed. Providing our students with the fundamentals of coding and bridging the gap between coding, logic and math is a priority for the prosperity of the province.

What is coding? Coding requires problem solving and creative thinking, and makes it possible for us to create computer software, apps, web browsers, online tools, programs and websites. This type of technology is

¹ <http://www.computingatschool.org.uk/data/uploads/ComputingCurric.pdf>

² <http://www.australiancurriculum.edu.au/technologies/digital-technologies/curriculum/f-10?layout=1>

fundamental in our daily lives and is all around us in our appliances, phones, vehicles and is critical in our growth industries in Nova Scotia.

Learning to code will empower our students to do many things that they would not otherwise be able to do. Students will gain a greater understanding of technology and become active participants in a technology rich world. Computer coding is now an essential skill which promotes problem solving, creativity, teamwork, perseverance, resilience, risk taking, critical thinking, innovation, and technological fluency. This in no way means a drastic increase in screen time for young students, but an increase in foundational learning opportunities that focus on creativity and logic through developmentally appropriate learning.

*'As long as computers and the Internet continue to have a central role in our personal and professional lives, students who have not acquired basic skills in reading, writing and navigating through a digital landscape will find themselves unable to participate fully in the economic, social and cultural life around them.'*³

Learning to code will open the doors of future opportunity, no matter the path that interests our youth beyond grade 12.

CODING IN NOVA SCOTIA SCHOOLS

Through our unique approach to coding, students will advance through the grades and progress from using computers for learning, to learning about computers, to learning to compute. Students solve problems, design products, develop their creativity, and make connections among the many different subjects taught in schools today. Our students can no longer simply be consumers of technology, but need the opportunity to become creators of it too. Through coding, students can gain the technology skills they need for a wide range of careers. Coding is now used in all industries including: banking, entertainment, ship building, government, marine and more. Coding and career-readiness go hand in hand, and the Action Plan for Education is dedicated to improving the career-readiness of our students. Supports will be prepared to assist parents with this new learning for students.

LEADING THE WAY WITH HOME-GROWN AND GLOBAL ICT EXPERTS

As advances are made and as we progress through our implementation timeline we will partner with others to keep current and to keep our pulse on future trends. Experts in the field including developers, programmers, and members of the start-up community will be tapped to assist us with advice and to provide mentoring for teachers and students.

We are already working with Google on implementing Google Apps for Education, and are working on plans with IBM. In addition, we will consult with local technology specialists to refine and advance our coding action for Nova Scotia. Expert advice will assist us to build on our current Information Communication Technology (ICT) Curriculum and to advance the concepts that students learn in math to further develop our outlined plan so that we can provide our students with the best educational opportunities to learn about coding and computer programming.

³ OECD (2015), "Executive Summary", in *Students, Computers and Learning: Making the Connection*, PISA, OECD Publishing, Paris.

FOR ALL STUDENTS

This action from our Plan will target all students, in all grades across the province. It will start in Grade Primary with the basics of safely using a computer. In grades 4-6, students will learn what coding is and apply their new knowledge. In high school, students can work toward a recognized certificate in coding. The **#NSGlobalReady** Certificate Program will be the only one of its kind in Canada. It focuses on making sure students have the skills in they need from coding and ICT, to citizenship, entrepreneurship, and global studies.

We will continue to build on what is already working:

Through Brilliant Labs, we are providing Maker Spaces in every school board and through these spaces opportunities for coding and robotics and developing an entrepreneurial mindset.

We are advancing opportunities for hands on learning through:

- sponsorship of Acadia Robotics and Junior Achievement
- the introduction of a STEAM Olympics for grades 4-8 in November 2015
- our ongoing support of the Science and Heritage Fairs
- support for the Big Data Congress and the Super Power Challenge in October 2015
- promoting participation in the Hour of Code

Last year, we invited Nova Scotia students to participate in a one hour on line activity in December. The Hour of Code is a worldwide event and we had a very successful 'Hour of Code', with over 60,000 Nova Scotia students registered in this coding event. From this, we created an award winning video that showcases this successful coding opportunity that our students experienced simultaneously with millions of others worldwide. See the video at <https://hourofcode.com/ca/promote/country-resources> but know this is only the tip of the iceberg. We are building on this success by expanding coding and the opportunities learning to code affords to all students and our province.

BUILDING A FOUNDATION FOR LEARNING P-3

At Grades Primary to 3, students will be introduced to basic computer skills as part of their integrated subjects. As per the Action Plan, this has already started and is not new but will be foundational for P-3 students.

Computer skills introduced in P-3 include:

- Establishing safe and healthy routines for responsible use of ICT
- Use grade-appropriate digital tools to explore ideas and create original work while collaborating with others
- Locate specific information and images
- Create and analyze electronic data representations for predicting patterns and relationships

As of September 2015, ICT outcomes have been streamlined and embedded within the curriculum. Competencies have been included with outcomes to promote: Citizenship (CZ), Personal-Career Development (PCD), Communication (COM), Creativity and Innovation (CI), Critical Thinking (CT), Technological Fluency (TF).

Students will continue to be engaged in plugged (using technology) or unplugged (using just brain power) learning activities primarily through math and ICT that promote:

- basic logic
- patterning
- sorting
- sequencing
- problem solving
- digital citizenship
- internet safety
- creativity and productivity.

Coding at this level involves the understanding that clear ideas and solutions require clear plans, or sets of instructions (algorithms), and that doing one step after another is important to arrive at the intended result. For example, the steps to make a sandwich (or a simple recipe) involves following a set of instructions that can be represented in a story-board. The importance of sequencing and logic is not only important in daily life but also in math and coding.

LEVEL UP TO INNOVATIVE LEARNING 4-6

At Grades 4-6, students can Level up to Innovative Learning by earning coding/computing digital badges.

Competency Aligned Digital Badge Program- Every student in Nova Scotia will have the opportunity to earn virtual badges in ICT, coding, computer programming. Specific criteria will be developed and students who earn a certain number of badges, by the end of Grade 6, will receive a certificate of recognition from the Minister of Education and Early Childhood Development.

These badges are related to specific activities and games that communicate what a student knows and can do. The criteria for attaining badges is embedded digitally. Through the badge program, students will have the opportunity to learn introductory coding languages such as MIT's Scratch. This will be introduced beginning in 2016 with the renewed 4-6 curriculum.

Badges that we are currently considering include:

- Algorithmic Adventurer
- Problem Solver
- Storyteller
- Skillful Searcher
- Data Driven Detective
- Digital Citizenship
- Logical Thinker
- Programmer Badge
- Computing Connections (using computing skills from the technology outcomes on projects for Fairs and special events)
- Earning badges for participation in approved out of class activities e.g. computing camps and clubs

EXPLORE AND DESIGN TO LEARN 7-8

In Grades 7 and 8, coding will support exploration, innovation, and design.

Grades 7 and 8 students will:

- be required, as part of the curriculum to participate in online activities, such as game and app development. These activities will move the students' skills from being consumers of computers, to be creators of computer programming, development, etc. Coding will compliment current curricular areas and will modernize the student learning experience.
- participate in mentoring opportunities that will be provided in person and/or online to connect students with individuals working in the field and to provide career information
- be encouraged to explore and design their own self-directed projects within maker spaces or in other ways in and outside of the school day. Opportunities will be provided to share and engage in online forums.
- be encouraged to apply their technology skills to projects, science fairs and the like
- participate in the Hour of Code Dec 7-11th beginning this school year. While we encourage everyone in the school system to take part in this world-wide event, it is required that all grade 7 and 8 students have the opportunity in December 2015. This is a minimum one hour commitment during that week.

EECD will develop an online technology showcase. The showcase will be an opportunity for the students to have their products (games/apps/animation) reviewed and vetted by Nova Scotia industry experts and shared with others around the world through the EECD app domain and other online tools. This will ensure an authentic audience for the work and give students access to new learning tools that may assist them and will promote their skill development.

EXPERIENCING AND PREPARING FOR LIFELONG LEARNING 9-12

NS Global Ready Certificate Program- students in grades 9 to 12 will have an opportunity to work toward completion of an **#NSGlobalReady** Certificate Program as an important credential for their future studies and career choices. When they graduate, they graduate with the NS high school diploma and a Certificate in Coding and Global Readiness.

EECD will work with industry and post-secondary to get the Certificate Program recognized.

To earn the certificate, students will be required to:

- 1) Successfully complete a prescribed set of courses as outlined in the PSP. These will include a new course in Exploring Technology 9, a revised Mathematics 11 full year course that includes big data and data analytics and Computer Programming 12.
- 2) Participate in both school based and non-school based activities related to coding that will introduce students to different mentors, opportunities, and ways to working with and acquiring ICT outcomes at this level.
- 3) As part of the prescribed courses, students will complete a self-directed work project. Students will be exposed to some basic coding languages that will vary depending on interest and purpose of activities and projects.

Students may as part of the certificate:

- 4) Experience an exchange program to learn more about other cultures first hand.
- 5) Engage in CoOp courses to experience coding in industry.

6) Provide evidence of extraordinary achievements in this area of study.

Starting in February 2016, computer programming 12 will be available to all high schools through the Nova Scotia Virtual School. This will be one of the courses required for achieving the coding certificate.

TEACHING

While this subject matter may be unfamiliar to many teachers, most aspects of this work will be online and teachers will be facilitators in the learning process. Teachers will initially be expected to provide their students with opportunities from the array of online choices that will be prepared to support teaching and learning. Self-directed learning opportunities such as tapping into existing organizations who support education free of charge may provide project materials and a volunteering framework to support teachers in extending their learning and in the running of coding and robotics clubs.

Teachers experienced last year that they do not need to be experts in this field to provide their students with opportunities in coding. They need to be facilitators of learning. From that exposure, the interest of teachers will continue to grow in this area. We will consult teachers to see what types of training they want to become more knowledgeable about coding and we will work with teachers to develop the training. Further, we will work to provide opportunities with universities to ensure that clear pathways are available for teacher certification upgrading, with possibilities of online course offerings and certificate programs if teachers identify this as a need.

At the high school level the Nova Scotia Virtual School will play an important role in making sure that equitable access to coding certificate courses is available to all students. This further will ensure that a teacher at the high school level is an individual who has expertise in the areas as required and will be made available to the whole province.

As part of our Action Plan we are committed to work with Bachelor of Education programs in Nova Scotia and this is an area that will be included for teacher certification.

LET'S GET CODING

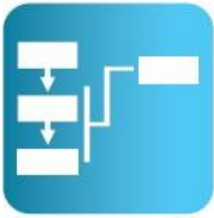
Now, our focus needs to be on improving critical thinking and problem solving skills of our students, across all grade levels. We will do this by implementing an action from the Action Plan for Education that calls for coding to be introduced P-12.

The goal of this Coding Action is to raise and educate a generation of students who are ready to live and lead in Nova Scotia. That is why we are focusing on mathematics, literacy and coding for all students. It is time to get coding!

APPENDIX

- A) Open Badges – sample badges for grades 4-6
- B) The Anatomy of an Open Badge for grades 4-6- criteria and format of open badge standards
- C) Implementation Timeline
- D) Visual Overview of the Coding Plan

Appendix A



Algorithmic
Adventurer



Problem Solver



Skillful Searcher



Logical Thinker



Data Driven
Detective



Programmer 1



Digital
Citizenship

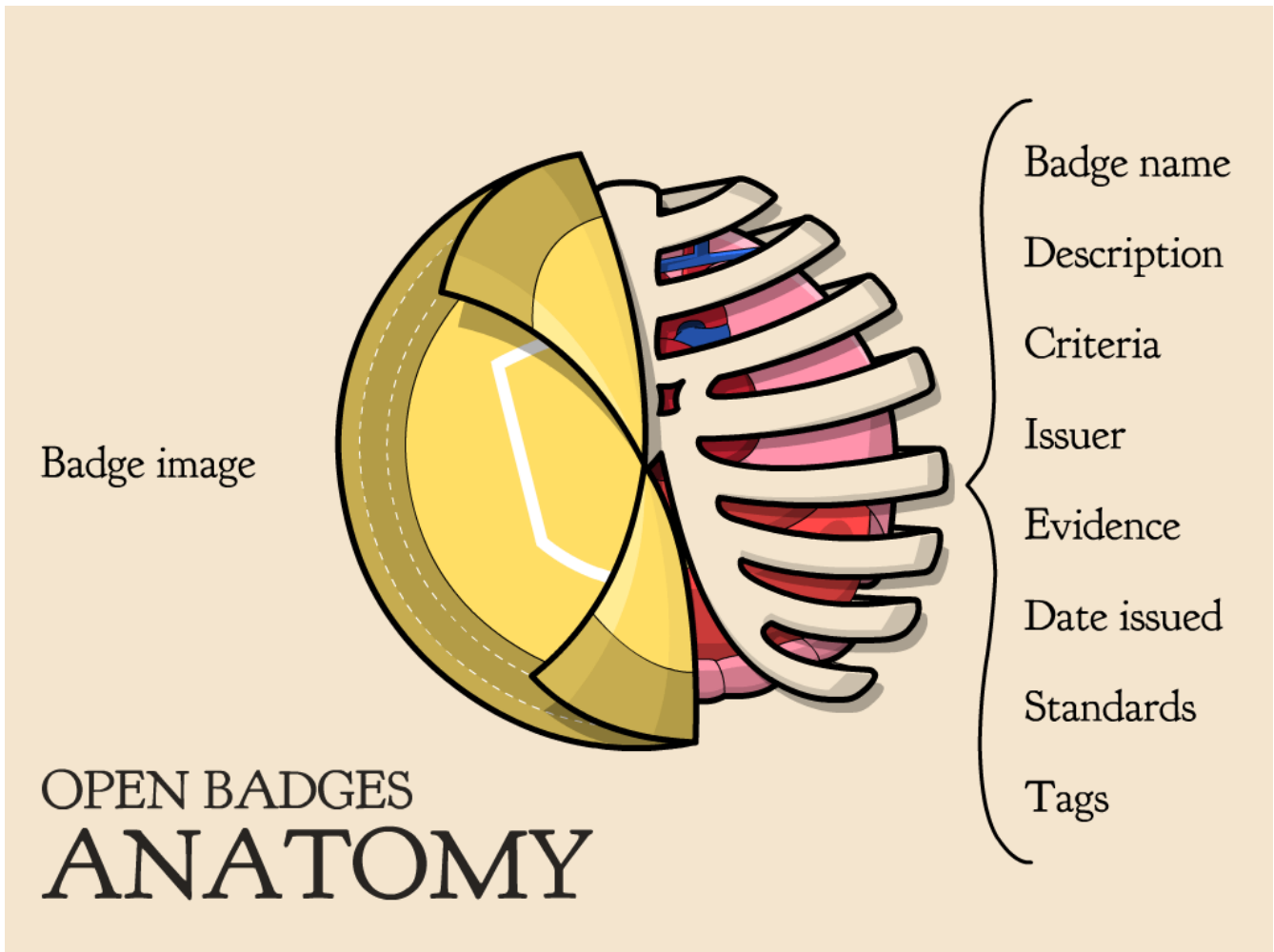


Programmer 2



Computing
Connections

Appendix B



Badge image

Badge name

Description

Criteria

Issuer

Evidence

Date issued

Standards

Tags

<http://i0.wp.com/dougbelshaw.com/blog/wp-content/uploads/2013/05/badge-anatomy.png>

Coding

For All Nova Scotia Students

Building a Foundation for Learning

ICT Outcomes have been streamlined and embedded within the curriculum

P-3

Level Up to Innovation Learning

Earn coding/computing badges to qualify for Minister's Coding Certificate

4-6

Explore and Design to Learn

Learn by Doing through online experiences and challenges integrated with the curriculum opportunities to connect with industry experts

7-9

Experiencing and Preparing for Lifelong Learning

Courses leading to #NSGlobalready computing certificate
Computer programming available to all high schools through NSVS

10-12

