Full STEAM Ahead

Science, Technology, Engineering, Art, and Math from nclab
More Than Coding

Bringing 21st Century Skills to Nevada Students

By Brian Sandoval, Governor of Nevada

Computer science and STEM (Science, Technology, Engineering, and Mathematics) are vital for Nevada's future. In response to this growing demand, Nevada launched Nevada Ready 21, a 1:1 computing program for students, with the goal of igniting economic development by delivering a 21st century workforce, and by ensuring student equity through personalized access to a connected, 21st century education. This fall, the first 20,000 Chromebooks with a coding and 3D modeling curriculum, and a variety of other STEM apps were delivered to middle school students across Nevada, and an initial group of teachers has been trained. Hundreds of Nevada students have already started to learn essential computational problem solving skills, and their number is growing. In the months to come, additional schools will be receiving hardware and more teachers will be trained. Not all students will be able to learn coding and 3D modeling in the classroom, but the programs are self-paced, which means that the students can explore them on their own in a public library, at home, or using any device they have permission to access. I encourage educators to make their students aware of these resources. I hope you will all take the time to learn more about these programs in order to best equip the generations to come for the jobs of the future.

*NVReady21 students who complete the NCLab curriculum will receive a certificate signed by Governor Sandoval, and their name will appear on a web page "**Nevada Ready 21 - Pioneers of Computing**"*

Sincere regards,

BRIAN SANDOVAL, Governor

CS Ed Week Dec. 5-11

More than 100,000 schools and libraries will host "Hour of Code" sessions during this annual event. Many will use our free, 15-level puzzle game that teaches programming basics like loops and conditionals.

YALSA Award for Carson City Library

The Carson City Library had one of the top 10 summer learning programs in the country in 2016! The library was recognized by the Young Adult Library Services Association (YALSA) for its Coding Camps, which used NCLab tools to teach basic programming skills.

STEAM and SHINE: Your Project for December

Does your school or library have a 3D printer? Why not let your class or computer club make some holiday cookie cutters? It's easy, with free NCLab Turtle Tina tools!

Bringing Computer Science to All Nevada Students

By Mark Newburn, Nevada State Board of Education

Computer Science for All is President Obama's initiative aimed at empowering all American students from kindergarten through high school to learn computer science. By developing computational thinking skills, students can become creators in the digital economy, not just consumers. They can be active citizens in our technology-driven world.

I am proud to say that Nevada is among the first 16 U.S. states that have accepted the President's challenge. We are preparing to implement computer science in K-12 schools state-wide. A group of Nevada leaders recently attended the Expanding Computing Education Pathways (ECEP) Alliance Summit at the White House. The summit let participating states exchange information and foster collaborative efforts.

In Nevada, numerous entities are working together to make this happen. These include the State Board of Education, Department of Education, school districts, and the Nevada system of public libraries.

Thanks to Governor Sandoval, more than 20,000 Chromebooks with a coding and 3D modeling curriculum have been already distributed to Nevada middle schools, and more should be coming in 2017. We will provide an update during the first half of 2017.

Mark Newburn represents District 4 on Nevada's State Board of Education. He is vice-president of the State Board of Education and chair of the High School Graduation Requirements Subcommittee.

The women who invented coding

Nearly everyone knows that the world's first electronic computer was ENIAC, a 27-ton beast developed by the Army during World War II. But did you know the first computer programmers were six young women hired to program ENIAC?

No programming languages existed at the time. These women programmed ENIAC by setting switches and moving wires. They created the first sort routine, the first instruction code, and ultimately, the world's very first software application.

The women often had to crawl inside ENIAC's air-conditioned 20- by 8- by 3-foot cabinet to replace vacuum tubes or repair its more than five million hand-soldered wiring connections. This led to their nickname: the "Refrigerator Ladies."

Before becoming programmers, all six worked for the Army as "computers" – that was their official job title. They used differential calculus and large, mechanical, desktop calculators to calculate artillery shell trajectories. A typical calculation took 20 hours. Once they finished programming ENIAC, the same calculation took 30 seconds, with much less chance of error.

In the 1940s, the men who developed ENIAC's hardware received all the accolades. Even 50 years later, reportedly, none of the women were invited to a 50-year anniversary celebration of ENIAC.

Now, a website and several books and movies aim to give these pioneering women programmers their rightful place in history: see EniacProgrammers.org.
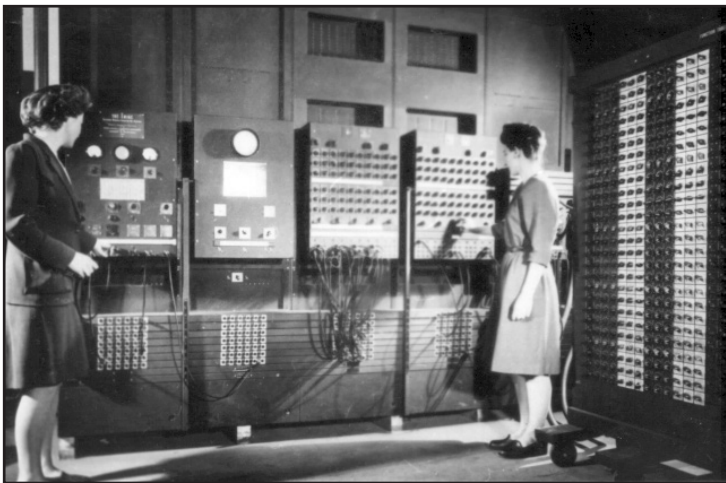
Miss Betty Jennings and Miss Frances Bilas (right) setting up a part of the ENIAC. Miss Bilas is arranging the settings on the Master Programmer. Note the portable function table on her right. **US Army Photo** (public domain)
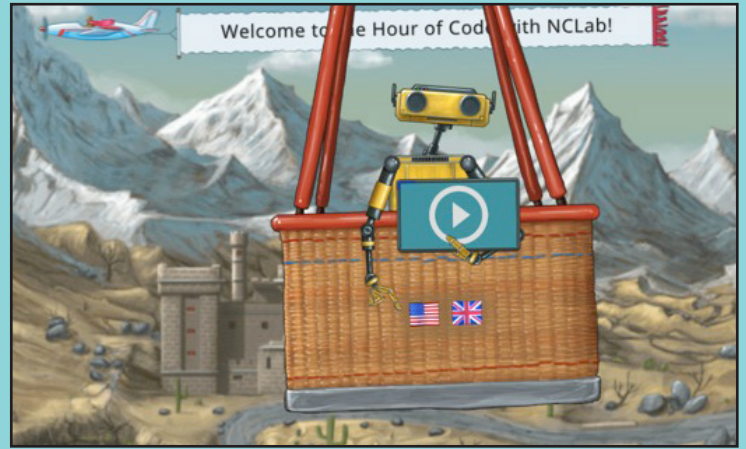
Can you pass 15 FREE, fun coding levels in an hour? Try it! hoc.nclab.com/karel

NCLab offers "Hour of Code"
Our contribution to National Computer Science Education Week, Dec. 5-11

At NCLab, we believe FUN is one key to learning. That is why we created our 15-level puzzle game with Karel the Robot. It challenges and entertains, while instilling vital coding principles like syntax rigor, problem-solving logic, conditionals, loops, and functions.

Our Karel game was selected as one of about 150 tutorials in Code.org's annual **"Hour of Code"** event. Part of **National Computer Science Education Week**, Dec. 5-11, 2016, the Hour of Code challenges educators to spend an hour teaching programming skills to their students.

About 100,000 schools, libraries, and other organizations are expected to host Hour of Code events this year. Hour of Code tutorials have been taken some 300 million times, according to the code.org website.

Our Karel the Robot puzzles introduce Hour of Code participants to the fun and satisfaction of programming. Those who enjoy the experience and wish to learn more can sign up for our complete Karel course at NCLab.com.

For more, visit the csedweek.org.

Cookie Cutters with Turtle Tina

Does your school or library have a 3D printer? Why not let your class or computer club make some holiday cookie cutters?

It's easy, with NCLab's Tina the Turtle. She's freely available to all Creative Suite users, and all visitors to our website's Free Portal (NCLab.com/free-portal).

Here are two examples, to get your creativity flowing. Just type the codes in and run them. The designs will appear, ready to be exported for 3D printing.

Then, modify the code to suit your own style! If you make something cool, send it to us and we will display it in the NCLab Turtle Gallery. Happy Holidays!
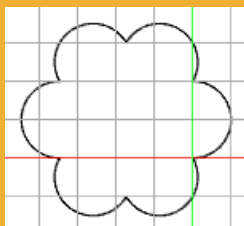
STAR COOKIE

```
 1  tina = NCLabTurtle()
 2  tina.color(STEEL)
 3  tina.width(0.5)
 4  for i in range(6):
 5      tina.go(10)
 6      tina.left(120)
 7      tina.go(10)
 8      tina.right(60)
 9  tina.extrude(10)
10  tina.show()
```
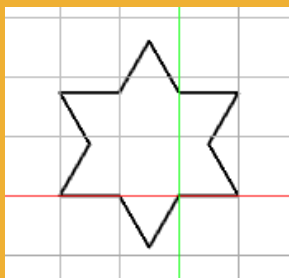
FLOWER COOKIE

```
 1  tina = NCLabTurtle()
 2  tina.color(STEEL)
 3  tina.width(0.5)
 4  for i in range(6):
 5      tina.arc(180, 10, 'l')
 6      tina.right(120)
 7  tina.extrude(10)
 8  tina.show()
```

"When I showed Turtle Tina and 3D Modeling to my students, they want these things more than anything else."

Petr Lukas, Teacher, Chrast, Czech Republic

A young man focuses intently at an NCLab Coding Camp held at the Carson City Public Library.

Coding? At the Library? Moo!

By Tammy Westergard and Roberta DeBuff
Nevada State Library

In many ways, learning to code at the library is no different than learning to read at the library. Don't forget that In Andrew Carnegie's day, librarians lent a huge hand to teachers working to tackle America's struggle with illiteracy. The crisis required a national effort from all fronts. Higher literacy rates meant communities were safer and more prosperous, because people who could read could get better jobs. Carnegie himself understood it best, and from his gifts, public libraries were built in hundreds of American communities. Today, Carnegie-funded libraries are still used by millions.

"Public libraries that have introduced NCLab to youth and adult library programs are finding engaged Nevadans eager to learn and develop skills that can get them a job now and well into the future. It's the world we live in," said Jeff Kintop, administrator of the Nevada State Library and Archives.

Library-led STEM programs are building literacy skills on a number of 21st century levels, in particular digital literacy. In their own way, librarians are sparking people's curiosity about how software is actually written in computer language code. Then, at the library, the opportunity to learn to code is right there. Deploying NCLab in the public library is a robust commitment to digital literacy for students of all ages. It's also an enrichment that builds upon existing curriculum for school-aged students at no cost to families.

"Instruction is a duty we all share. While our formal places of education have primary jurisdiction over the day-to-day teaching of students, the State Library should and does play a supportive role," said Kintop.

LEARN 3D MODELING THE EASY WAY

Lesson One: Create, Color and Display your First Model

Welcome to NCLab's 3D modeling mini-tutorial! The lessons are designed to that they do not take more than a few minutes of your time. You can go through them on a PC, Mac, laptop or tablet.

NCLab's Creative Suite provides two open source 3D modeling apps: PLaSM (Programming Language of Solid Modeling) and OpenSCAD (Open Scripting CAD). Both provide advanced 3D modeling functionality that is comparable to expensive commercial CAD systems. Since PLaSM has a simpler syntax than Open-SCAD, we will use it for this tutorial.

To begin, log into your free NCLab account at *NCLab.com*, open the Creative Suite and go into 3D Modeling -> PLaSM.

Alternatively, you can use the PLaSM app on NCLab's Free Portal (*NCLab.com/free-portal*). There you do not have to log in, but you will not be able to save your work.

Once there, clear the demo code by pressing the eraser button. Type in the code for your first lesson:

```
1 top = CONE(4, 8)
2 MOVE(top, 2, Z)
3 COLOR(top, GREEN)
4 trunk = CYLINDER(0.5, 2)
5 COLOR(trunk, BROWN)
6 SHOW(top, trunk)
```

Here is what the lines mean:

1. Object top is a cone of radius 4 and height 8.

2. Move object top by 2 units in the Z direction.

3. Color object top green.

4. Object trunk is a cylinder of radius 0.5 and height 2.

5. Color object trunk brown.

6. Show objects top and trunk together.

Run the code pressing the green Play button. After a short moment of data transfer between your web browser and the cloud server, you should see the 3D model appear.

It really only takes six simple lines to create a Christmas tree! Isn't this amazing? You can save the model in your NCLab account by selecting "Save in NCLab" from the File menu. Let's stop here for today.

Here are your assignments for next time:

1. Change the dimensions of the tree so that the top has radius 6 and height 12. Also change the trunk to have radius 0.75 and height 3.

2. Add a few presents under the tree! Little boxes with various colors would be nice.

If you get stumped, have a look at the commands and examples under the Help menu.

Happy Holidays!

KAREL GAME OF THE MONTH

The Code of War by Aaron Goff

Virginia City Middle School (VCMS) 7th-grader Aaron Goff created this awesome Karel the Robot game, then used the power of randomness to solve it with only nine lines of code:


```
The Code of War
BOOM! Your squad, on the "Battlefield of
 Randomness" has been hit by a deafening
 explosion. Find the medkit and get to the home
      square to save your friends!
```

```
1 while not home
2   while not (wall or skull or fire)
3     go
4     if medkit
5       get
6   if rand
7     left
8   else
9     right
```

WHY IT WON — Aaron's game has an interesting story and the code combines a number of key programming concepts: a while loop, if-else statement, randomness, and a complex boolean operation.

Aaron's teacher, Barbara Bush, commented, "VCMS has worked with NCLab for a few years now. By the second semester of last year, some 7th graders not only worked with Karel Robot, but were also able to code in Turtle (3D).

" This year, both the 6th- and 7th-graders are working in NCLab and doing very well. For the first time, VCMS has students working in Creative Suite. Three students have completed Karel Robot Games, and many others are working on them.

"The students feel challenged, yet know they can succeed. Most are determined to figure things out for themselves, rarely asking for my help. I'm excited about what these students will accomplish this year!

"I'm also pleased with the progress I have been making. I would never have guessed that I would be learning these skills as well!"

Try Aaron's game here: NCLab.com/karel-gallery/
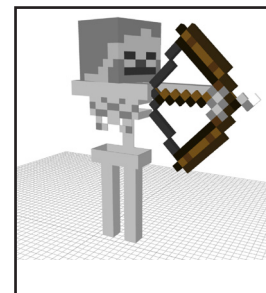
3D MODEL OF THE MONTH

Minecraft Skeleton by Evan Rowley

Evan writes, "I go to Damonte Ranch HS [in Reno] and I am a sophomore now. I was a freshman when I made the model.

"I built this model mainly to assess my NCLab skills and see how well I could do replicating the in-game model of a Minecraft Skeleton.

"I've always had fun developing structures in sandbox style situations, so NCLab and Minecraft are fun things for me to do on my spare time. I've built many things in Minecraft, from mansions to pixel art, and I hope to experiment more with NCLab in the future!"

View Evan's model here: NCLab.com/3d-gallery