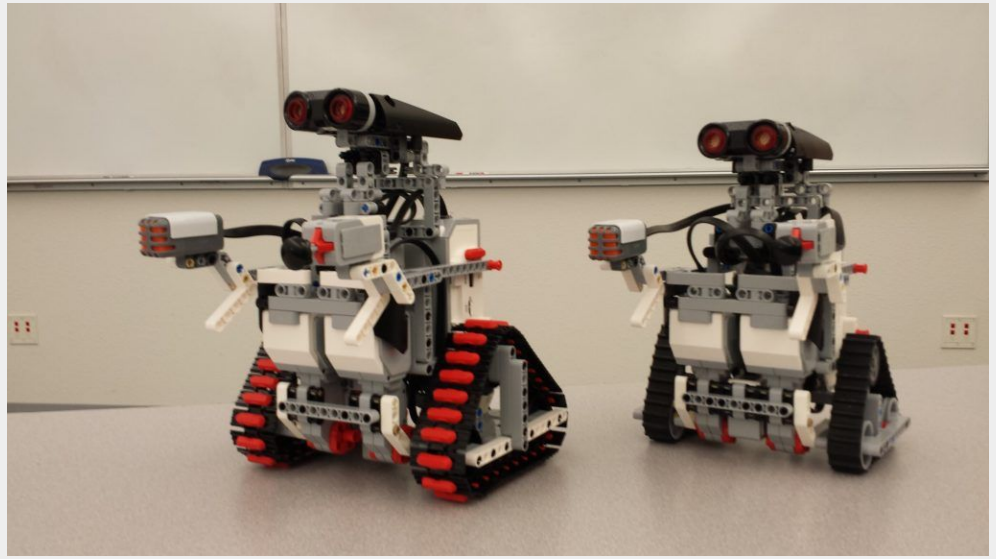
nclab

More Than Coding

Taking Karel the Robot Off the Computer Screen

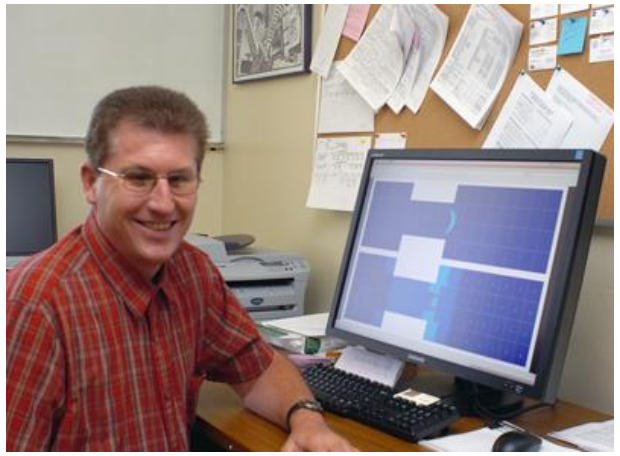
D. Riske (WNC), P. Solin (NCLab)

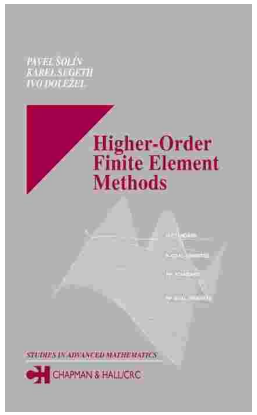


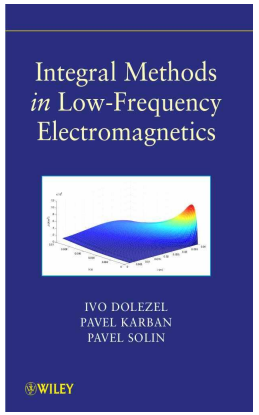
WESTERN NEVADA COLLEGE

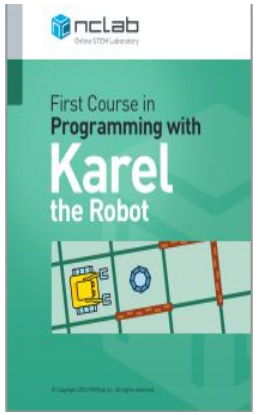
Introduction - Dr. Pavel Solin

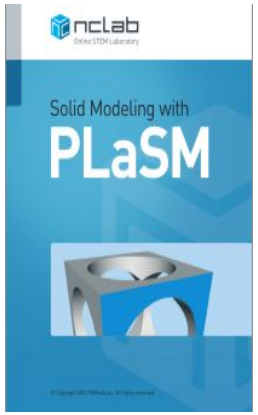
- I am a Professor of Applied & Computational Math @ UNR. My research is to employ supercomputers to simulate complex engineering processes (nuclear reactors, fluid dynamics, electromagnetics, ...)
- During the last 30 years I learned a lot about computer programming, and still learning something new every day.
- My passion is to train teachers and librarians in using modern computing technologies including 3D modeling, computer programming, engineering simulations, and more.





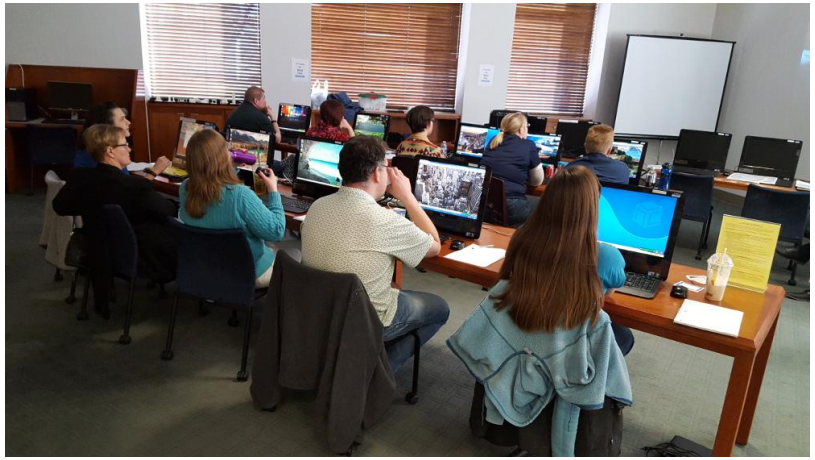






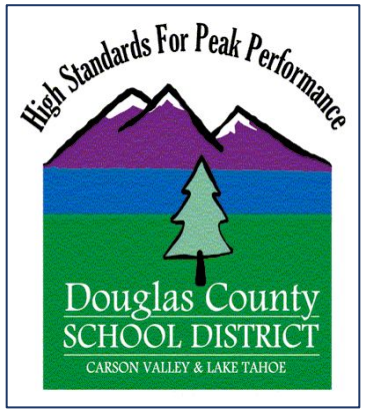
Since 2010 - Working for the Youth in NV

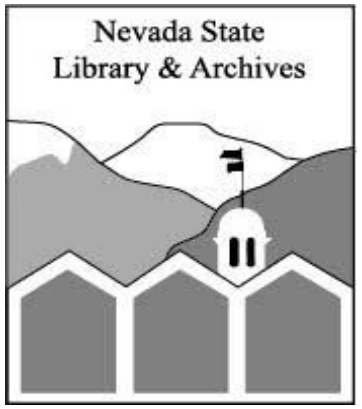
- Training teachers,
- training librarians,
- coding camps,
- afterschool programs.



NCLab - Coding and 3D Modeling Platform

- Nevada Dept. of Education
- K-12 Schools and Junior Colleges
- Nevada Library System
- Individuals, Clubs & Homeschools





2016: NV Library Wins a National YALSA Award

Carson City Library's NCLab Coding Camps make national top 10 list

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Cathleen Allison | Nevada Photo Source

The Carson City Libraryâ□□s NCLab Coding camps have been named a top 10 summer learning program by the Young Adult Library Services Association.

Carson City Library's NCLab Coding Camps have been named a top 10 summer learning program by the Young Adult Library Services Association.

"Everyone at the Carson City Library is so grateful for this national recognition," said Carson City Library Director Sena Loyd. "We strive to make the library an active place of learning for the community. Our lifelong learning coding program through NCLab is something we are very proud of, and we are more than happy to see the creativity of our staff and the participation of our community come together in a way that will broaden the skill-set of patrons who take and participate in NCLab this summer."

The #1 Mistake Instructors Make when Teaching Programming to Beginners

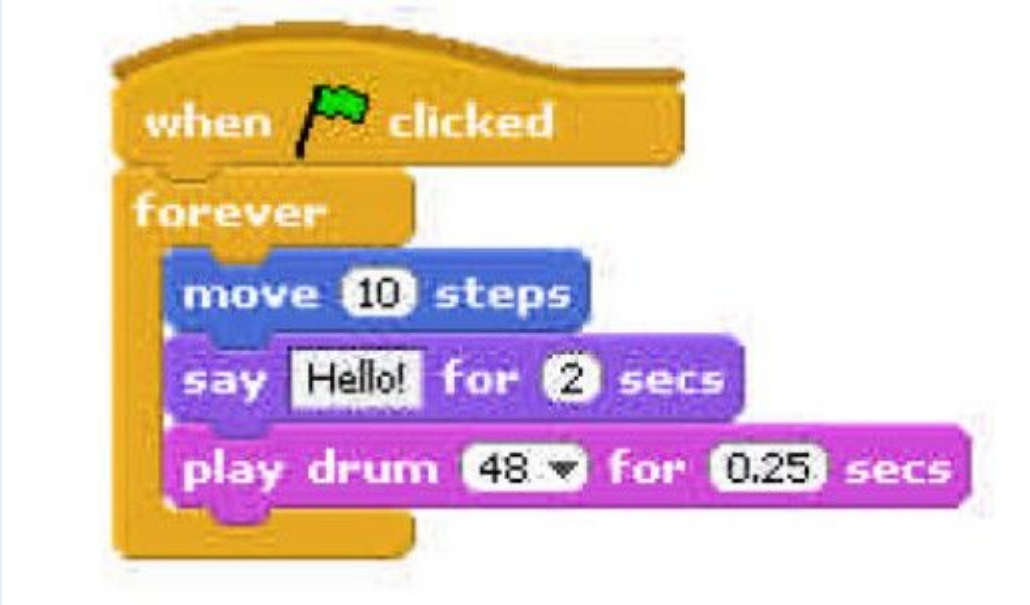
Starting with the “real thing” (C++, Java, Python, …)

… please don’t!

```
def add5(x):
   return x+5

def dotwrite(ast):
   nodename = getNodename()
   label=symbol.sym_name.get(int(ast[0]),ast[0])
   print '    %s [label="%s' % (nodename, label),
   if isinstance(ast[1], str):
      if ast[1].strip():
         print '= %s"];' % ast[1]
      else:
         print '"]'
   else:
      print '"];'
      children = []
      for  in n, childenumerate(ast[1:]):
         children.append(dotwrite(child))
      print ,'    %s -> (' % nodename
      for  in :namechildren
         print '%s' % name,
```

Up to 4th Grade: Block Coding is OK

Suitable for kids who have not developed keyboarding skills yet.



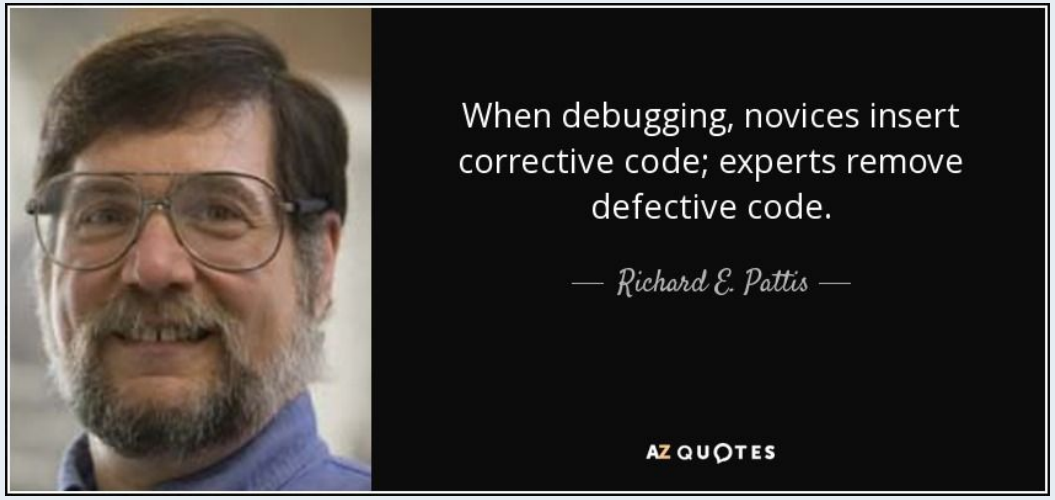
Grades 5+: Students Need to Type Code

All real programming languages require typing code. When typing code, students:

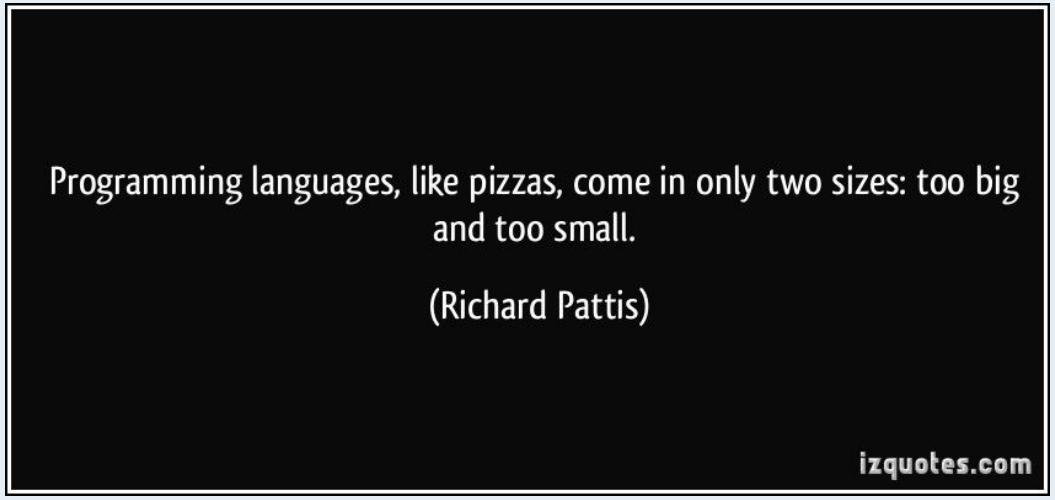
- focus
- pay attention to detail
- get used to accuracy
- get used to code formatting

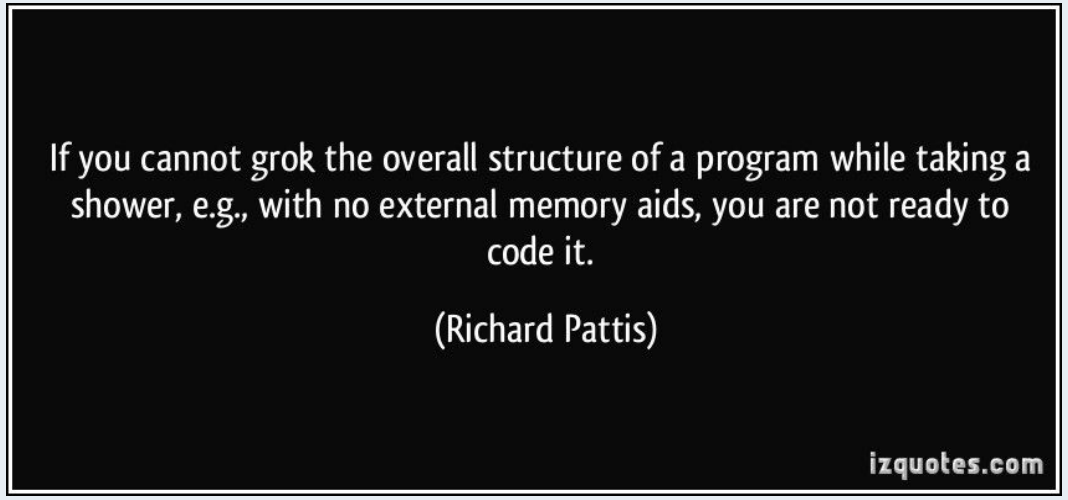
But How Can This Be Made Fun?!

Solution: The Karel Language



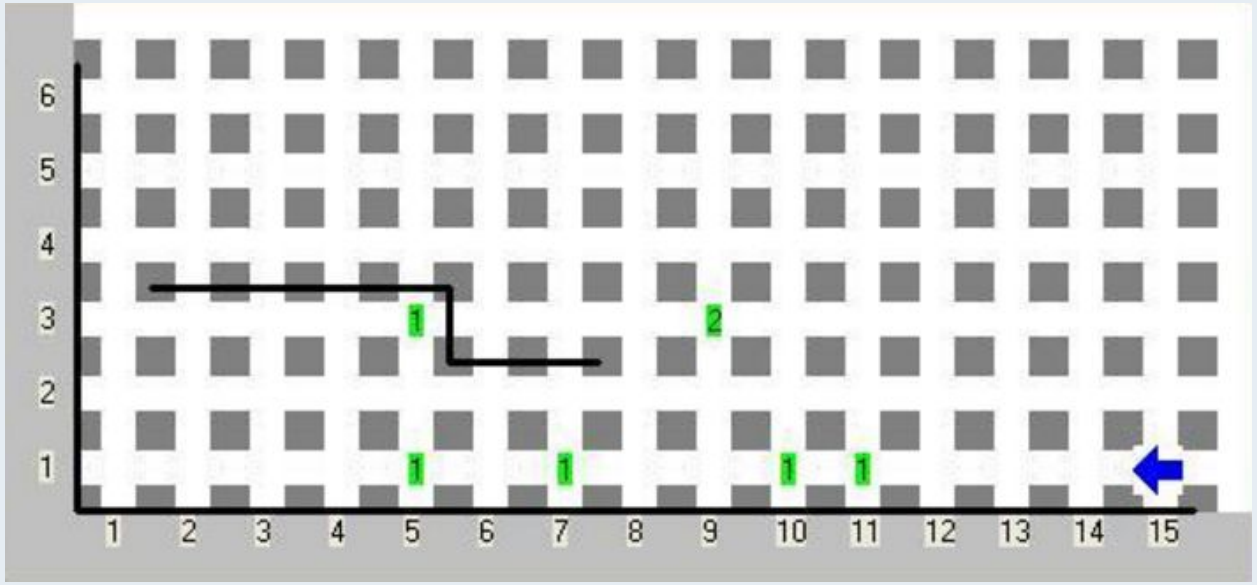
- Created by Richard Pattis.
- Used at Stanford University.
- Used in many countries including Mexico.





The Original Karel

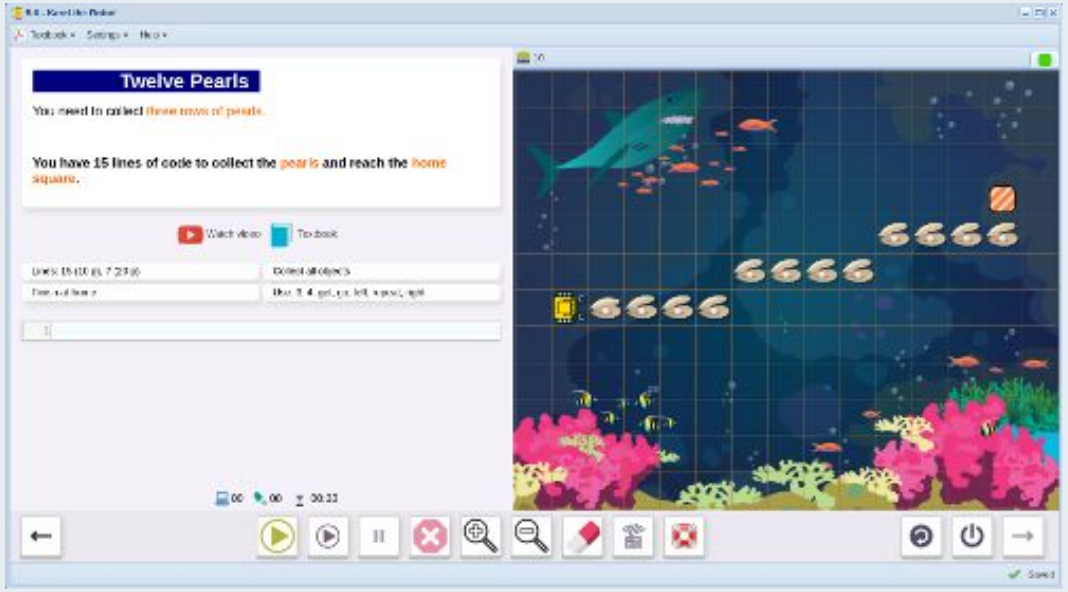
- Simple Pascal-like syntax
- Primitive graphics
- POWERFUL CONCEPTS




```
BEGINNING-OF-PROGRAM

 DEFINE turnRight AS
 BEGIN
   turnLeft;
   turnLeft;
   turnLeft;
 END

 BEGINNING-OF-EXECUTION
   ITERATE 3 TIMES
   BEGIN
     turnRight;
     move
   END
   turnoff
 END-OF-EXECUTION

END-OF-PROGRAM
```

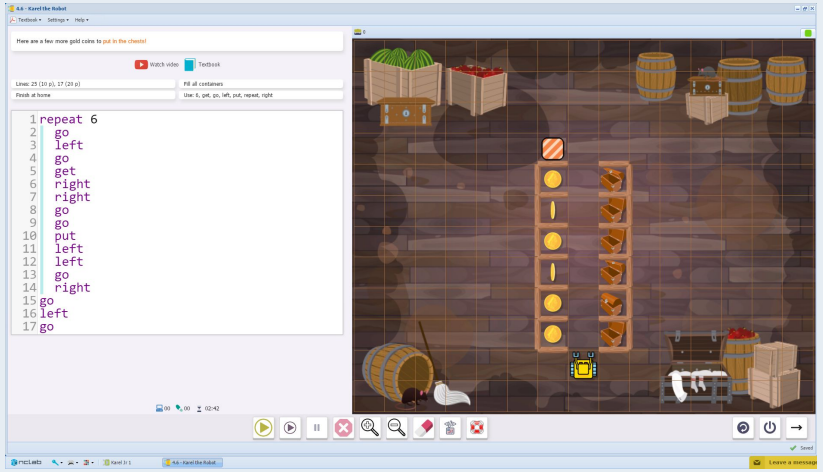
The Karel App in NCLab

- Simple Python-like syntax
- Beautiful graphics




```
while not home
    go
    if key
        get
    if wall
        right
        if wall
            repeat 2
                left
```

Game-Based Karel Course in NCLab



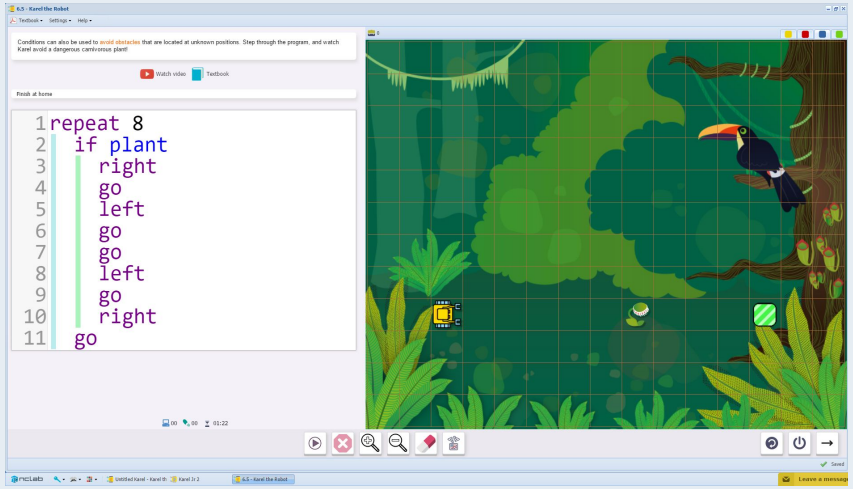
Beginning level skills - quick to learn

UNIT 1: Students learn how to guide the robot, type simple programs, recognize repeated patterns, and use the repeat loop.

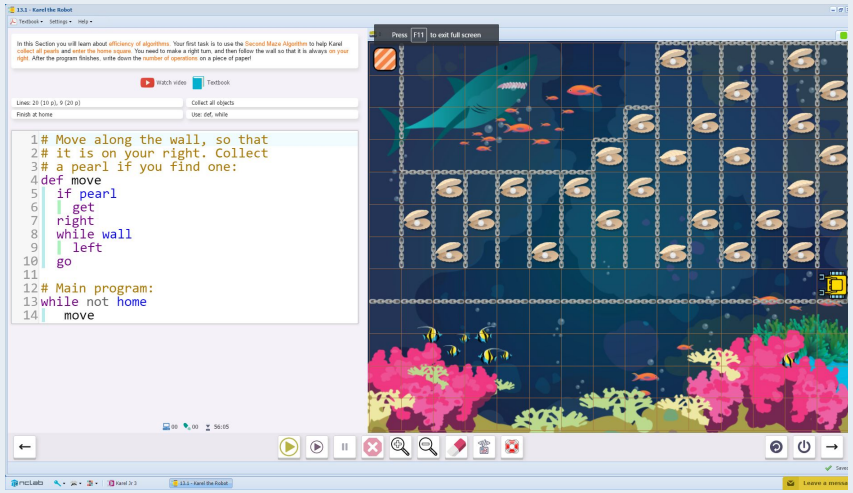
At the end of this unit, they are be able to create their own mazes with features such as nested loops.

Game-Based Karel Course in NCLab

Intermediate level skills



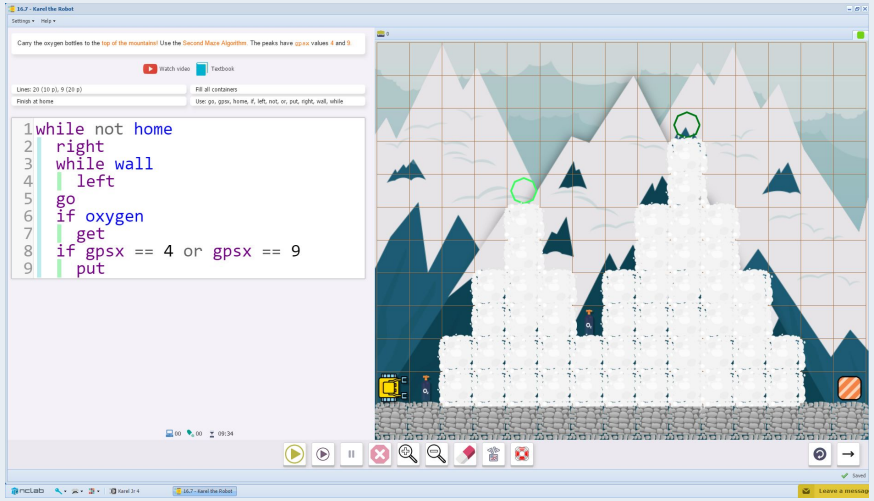
UNIT 2: Students will learn how to use **if-else conditions**, the **while loop**, and how to combine loops and conditions together.



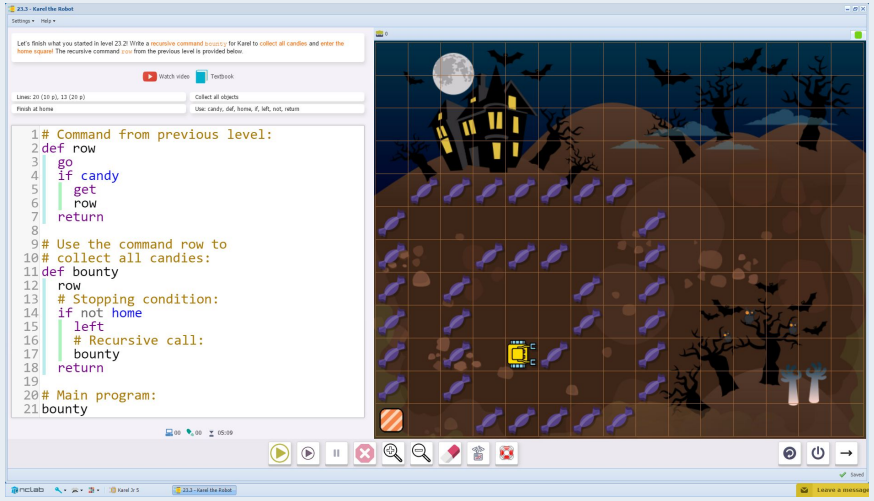
UNIT 3: Students will learn how to use **custom commands**, local and global **variables**, and **functions** that return values.

Game-Based Karel Course in NCLab

Advanced level skills



UNIT 4: Students will learn how to use **GPS coordinates**, **comparison symbols**, **Boolean values**, and **random variables**.



UNIT 5: Students will learn how to make **random decisions**, use **recursion**, and solve **advanced** programming challenges.

How Do Students Learn?

There are 5 units in Karel

UNIT

Each unit is made up of 5 sections

SECTION

A section represents a concept arc.

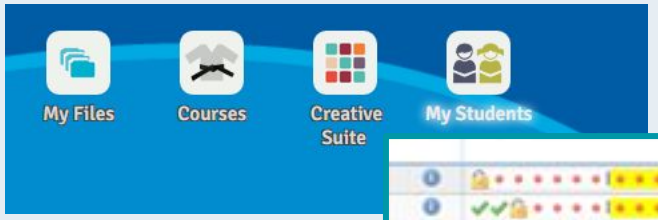
One section = 8 levels + quiz

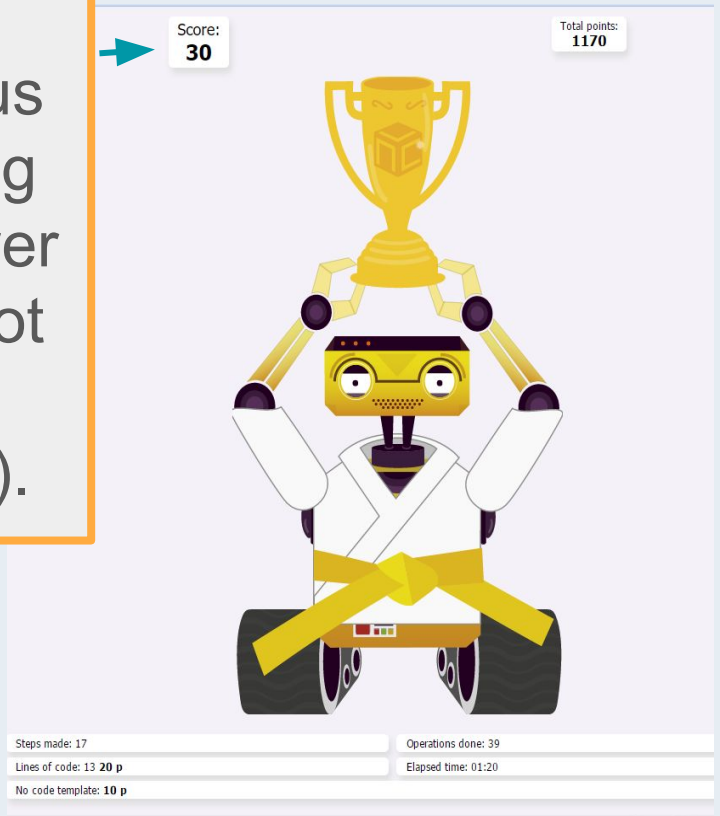
LEVEL

A level represents one step of instruction or practice within the concept arc.

Systematic instruction and practice with gradual release - 200+ levels in all.

Instructor Dashboard



My Students shows how many points students have earned and what levels they are working on. You can get precise information by clicking on a completed level.

Students earn points for each level, with bonus points for writing the code in fewer lines, and for not using the code template (hints).