Scratch for Budding Computer Scientists
Computer Science S-1: Great Ideas in Computer Science
Harvard Summer School

SIGCSE
9 March 2007

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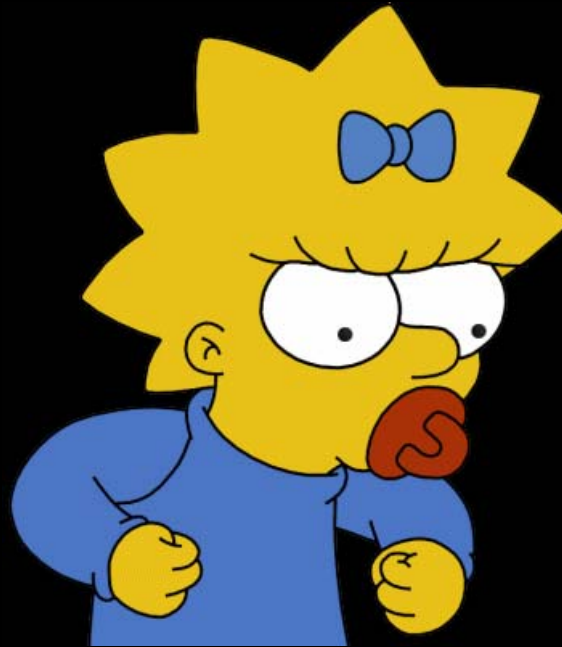Harvard University

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Programming

?

Programming
Looking Up a Phone Number

Programming
Changing a Baby's Diaper

Programming
Putting on Socks

```
1.  let socks_on_feet = 0
2.  while socks_on_feet != 2
3.      open sock drawer
4.      look for sock
5.      if you find a sock then
6.          put on sock
7.          socks_on_feet++
8.          look for matching sock
9.          if you find a matching sock then
10.             put on matching sock
11.             socks_on_feet++
12.             close sock drawer
13.         else
14.             remove first sock from foot
15.             socks_on_feet--
16.     else
17.         do laundry and replenish sock drawer
```

Programming
Saying Hello in Java

```java
class Hello
{
    public static void main(String [] argv)
    {
        System.out.println("hello, world!");
    }
}
```

Programming
Saying Hello in Scratch

Hello1.scratch

Programming
Statements

say Hello!

say nothing

wait 1 secs

play sound meow

. . .

Programming
Statements

Hello{2,3}.scratch

Programming
Boolean Expressions

touching mouse-pointer ▼ ?

mouse down?

◯ < ◯

⬡ and ⬡

. . .

Programming
Conditions
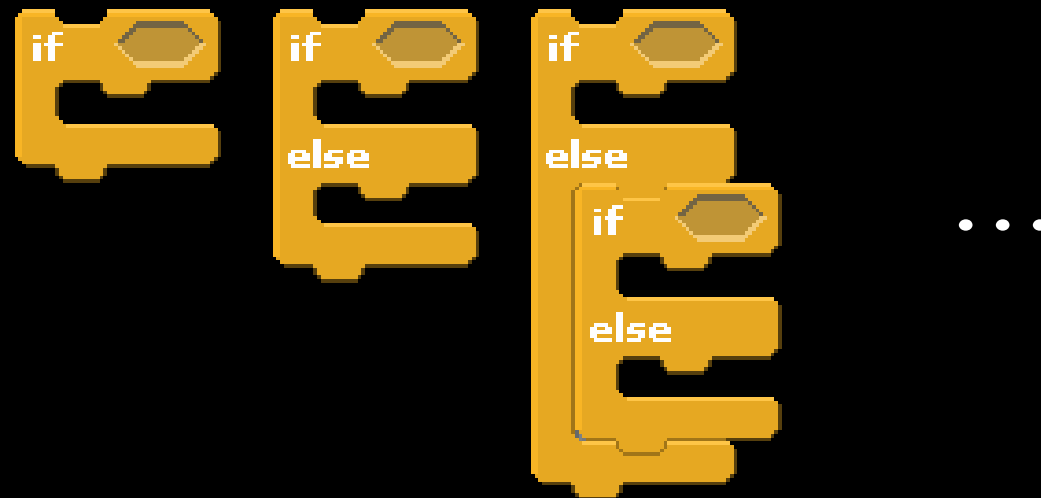
Programming
Conditions

Hello5.scratch

Programming
Loops

Programming
Loops

Hello{6,7,8}.scratch

Programming
Threads

Move2.scratch

```
when [flag] clicked
go to x: -150 y: 150
point in direction 45
forever
    if on edge, bounce
    if < not < touching cat ? > >
        move 3 steps
```

```
when [flag] clicked
go to x: -160 y: -160
point in direction (pick random 91 to 179)
forever
    if < touching bird ? >
        play sound roar
        stop script
    point towards bird
    move 1 steps
```
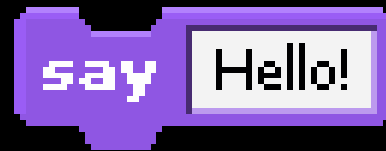
Programming
Saying Hello to Java

```java
class Hello
{
    public static void main(String [] argv)
    {
        System.out.println("hello, java!");
    }
}
```

Programming
Statements


```
System.out.println("Hello!");
```

Programming
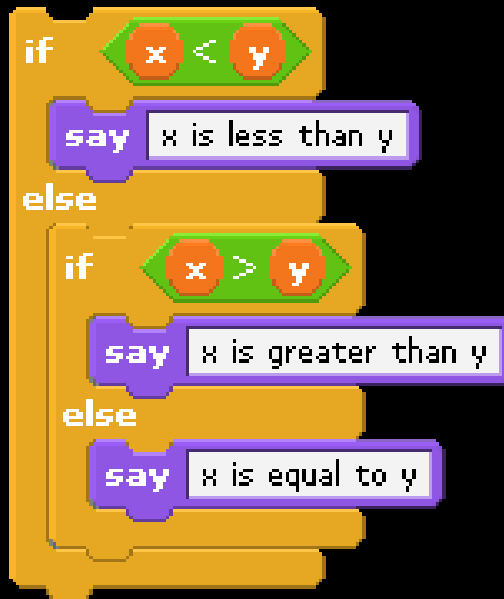## Boolean Expressions

(x < y)

((x < y) && (y < z))

Programming
Conditions


```
if (x < y)
{
    System.out.println("x is less than y")
}
else if (x > y)
{
    System.out.println("x is greater than y");
}
else
{
    System.out.println("x is equal to y");
}
```

Programming
Loops

forever

say Hello!

```java
while (true)
{
    System.out.println("Hello!");
}
```

repeat 10

say Hello!

```java
for (int i = 0; i < 10; i++)
{
    System.out.println("Hello!");
}
```

We Surveyed Our 25 Students

76% felt exposure to Scratch was a positive influence on their subsequent experience with Java.
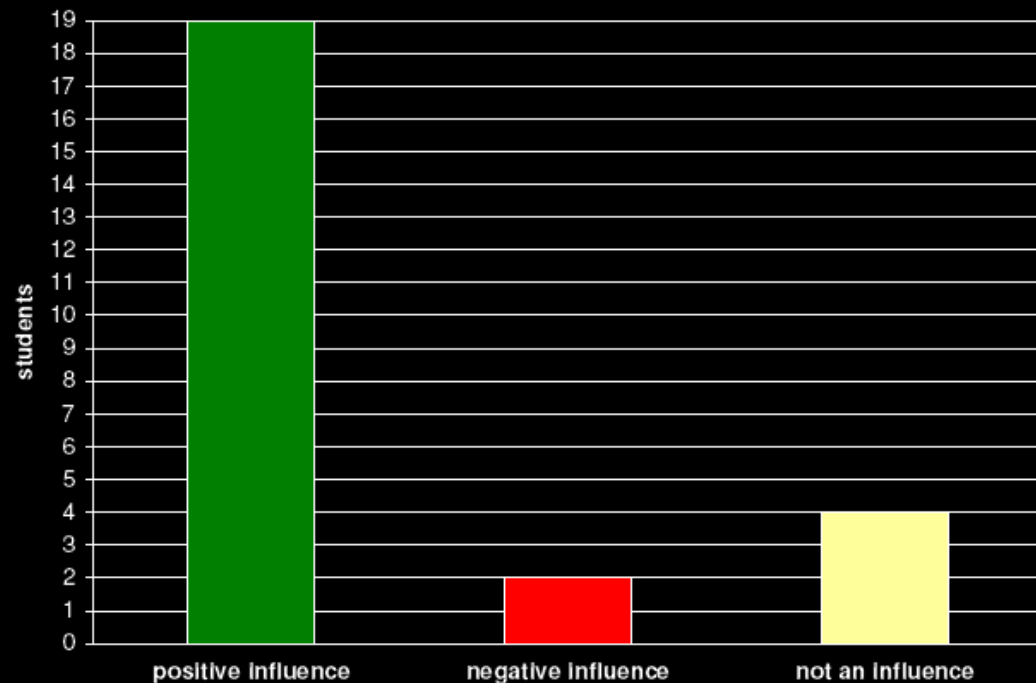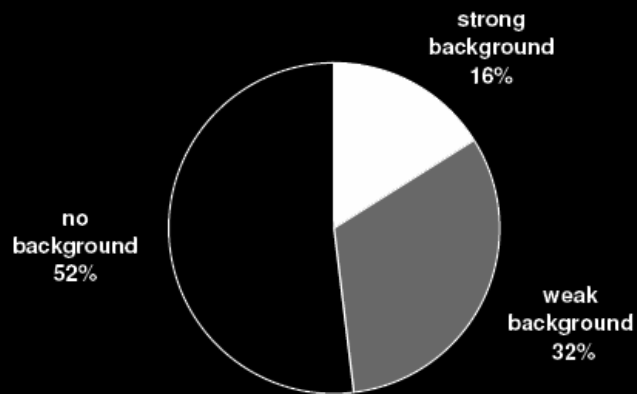
Comments from Students

"It was really nice having visible rewards for the work instead of 'Oh my god! those randomly generated numbers sorted themselves!'"

"[My] brother is a senior programmer at Apple so occasionally he hands me a book and tells me to learn something. . . . The thing that didn't keep me learning Java and C++ was that there were hardly any tangible rewards. The thing I really wanted to make was a game but according to my brother it was next to impossible for me to do it. Where as [sic] with Scratch it was extremely easy for me to do it."

"Though we did not learn Java syntax by using Scratch, we learned the type of thinking necessary to implement simple programs. . . . I was able to approach the first Java programs with an idea of how to tackle the problems. Though I did not yet know how to create a for loop, I knew when a for loop was necessary because I had used loops in my Scratch program."

Where to Download Scratch

`http://scratch.mit.edu/`

Our thanks to the
Lifelong Kindergarten Group
MIT Media Lab

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