Toward community-enhanced programming education

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Software is eating the world.

by Marc Andressen

Founder Netscape and Andressen Holovitz
Labor of software developers
increase by **22%** in **10 years**

1M -> 1.22M

2012 -> 2022

Source: U.S. Bureau of Labor Statistics
Demand for programming skills increases.
But, not enough programmers.
Governments promote students to learn to code
The way of learning is also changing.
10 years ago - books
Now - online courses
Now - online courses
HTML & CSS
Learn how to create websites by structuring and styling your pages with HTML and CSS.

JavaScript
Last active 2 months ago

jQuery
Learn how to make your websites interactive and create animations by using jQuery.

PHP
Learn to program in PHP, a widespread language that powers sites like Facebook.

Python
Learn to program in Python, a powerful language used by sites like YouTube and Dropbox.

Ruby
Last active 5 months ago
Basic courses (e.g. JavaScript)

INTRODUCTION TO JAVASCRIPT

Getting Started with Programming
Time to become a coding champ.

Choose Your Own Adventure!
Let's create your very own "choose your own adventure" game.

FUNCTIONS

Introduction to Functions in JS
This course introduces functions, why we use them, and how to use them. The course also combines functions with other programming concepts previously learned.
Digitizing People

Meet Bob. Bob is our friend. But how do we get in touch with Bob?

Look at the code in the editor. We have Bob’s information stored in an **associative array** named `bob`. `bob` has a **property** called `firstName` which has a **value** of “Bob”. Similarly, it has properties `lastName`, `phoneNumber` and `email` which each have values.

To access the values for each property we write `array.property`. Check out line 8 where we log to the console `bob.firstName`.

Copying the format we used on line 8, fill in lines 9 and 10 so that Bob’s `lastName` and `email` are printed out.

**Stuck? Get a hint!**
What happened after that?
The gap between knowledge and practice.

put it into practice
The gap between knowledge and practice.
Example: Create YouTube app.
Example: Create YouTube app.

1. define requirement
Example: Create YouTube app.

1. define requirement
2. search the example code
Example: Create YouTube app.

1. define requirement
2. search the example code
3. read/write documentation
Example: Create YouTube app.

1. define requirement
2. search the example code
3. read/write documentation
4. link documents to your code
Example: Create YouTube app.

1. define requirement
2. search the example code
3. read/write documentation
4. link documents to your code
5. debugging
The gap between knowledge and practice.

put it into practice
The gap between knowledge and practice.
The next challenge in HCI

define requirement
search example code
documentation
link doc to code
debugging
We focus on documentation

define requirement

search example code

documentation

link doc to code

debugging
Cumiki: Annotation + tutorial creation for GitHub code.

```ruby
class UsersController < ApplicationController
  def index
    @users = User.all

    config.consumer_key = ENV['TWITTER_KEY']
    config.consumer_secret = ENV['TWITTER_SECRET']

    @client = Twitter::Client.new(oauth_token: @user.token, oauth_token_secret: @user.token_secret)
    @tweets = @client.user_timeline(@user.uid)
  end
```
Cumiki: collaborative tutorial creation for GitHub code
現在の位置を取得する

```swift
<!-- Map/DetailViewController.m

```locationManager startUpdatingLocation];
```}

```swift
- (void)locationManager:(CLLocationManager *)manager didUpdateToLocation:(CLLocation *)newLocation {
    CLLocationCoordinate2D coordinate = newLocation.coordinate;  
    NSLog(@"%f", coordinate.latitude);  
    NSLog(@"%f", coordinate.longitude);
    [mapView setCenterCoordinate:coordinate animated:YES];
    MKCoordinateRegion zoom = mapView.region;  
    zoom.span.latitudeDelta = 0.005;  
    zoom.span.longitudeDelta = 0.005;  
    [mapView setRegion:zoom animated:YES];
```
Cumiki: collaborative tutorial creation for GitHub code
1. Interactive annotation interface.
2. Embed and expand code in the tutorial.
3. Git based auto update

```ruby
# comment
def current_user
  begin
    @current_user ||= User.
  rescue
    puts "error"
  end
end
```

```ruby
# comment
def current_user
  begin
    @current_user ||= User.
  rescue
    puts "error"
    session[:user_id] = nil
    redirect_to root_path
  end
end
```
3. Git based auto update

```ruby
# comment
def current_user
  begin
    @current_user ||= User.
    rescue
      puts "error"
    end
  end
end
```
Usage scenario:

Knowledge sharing within the groups.
We focus on documentation

- define requirement
- search example code
- link doc to code
- debugging
Community-enhanced learning

- define requirement
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Codelets: Linking Interactive Documentation and Example Code in the Editor [CHI’12]
CommunityCommands: Command Recommendations for Software Applications [CHI’12]

TRIM
Trims objects to meet the edges of other objects

Manager’s Notes: Don’t forget about the -t option to keep our files consistent.

Co-Worker’s Notes: Use this instead of Break when there are three dashes in the way.
The real-time interactive environment for classroom education (in-progress) collaborations with Koji Yatani and Jun Kato.
Summary

Community-enhanced learning

define requirement
search example code
documentation
link doc to code
debugging
Thank you