

Toward community-enhanced programming education

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Software is eating the world.

by Marc Andressen

Founder Netscape and Andressen Holovitz



PHOTO: ROBYN TWOMEY

Labor of software developers

increase by **22%** in **10 years**

1M -> 1.22M

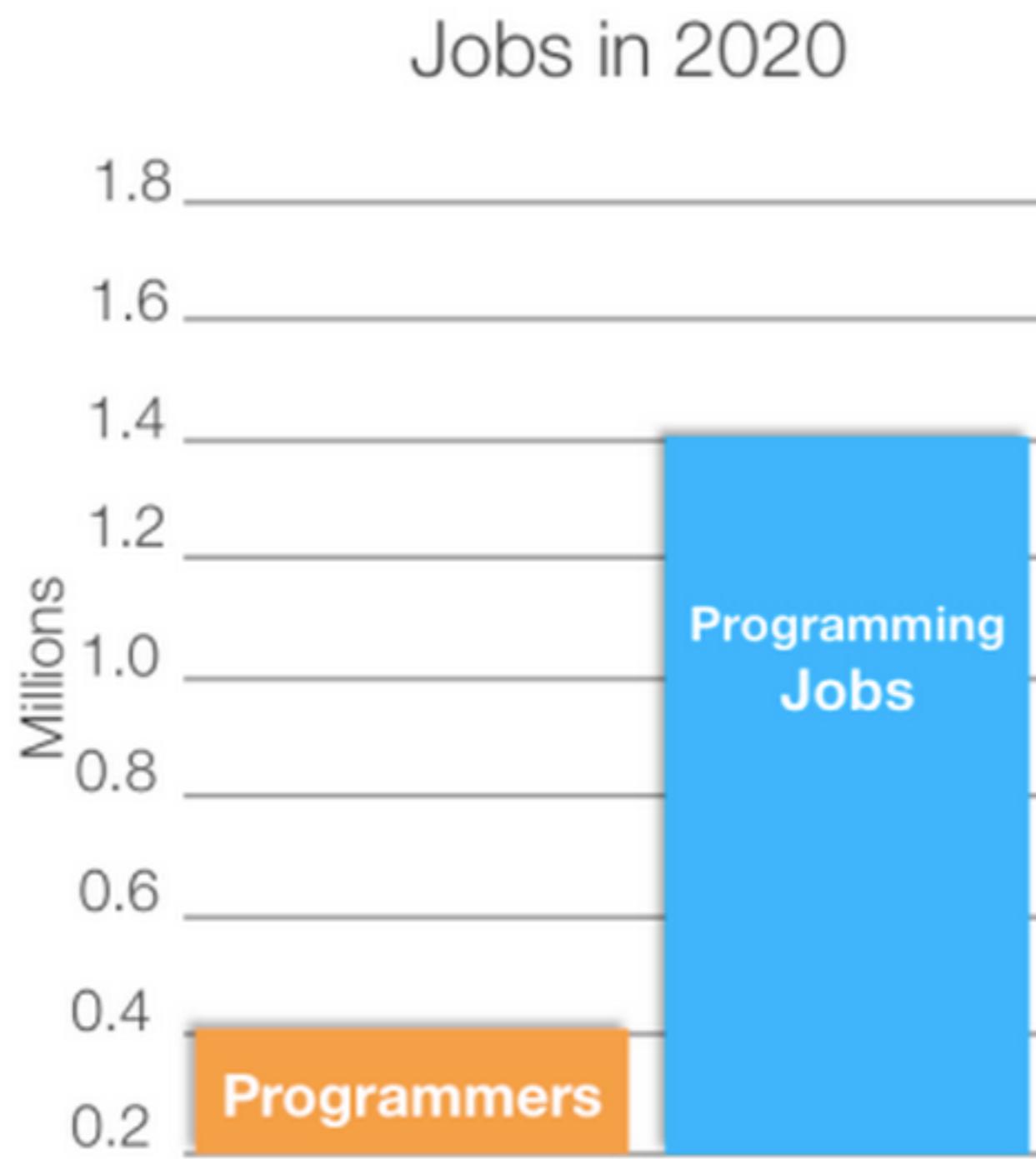
2012 -> 2022

Source: U.S. Bureau of Labor Statistics

Demand for programming skills increases.



But, not enough programmers.



Source: U.S. Bureau of Labor Statistics

Governments promote students to learn to code



The way of learning is also changing.



10 years ago - books



Now - online courses



Now - online courses



KHAN ACADEMY



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

Codecademy  12%



Basic courses (e.g. JavaScript)

INTRODUCTION TO JAVASCRIPT



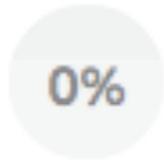
Getting Started with Programming
Time to become a coding champ.



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.

Codecademy

Firefox File Edit View History Bookmarks Tools Window Help

Sun 10:15 Christopher Hunt

Building an Address Book ... repl.it - JavaScript DevDocs/JavaScript/Math... for in loop javascript - Go... Search for new Boolean() ... +

www.codecademy.com/courses/building-an-address-book/0/1?curriculum_id=506324b3a7dff000020bf661

← JavaScript codecademy Me

Building an Address Book 1/6

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`.

Instructions

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!

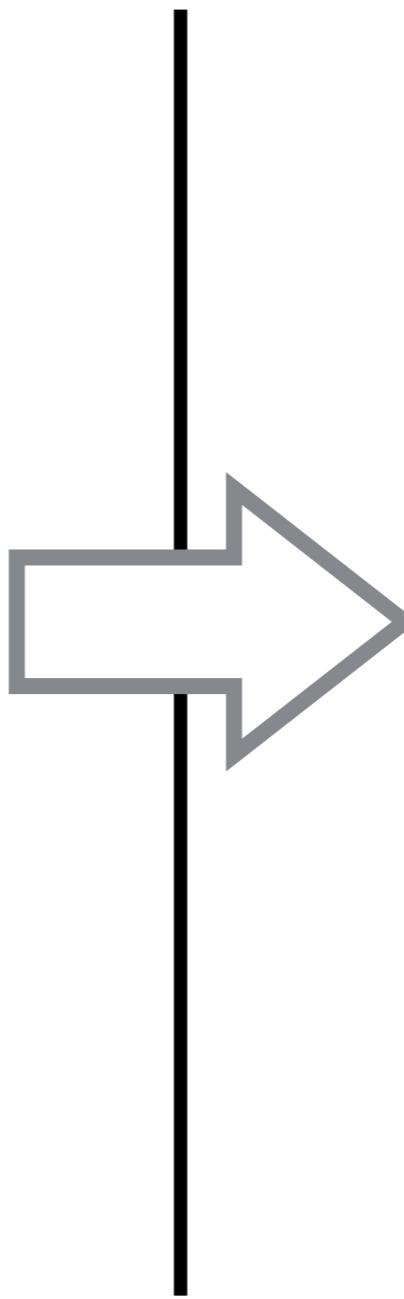
Save & Submit Code Reset Code

What happened after that?



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?

put it into practice

The gap between knowledge and practice.



The gap between knowledge and practice.

Example



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.



The gap between knowledge and practice.



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define requirement

search example code

documentation

link doc to code

debugging

The next challenge in HCI



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define requirement

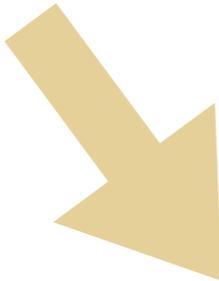
search example code

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.

The screenshot shows a GitHub code editor interface with the following details:

- Path:** master : app / controllers / users_controller.rb
- Annotations:** A tooltip is displayed over the line `@users = User.all` with the text "Get all objects from user model".
- Buttons:** A "Cancel" button and a "Hunk" button are visible at the bottom right of the annotation box.
- Code Lines:** The code consists of 16 numbered lines:
 - 1 class UsersController < ApplicationController
 - 2
 - 3 def index
 - 4 @users = User.all
 - 5
 - 6 Get all objects from user model
 - 7
 - 8
 - 9
 - 10 config.consumer_key = ENV['TWITTER_KEY']
 - 11 config.consumer_secret = ENV['TWITTER_SECRET']
 - 12 end
 - 13 @client = Twitter::Client.new(oauth_token: @user.token, oa
 - 14 @tweets = @client.user_timeline(@user.uid)
 - 15 end
 - 16

+  0.0.0.0:3000/dashboard

cumiki Notes Explore Dashboard  ryooopan ▾

Dashboard

Repositories Search

 GitHub ryooopan / ios-map
Dashboard

 GitHub cakephp / debug_kit
Dashboard

1 Hacks
3 Notes

 GitHub ryooopan / rails
Dashboard

Cumiki: collaborative tutorial creation for GitHub code

+ 0.0.0.0:3000/ryooopan/ios-map/dashboard/hunks/WDMrRbOEhB

cumiki Notes Explore Dashboard ryooopan

ryooopan / ios-map [Dashboard]

Source Commits **4 Hunks**

2013-11-10 - 03:34 現在の位置を取得する

ryooopan

SELECT

2013-11-10 - 03:30 CLLocationManagerを定義して現...

ryooopan

SELECT

2013-11-10 - 03:29 地図を表示するためのMKMapView...

ryooopan

SELECT

2013-11-10 - 03:29 MapKitとCoreLocationフレームワ...

ryooopan

SELECT

現在の位置を取得する

2013-11-10 - 03:34 Ryo Suzuki (ryooopan)

Delete

</> Map/DetailViewController.m

Expand

```
[locationManager startUpdatingLocation];
}

- (void)locationManager:(CLLocationManager *)manager didUpdateToLocation:(CLLocation *)newLocation {
    CLLocationCoordinate2D coordinate = newLocation.coordinate;
    NSLog(@"%@", coordinate.latitude);
    NSLog(@"%@", coordinate.longitude);

    [mapView setCenterCoordinate:coordinate animated:YES];

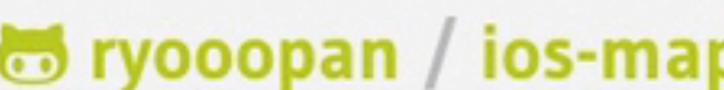
    MKCoordinateRegion zoom = mapView.region;
    zoom.span.latitudeDelta = 0.005;
    zoom.span.longitudeDelta = 0.005;
    [mapView setRegion:zoom animated:YES];
}
```

- (void)locationManager:(CLLocationManager *)manager didUpdateToLocation:(CLLocation *)newLocation {
 CLLocationCoordinate2D coordinate = newLocation.coordinate;
 NSLog(@"%@", coordinate.latitude);
 NSLog(@"%@", coordinate.longitude);

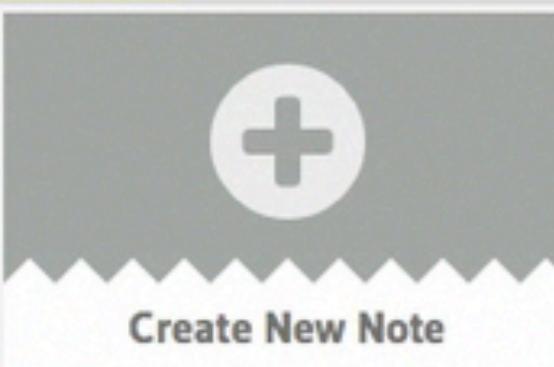
 [mapView setCenterCoordinate:coordinate animated:YES];

 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



Notes



iOSで地図アプリを作る



iOSで地図アプリを作る

- Step. 1 : MapKitとCLLocationManagerフレームワークを追加する
 - Step. 2 : 地図を表示するためのMKMapViewのインスタンスを定義
 - Step. 3 : CLLocationManagerを定義して現在の位置を取得する
 - Step. 4 : 現在の位置を取得する

Step. 1 : MapKitとCoreLocationフレームワークを追加する

```
</> Map/DetailViewController.h
```

Expand

```
#import <UIKit/UIKit.h>
#import <MapKit/MapKit.h>
#import <CoreLocation/CoreLocation.h>
```

Cumiki: collaborative tutorial creation for GitHub code

1. Interactive annotation interface.

The screenshot shows a code editor interface with a yellow background. At the top, there's a header bar with a lock icon, a toggle switch, and a pencil icon. Below the header, the file path is shown as </> master : app / controllers / users_controller.rb. The code itself is a Ruby class definition:

```
</> master : app / controllers / users_controller.rb

1 class UsersController < ApplicationController
2
3   def index
4     @users = User.all
5
6     Get all objects from user model
7
8   config.consumer_key = ENV['TWITTER_KEY']
9   config.consumer_secret = ENV['TWITTER_SECRET']
10  end
11  @client = Twitter::Client.new(oauth_token: @user.token, oa
12  @tweets = @client.user_timeline(@user.uid)
13  end
14
15
16
```

A callout box is positioned over the line `@users = User.all` with the text "Get all objects from user model". At the bottom right of the callout box are two buttons: "Cancel" and "Hunk".

2. Embed and expand code in the tutorial.

Get current user data object

```
</> app/controllers/application_controller.rb
begin
  @current_user ||= User.find(session[:user_id])
rescue
  session[:user_id] = nil
  redirect_to root_path
end
```

This code checks whether current user has logged in or not. `session[:user_id]` has user's session information. If it does not match with any user data, then redirect to root url.

Expand

click

```
</> app/controllers/application_controller.rb
class ApplicationController < ActionController::Base
  protect_from_forgery with: :exception

  private
  def current_user
    begin
      @current_user ||= User.find(session[:user_id])
    rescue
      session[:user_id] = nil
      redirect_to root_path
    end
  end

  helper_method :current_user
end
```

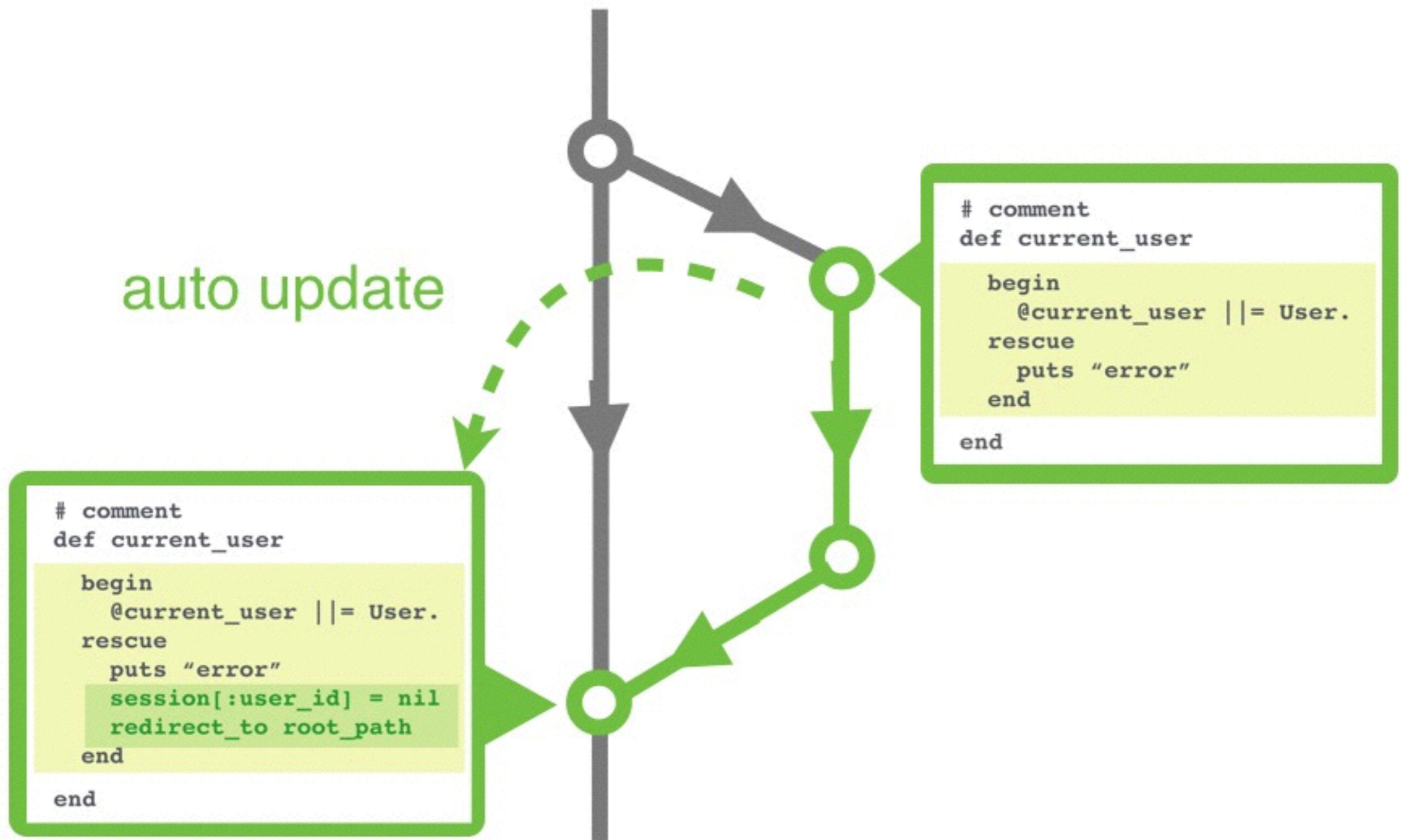
expand
source code

3. Git based auto update

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

```
# 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



Usage scenario:



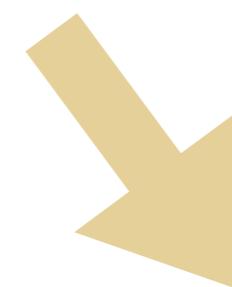
Knowledge sharing within the groups.

We focus on documentation



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Community-enhanced learning



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Codelets: Linking Interactive Documentation and Example Code in the Editor [CHI'12]

```
8 <div data-role="header">  
9   <h1>Title</h1>  
10 </div>  
11 <div data-role="content">  
12   <a data-role="button" href="#added_item" data-icon='plus'>Add</a>
```

[X](#) [-](#) [+](#) **jQuery Mobile Buttons**

[Syntax](#) [Preview](#) Buttons that are used for navigation should be coded as anchor links, and those that submit forms as button elements - each will be styled identically by the framework.

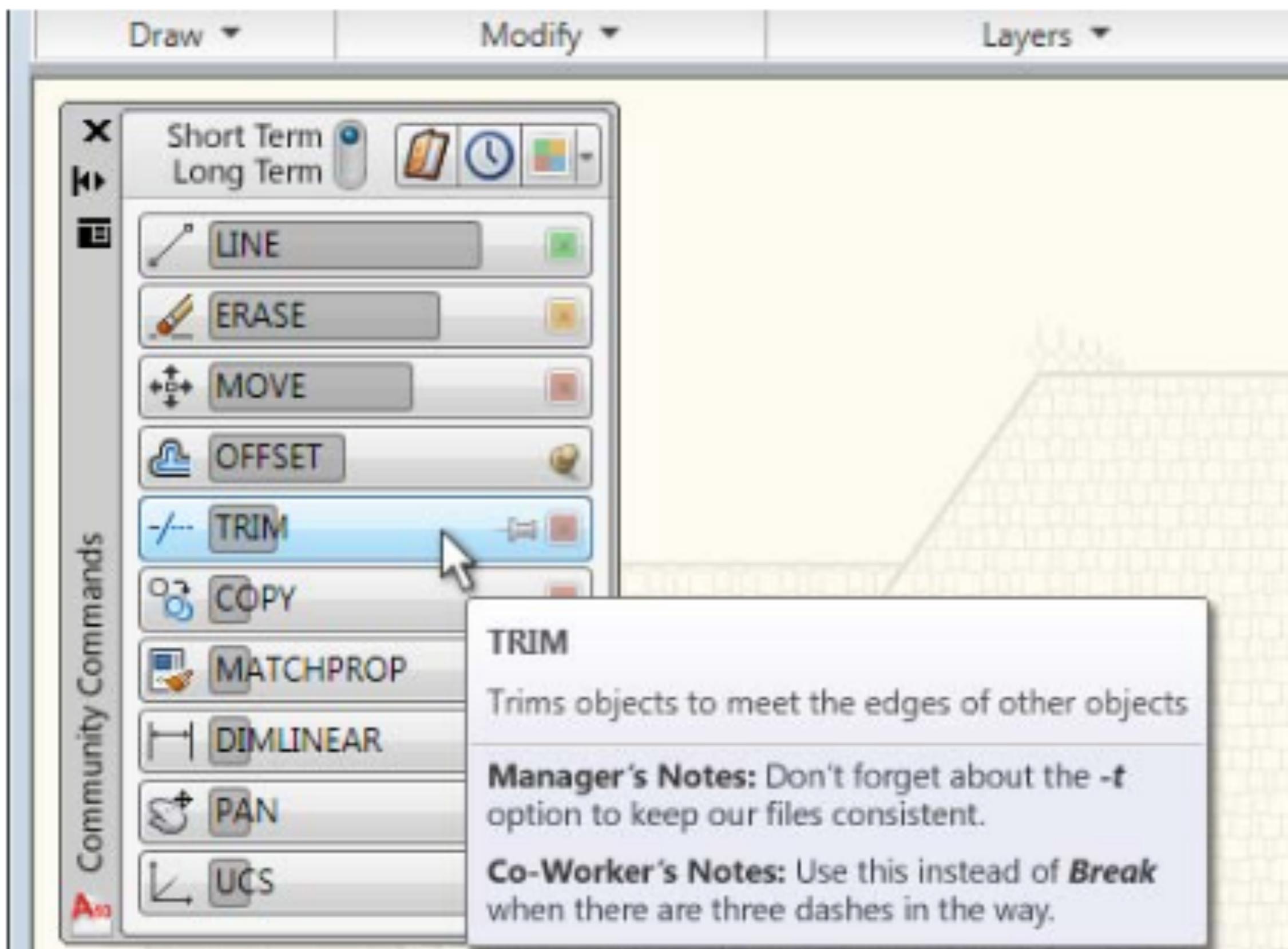
Icon:

Placement:
 Left Right Top Bottom

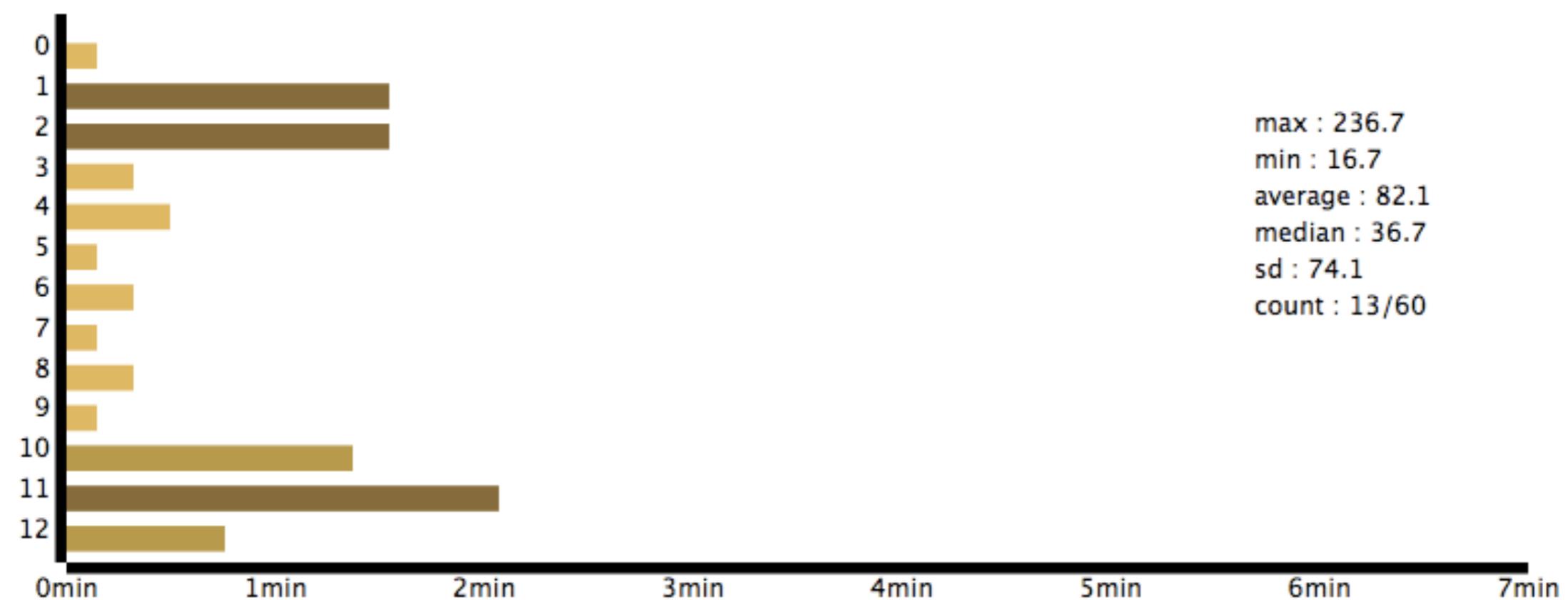
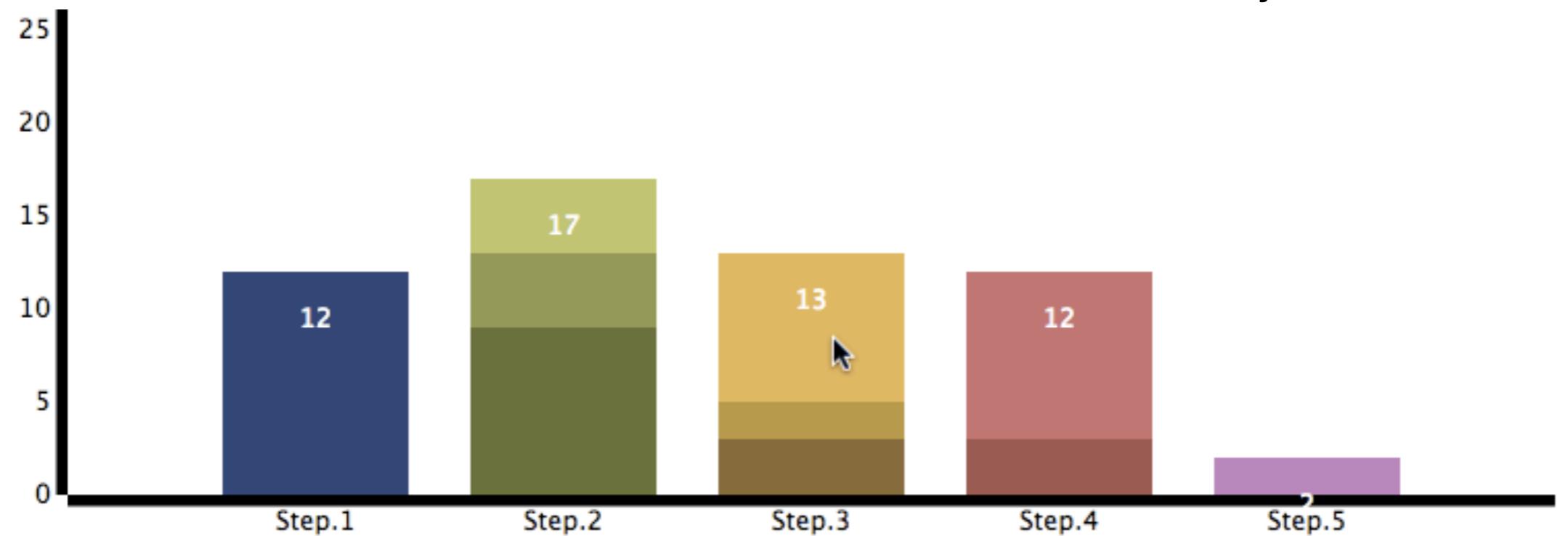
Text: Hidden

Open as:
 Dialog Reverse Transition

CommunityCommands: Command Recommendations for Software Applications [CHI'12]

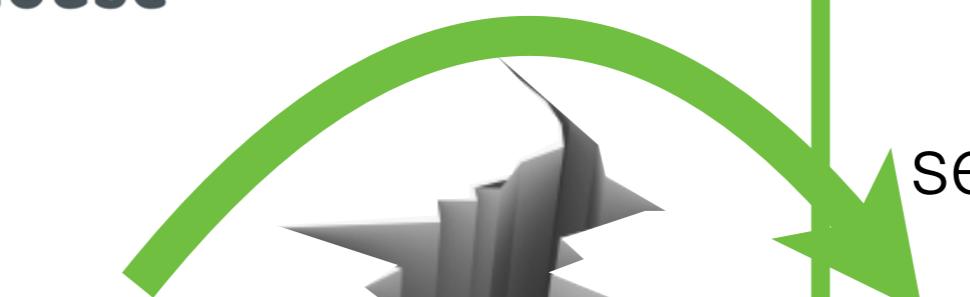


The real-time interactive environment for classroom education (in-progress) collaborations with Koji Yatani and Jun Kato



Summary

Community-enhanced learning



define requirement

search example code

documentation

link doc to code

debugging

Thank you