Is there a benefit of self-explanation prompts for learning a programming language?

In-Vivo Study

Bekir Mugayitoglu
Duquesne University

with mentorship and guidance from
Timothy J. Nokes-Malach
Dan Belenky
Liz Richey

Background

- Self-explanation is beneficial for learners (Chi, Renkl, etc)
- Self-explanation is scaffolding for generating knowledge and fixing incorrect knowledge (Chi, 2000; Roy & Chi, 2005)
- Encouraging learners to produce explanations is a process to try to make sense in building (new) knowledge (Chi, 2000)

Contributions

Research question

- Is there a benefit of self-explanation prompts for learning a programming language with little prior knowledge for freshmen students to have conceptual and transfer learning?

Hypothesis

- There is a benefit of self-explanation prompts for learning a programming language with little prior knowledge for freshmen students to have conceptual and transfer learning.

Design

As an In Vivo study, this is part of normal classroom instruction.

Participants: 20 freshmen students (17-20 years)

Males and Females

No prior programming language background

Materials

Independent variable:

Typical self-explanation

(Explanation of correct worked examples)

No self-explanation

(Instructor explains correct worked examples)

Dependent variables:

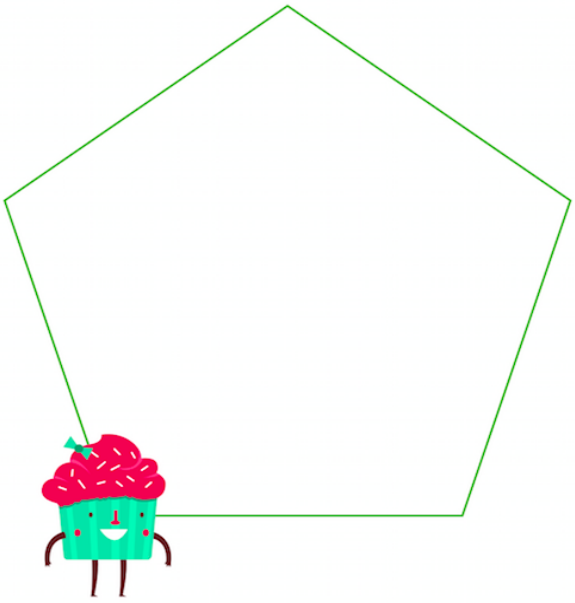
- Pre-test (Paper & pencil)
- Intervention
- Post-test (Paper & pencil)

Study procedure

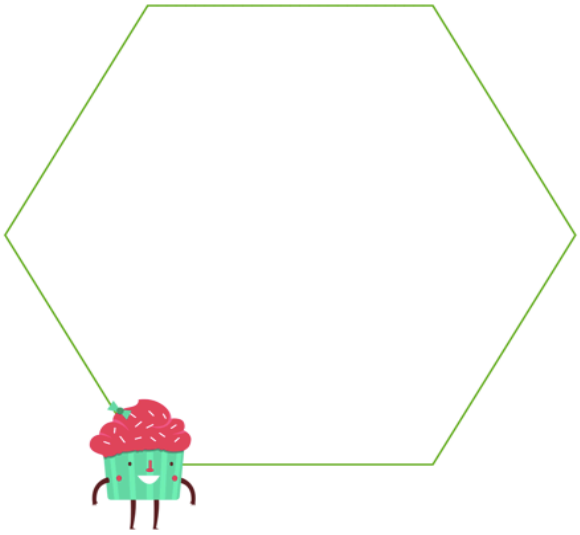
Control group	**Experimental group**
Instructions	**Self-explanation**
Study correct example 1 (7 minutes)	Study correct example 1 (15 minutes) Self- explain
Study correct example 2 (7 minutes)	Study correct example 2 (15 minutes) Self-explain
Study correct example 3 (7 minutes)	Study correct example 3 (15 minutes) Self-explain
Study correct example 4 (7 minutes)	Study correct example 4 (15 minutes) Self-explain
Study correct example 5 (7 minutes)	Study correct example 5 (15 minutes) Self-explain
Overall (35 minutes)	**Overall (75 minutes)**

Pre-test & Post-test

How would you create this shape?



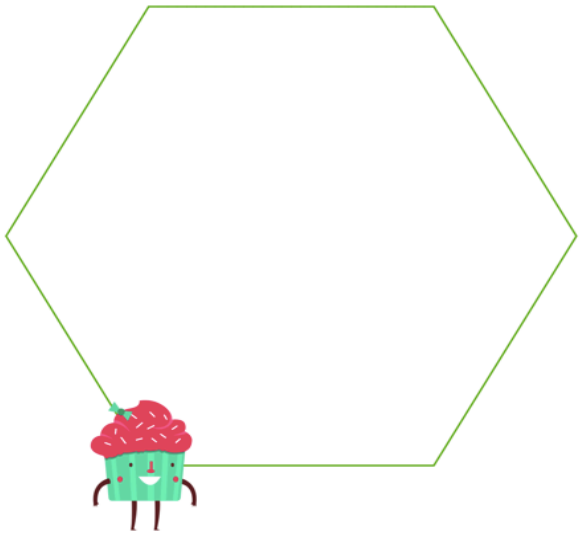
Pre-test



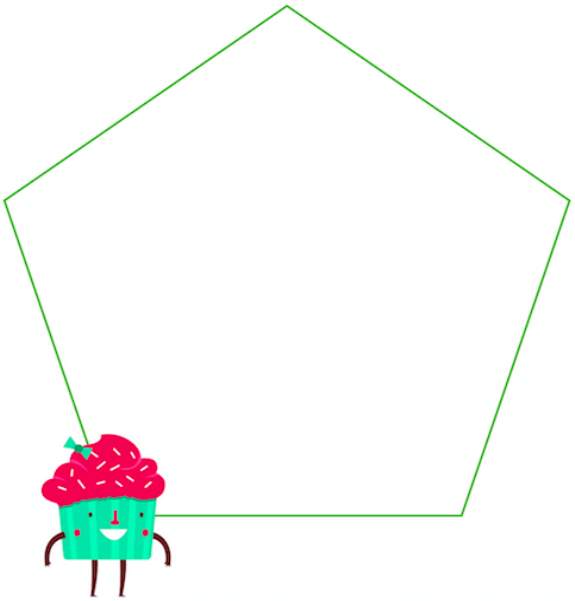
Post-test

Pre-test & Post-test

How would you create this shape?



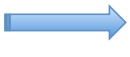
Pre-test

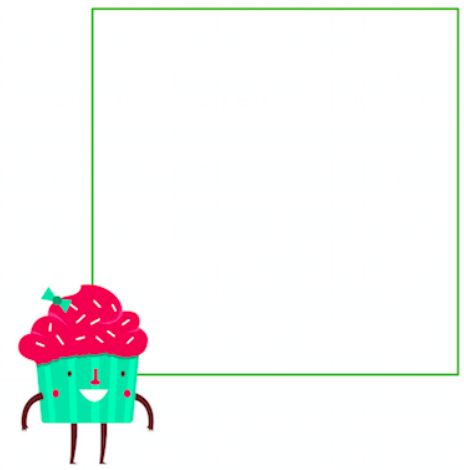


Post-test

Karl was asked to draw a square with the following block of codes. He was successful at drawing a square. Look at his codes.
What did Karl do? Explain why these sequence of blocks are successful to use.

Answer here

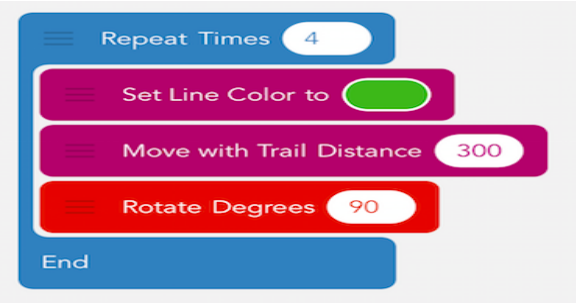


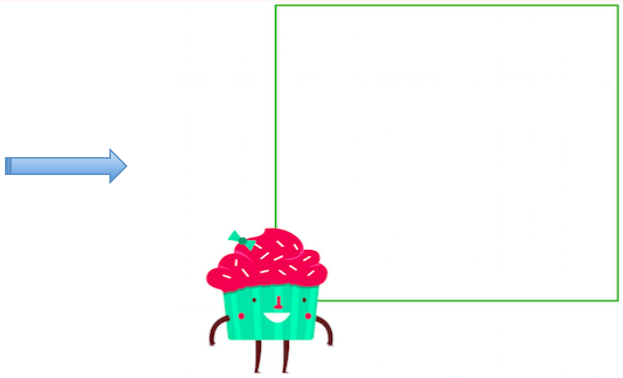


Experimental condition :
There is self-explanation, Correct worked example.

Karl was asked to draw a square with the following block of codes. He was successful at drawing a square. Look at his codes.
What did Karl do? Explain why these sequence of blocks are successful to use.

Expert explanation: In order to draw a square, first of all, we need an object to program. You have to have a loop block which is repeat times block, C Shape on Hopcotch. Whatever you put in C shape, it makes number of times what you type in the blank. Drag and drop repeat times block on the editing center and then we need to drag set line color block to pick the color what you want. Let's pick green color, and then what we want is that leave a trail after making square so drag move with trail distance block on the editing area in the C shapes which is repeat times.The last thing you need to do is that degree what object need to do to 90 degree.Drag and drop rotate degrees.





Control condition:
There is no self-explanation, Correct worked example with an explanation written by the instructor.

Expected effectiveness of self-explanation by coding

In order to test measure effectiveness of self-explanation, gain score will show us whether learners have procedural (How well they solve new problems) or conceptual knowledge (how well they understand what different programming steps mean).

Things that I learned

How to use In-Vivo to develop an ipad programming language tutor for students with little prior knowledge.

Developed self-explanation and instructor interface

Applied self-explanation model.