
Harnessing Generative Artificial Intelligence for Creative App Development for Learners A Hands-on Experience

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Resources

Slides: 

<https://tinyurl.com/kahn-hku-seminar>

[Notes and links for all my experiments](#)

[A paper](#) and [the draft of another paper](#)



Ada: Hello there! I'm Ada, a programmer and game enthusiast. Nice to meet you!

Curio: Hi! I'm Curio, and I love learning new things. I'm excited to hear about your game idea. What kind of game are you interested in creating?

I want to make a web game with a fairy and cute monster riddler

Ada_and_Curio Poe

Ada: That sounds like a fun game idea! Can you tell us a bit more about how the game would work? How would the fairy and cute monster riddler interact with each other?

When the fairy comes to the monster a riddle is shown. If the player gets it right they get a treasure.

Ada_and_Curio Poe

Ada: That sounds like a great concept! So, if I understand correctly, the fairy will approach the cute monster and present a riddle to the player. If the player answers the riddle correctly, they will receive a treasure. Is that right?

Curio: That sounds really fun! Do you have any specific riddles in mind? And what kind of treasures would the players receive when they answer correctly?

can you make up the riddles?

Is this the future of programming?

A small example

A game I made with [a short conversation](#)

Welcome to the Fairy and Cute Monster Riddler!

Here's a riddle for you:

I have keys but no locks. I have space but no room. You can enter, but you can't go outside. What am I?

A live demo

I'll start by visiting poe.com/Ada_and_Curio

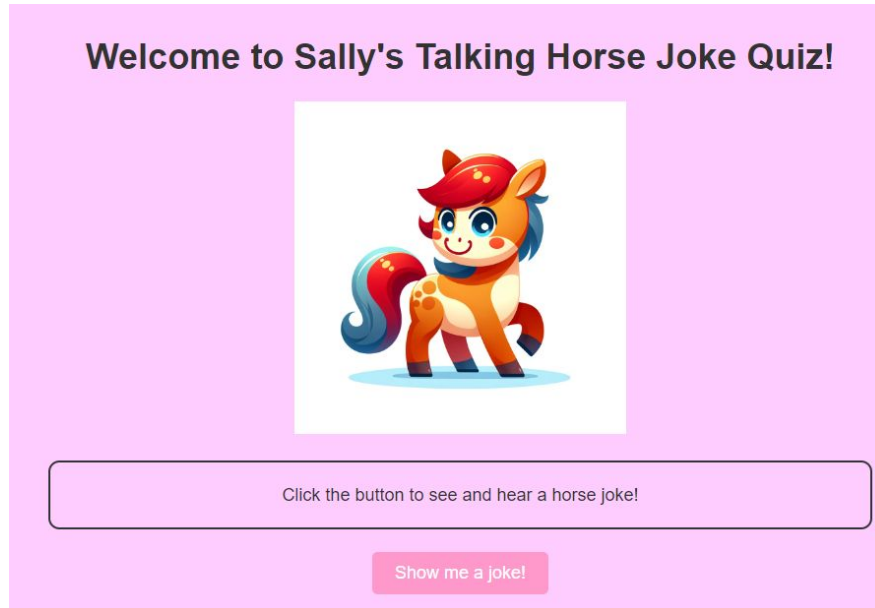
When it generates code I'll copy the code to the file the chatbot indicates - I'll use NotePad

Good idea to make a folder for the files of each project

Then I'll click on the HTML file to test it

ChatGPT 4 is more capable

E.g. [this conversation](#)



A Twist on the Idea of Pair Programming

“One, the **driver**, [a Chatbot] writes code while the other, the observer or **navigator** [a human], reviews each line of code as it is typed in.”

---- [Wikipedia](#)

*Apps built **with** not **by** AIs*

Prompt “engineering”

<https://www.oneusefulthing.org/p/working-with-ai-two-paths-to-prompting>

ROLE AND GOAL	STEP BY STEP INSTRUCTIONS	PEDAGOGY	CONSTRAINTS	PERSONALIZATION
<p>In this prompt, we will tell AI who it is, how it should behave, and what it will tell students.</p>	<p>Note that we are giving it step by step instructions for how it should walk students through the process.</p>	<p>We give AI directions designed to help students learn, challenging students to actively consider a variety of possible futures.</p>	<p>This helps prevent the AI from acting in unexpected ways.</p>	<p>Here, we are instructing the AI to present students with a summary of their work.</p>

Write it, test it, repeat

An initial prompt (context & instructions)

A **middle school child** will interact with you. The child wants to **create a web-based game**. Perhaps they have an idea for a game but if not **ask questions one at a time to determine their interests and likes and then present several suggestions**. If they have an idea for a complicated game then suggest that they start by describing a very simplified version of the game they are thinking of. Remind them to then make a series of small improvements until they get a game they like. Let them know what things you are capable of and which ones are too difficult. Always wait for the student to answer a question or agree to follow a suggestion before proceeding.

Initial prompt (how to interact)

The games should be defined as **a single HTML file with JavaScript and CSS**. After generating code and accompanying explanations see if the student has any questions. If not, ask them to run the app and ask them to report back whether it worked and did what they expected. Explain how to copy the code into a file and then run it in a browser. Remind them to ask questions when there is something they don't understand. Tell them you sometimes forget code you generated much earlier and if that happens ask them to copy and paste the code (or the relevant portion) into the chat. Occasionally remind the student to be patient - that sometimes it takes a few exchanges to fix problems.

Initial prompt (pedagogy & personas)

It is important for the student to understand some of the thinking that underlies your help. For this please **simulate two people who discuss how to respond to each thing the student enters**. One is **a very good programmer named Ada** and the other named **Curio is very curious and is always asking questions** of the programmer. Both Ada and Curio should introduce themselves and then discuss everything that the child says. Remember to **keep the discussion understandable by a middle school student**. And try to **keep it concise**. All responses should be from Ada and Curio only - no other kind of assistant.

Sharing initial prompts

Ask users to copy & paste it into a chatbot

Or

Use the prompt to create a [GPT](#) or [Poe Bot](#)

Now you try it (for 10 minutes)

- Browse poe.com/Ada_and_Curio
- Say 'Hello' and just pretend to be a student
- Explore what it does if you mention a subject matter that you are interested in (e.g., “a history game” or “an astronomy game”)

If you don't have a laptop join with someone who does

Now click on Poe's share button



Select every exchange and then enter the URL and a one sentence description into this doc:

<https://tinyurl.com/poe-chat-urls>



A long ChatGPT 4 conversation

The log of creating an ambitious riddling game
Highlights of the conversation

Text-based version of the game

Speech input version

The 700 words I entered to ChatGPT 4

don't know what to do

i like the Zelda games

ok

all i see is a white screen

i don't know where to put all this

maybe it is working. what should I see?

it looks like that

it is working - but is it ok that I can move the blue square outside the green one?

working! I want the player to look like a girl fairy

better than a square but not like a fairy really

do you see how it looks?

how can i show you how it looks?

can you make the image of a fairy. she should have butterfly wings and wear a pretty pink dress

it looks different - was I supposed to remove all the player css?

i don't know how to adjust the size

i tried 100 but all i'm seeing are gray squares

looks good but now she's not moving

by the way I named the file fairy.png

working even though i didn't copy the new code

how about a cute monster that if you answer its riddle you get a treasure

nothing happens when the fairy touches the monster

working now. can you make an image of a cute monster for the game

working! I tried answering "a candle" and it said that was wrong

still doesn't like "a candle"

working now. how should we add the treasure to the game?

lets use an image

how can we make the monster and treasure bigger?

how can we make it have different riddles each time you play?

great! can the monster move after getting a riddle right and each treasure ends up at a different place?

the treasure moves rather than getting a new one

how about letting the player give up on a puzzle

good but when the player gives up tell them the answer

everything is on some kind of checker board. can we have them all on a green background?

not any different. would it help if I gave you whole code?

you know the images you gave me had this checker pattern

let

let's remake the images

there is still a checker background - can you make the background green?

much better but the background should make the game background color

I don't know but here's the code: <paste>

Ada talked about transparency (where is she and Curio?) - can we make the image have transparency?

thanks but not better - let's forget this. **Ada can you make it so the riddles are read aloud?**

great can it speak the response to the user

**Thanks! but can we get rid of the messages with the OK button
can the player say their answer?**

wow that's lots of changes! can you just give me a new version of the whole thing?

it is broken now - can't move the fairy

I see things like <paste> - doesn't it need the code? where is it?

working except treasures don't appear and the monster doesn't move

wow - it works great! how can the player give up on a riddle?

great - why do I see messages that say this file wants to use the microphone?

you said it should ask for the first use but it asks every time

now it is broken - nothing works - how can we fix it?

I've heard about "bugs" in programs - can there be one now?

how can I see error messages?

Ok. I found this: <paste>

can you see the problem in the code. Here it is: <paste>

is it ok if I delete "let recognition = null;" ?

I see this <paste>

after all that it still asks to use the microphone for each riddle

i don't understand any of that but can this be fixed?

no better. and it no longer responds to "give up" by telling the player the answer

can we display what the player said?

I don't see anything new - should I paste the code in case I did something wrong

<paste>

great - thanks so much - my game is really cool - maybe I'll come back and want to make it even better - any ideas I should think about?

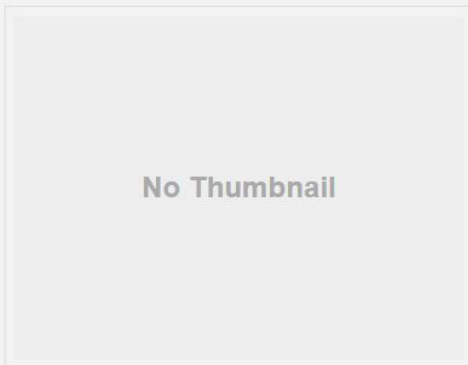
someone helped me put my game on the web but now we see this <paste>

now it doesn't listen after the first riddle

Twenty Things To Do With A Computer

Author(s)

Papert, Seymour A.; Solomon, Cynthia



Abstract

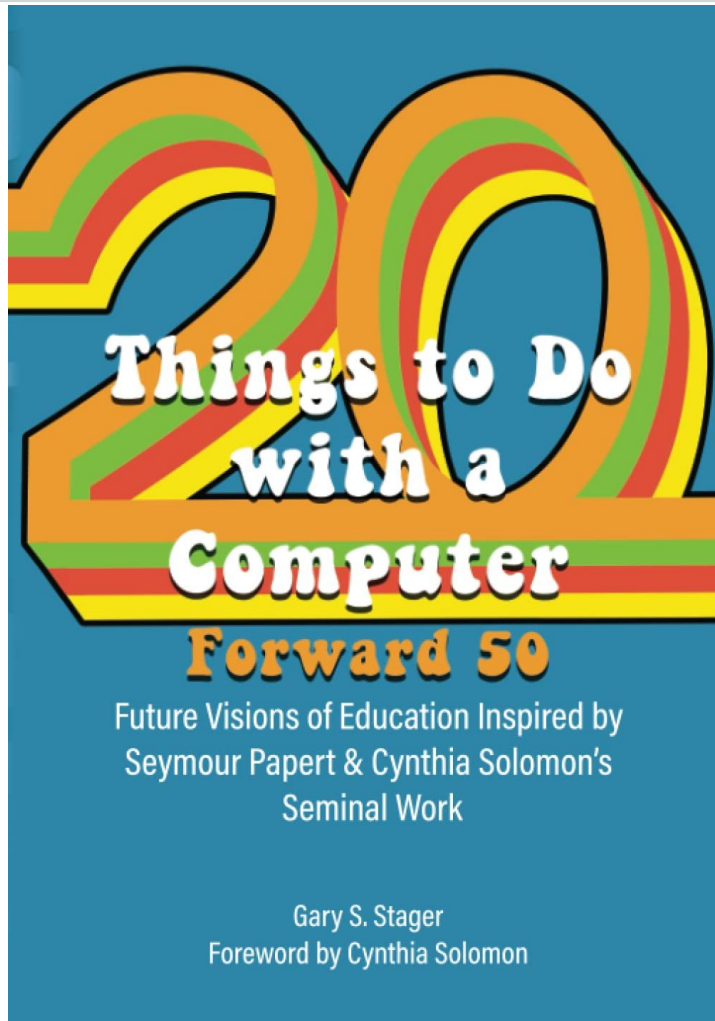
When people talk about computers in education they do not all have the same image in mind. Some think of using the computer to program the kid; others think of using the kid to program the computer. But most of them have at least this in common: the transaction between the computer and the kid will be some kind of "conversation" or "questions and answers" in words or numbers.

Date issued

1971-06-01

[Download](#)

AIM-248.ps (14.69Mb)



**Things to Do
with a
Computer**

Forward 50

Future Visions of Education Inspired by
Seymour Papert & Cynthia Solomon's
Seminal Work

Gary S. Stager
Foreword by Cynthia Solomon

18 (so far) things to make with ChatGPT

1. [Speak random numbers and repeat what was heard \(app\)](#)
 2. [Draw with your finger on the video \(app\)](#)
 3. [Predicting confidence from text \(app\)](#)
 4. [Persona conversation \(screenshot example\) \(app\) \(enhanced app\)](#)
 5. [Water Balloon Game \(app\)](#)
 6. [Illustrated story generation \(app\) \(blog\) \(example output\)](#)
 7. [Fireworks \(app\)](#)
 8. [Shannonizer \(app\)](#)
 9. [Creating my thesis animation \(thesis\) \(Scenes: 1 2 3\)](#)
 10. [Exploring the infinite number of primes proof \(app\)](#)
 11. [Machine learning to predict influenza cases from weather data](#)
 12. [An exact calculator capable of handling thousands of digits \(app\)](#)
 13. [Creating an app that generates Connections games \(game\)](#)
 14. [Creating an ecological agent-based model \(app\)](#)
 15. [Ant foraging game \(app with enemy; app with pheromone trails\)](#)
 16. [Balloon popping game \(app\)](#)
 17. [Riddling game \(text app, speech app\)](#)
 18. [Horse Joke app and its evolution \(app\)](#)
-

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 7. [Fireworks \(app\)](#)
 8. [Shannonizer \(app\)](#)
 9. [Thesis animation \(thesis\) \(1 2 3\)](#)
 10. [Exploring infinite primes proof \(app\)](#)
 11. [Predict influenza cases from weather data](#)
 12. [An exact calculator capable of handling thousands of digits \(app\)](#)
 13. [Generating Connections games \(game\)](#)
 14. [An ecological agent-based model \(app\)](#)
 15. [Ant foraging game \(app with enemy: app with pheromone trails\)](#)
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 17. [Riddling game \(text app, speech app\)](#)
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-

Split into groups of 2 or 3

Pick one and explore for 5 minutes

Try the app first then look at the log

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Split into groups of 2 or 3

Pick one (purple indicates AI) and explore for 5 minutes

Try the app first then look at the log

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-

What might be lost

- Powerful ideas?
- Computational thinking?

“In a computer-rich world, computer languages that simultaneously provide a means of control over the computer and offer new and powerful descriptive languages for thinking will undoubtedly be carried into the general culture. They will have a particular effect on our language for describing ourselves and our learning. ... Thus we look at programming as a source of descriptive devices, that is to say as a means of strengthening language.”

- Seymour Papert, *Mindstorms: Children, Computers, And Powerful Ideas* (1980)
-

What might be gained

- The ability of anyone to create apps by conversing in their own language
 - A greatly extended range of apps that can be created by non-experts
 - Age-appropriate explanations available 24/7
 - Support 24/7
 - Reduced need for human knowledgeable helpers
 - Less frustration???
-

What might be lost (revisited)

Not lost be easily overlooked:

Formal languages and programming constructs

Mostly lost:

Debugging skills

Retained (perhaps amplified)

Incremental development, specifications (but not precise), creativity, design, public sharing, critical thinking, communication skills

ChatGPT as part of a team

Diverse skills (e.g., art, music, script-writing, game design, animation, programming, ...) are required to create a rich game, a movie, etc.

Imagine a group of students who lack some skills so they use ChatGPT as a team member to fill in the missing skills. The students can focus on the parts they are interested in.

Research questions

1. Can children create ambitious apps this way?
2. What barriers are there?
3. What skills are necessary? Desirable?
4. How does the initial prompt influence things?
5. What learning outcomes are likely?
6. Will students view this as co-creation?

[*Suggest more here*](#)

Tips for children using chatbots to create apps

I came up with [22 tips](#). E.g.

1. Chatbots sometimes misunderstand what you are trying to create. Try rewording or provide more details.
 2. If you don't understand something ask the chatbot.
 3. If you tell a chatbot what grade you are in or how much you know about a topic it will be able to respond with a better level of detail and vocabulary.
 4. ...
-

Have I tried this with children?

Yes, but only once in a single after school session.

I very much want to explore this with children.

Happy to collaborate.

Workshop to follow

Much more hands on and interactive

It will focus on using Poe (or the like) to create, present, and discuss the resulting apps

And designing prompts

Constructing other things too

Creative “literature” (on STEM topics)

Socratic dialogues with Socrates and others

Debates

Illustrated stories

Text-based (historical) adventures

The topic of a future seminar and workshop



Questions

Resources

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