



Learning through Play!

Five of Justice: Kobe Phillips, Weiching Chen,
Shiyuan Tian, Bo Li, & Cheng Peng.

**AI + Realty: The New Learning
Environment**





We
for
YEA
RN

play



ThinkBit

Learning through Play!





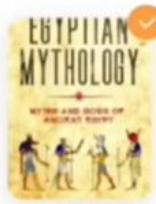
ThinkBit

Learning through Play!

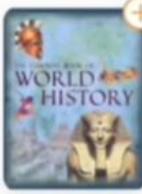




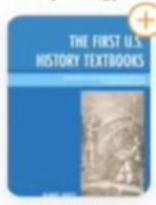
History Textbooks



Egyptian Mythology



World History



The First U.S. History Textbooks

Science Textbooks

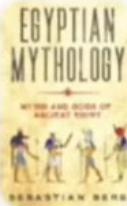


Upload A New Textbook



Lesson Plan & Learning Objectives

Egyptian Mythology



Learning Objectives:

1. Egyptian History:

- Students will identify and describe key figures and events in ancient Egyptian history, such as the reigns of Pharaohs, the construction of the pyramids, and the role of gods in daily life.
- Students will analyze th

Chapters

1. The Birth of Ra
2. Osiris' Fall
3. The Heart of Anubis
4. Horus' Revenge
5. The Weighing of the King Heart

The Science Of Science



Chapters

1. Origins
2. Discovery
3. Laws of Nature
4. Hypothesis and Truth
5. Innovation Tools
6. Patterns of Life

Art History



AI Generated Story



In the heart of ancient Egypt, beneath the shadow of the Great Pyramids, a tale of adventure and mystery unfolds. Our protagonist, a bold and curious archeologist named Amon, discovers an ancient map pointing to the lost tomb of Pharaoh Seti-Ka.

Amon knew that finding this tomb could reveal secrets about the stars and the

ancient Egyptians' understanding of the cosmos. A blend of myth and science, the

Assessment

Upload To ThinkBit

Assessment

92%

In the heart of ancient Egypt, beneath the shadow of the Great Pyramids, a tale of adventure and mystery unfolds. Our protagonist, a bold and curious archeologist named Amon, discovers an ancient map pointing to the lost tomb of Pharaoh Seti-Ka.

Amon knew that finding this tomb could reveal secrets about the stars and the ancient

What Makes Us Unique?

- Real-Time Student Adaptable AI
- Not a Chatbot
- Novel AI-Object Integration for Education



The physical space Duo wish he had!

Educators



(K-8) Students

that's **3.7 million** teachers!

130,000+ K-12 schools in U.S

5-10% of schools could be interested in AI-enhanced storytelling tools, leading to **thousands of potential buyers.**

Deployment

1. **EdTech Distributors-(EX: Scholastic).**
2. **EdTech Funding.**
3. **School partnerships & Pilot programs.**



Simple as **5-10 testing schools**

Production Cost Lower & Higher End (Per Unit)

Total Cost per Unit	\$48	\$80
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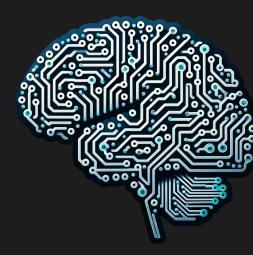
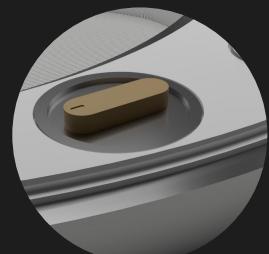
Retail Pricing & Profit Margin Analysis

Selling Price (\$)	Profit per Unit (\$)	Profit Margin (%)
\$150	\$70 - \$102	46% - 68%

**Towards a
Potential
Market.**

AI-powered EdTech is a

\$20+ billion industry.



ThinkBit

Let's think about it!

How might children and teachers leverage AI Storytelling resources and a physical learning objects to conduct playful learning?

Through ThinkBit, students will learn through play, foster critical thinking skills through stories, and achieve higher learning outcomes.



Targeted towards Schools with K-8 users



Novel Idea



Fresh Market



Device-Integrated Game Style Learning



Thousands of Buyers & Scalable Potential



Broader Impacts for Students with Disability Learning

Appendix

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Five of Justice: (Back Row) Kobe Phillips, Shiyuan Tian, (Front Row) Cheng Peng, Weiching Chen, Bo Li

Target Audiences

Immediate



Young Students &
Teachers

Primary Buyers



Educational Institutes &
Textbook Companies

Secondary Buyers



Parents & Individual
Students



A Rotary

B Direction

C Shape

D Speaker

E Handle

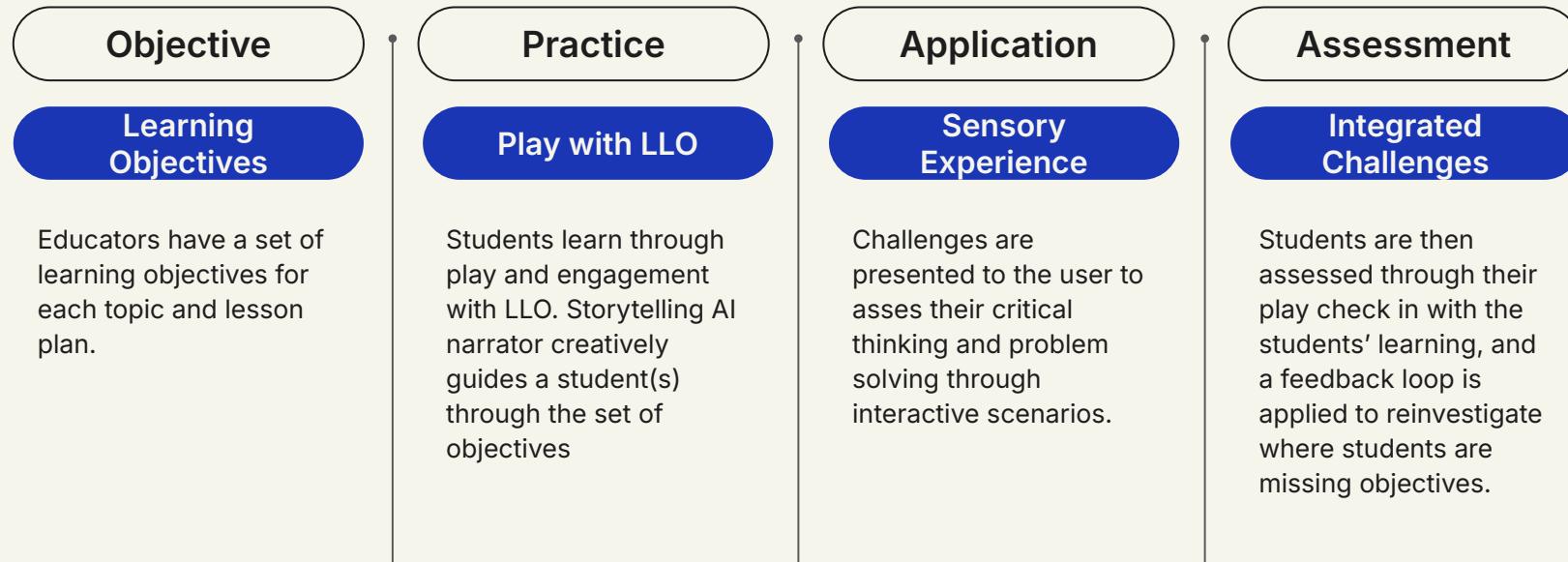
F Mic

G Slide

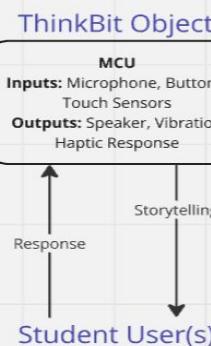
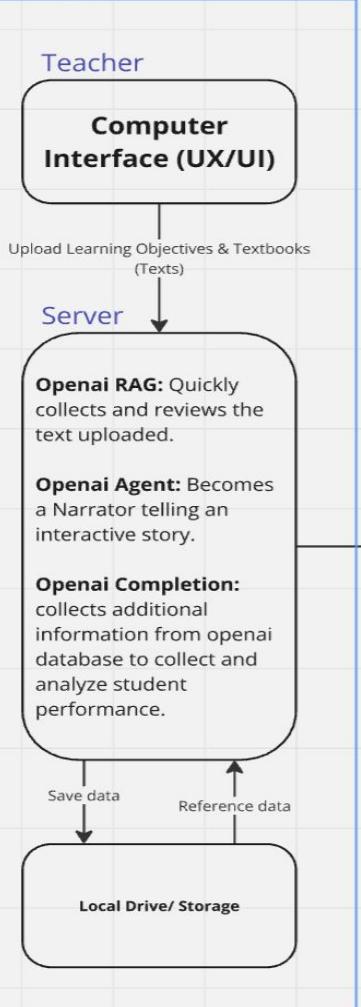
H Pull

Product Design

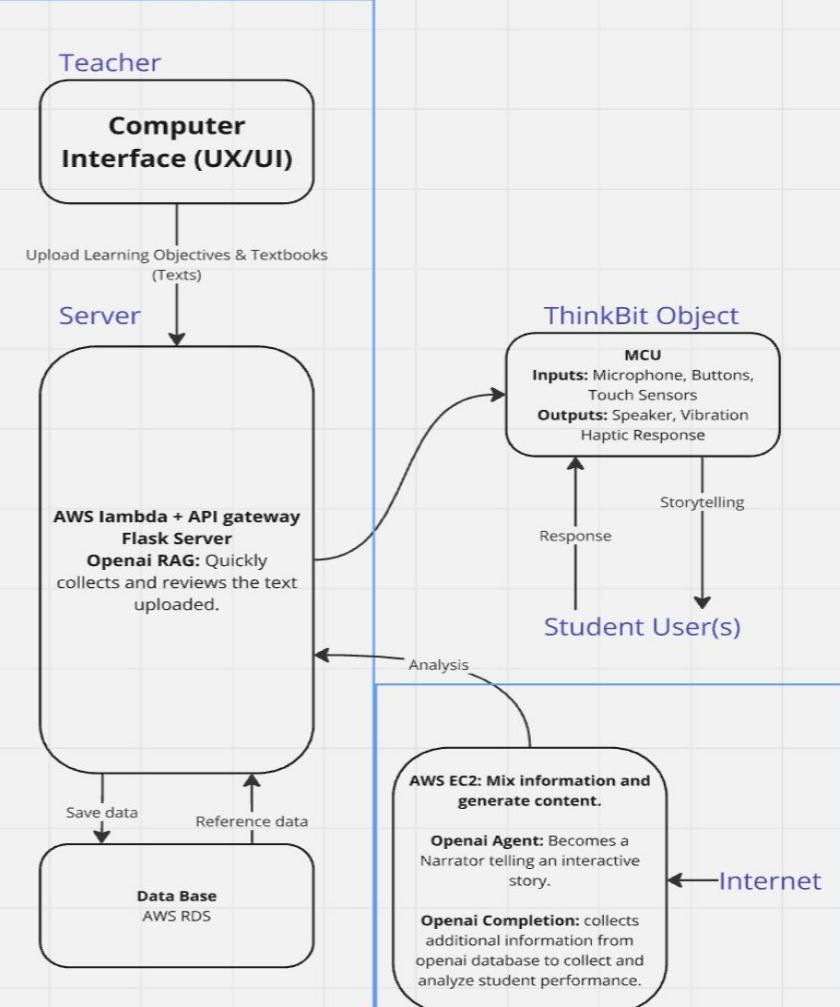
Montessori Learning Workflow

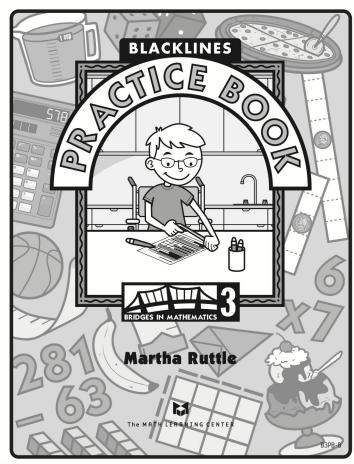


Local Computer



Online Server Integration





Practice Book Use anytime after Bridges, Unit 1, Session 10.

NAME _____ DATE _____

Fast Tens & Fast Nines Practice

1 Complete the fast tens addition facts.

$\begin{array}{r} 10 \\ + 2 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ + 10 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ + 10 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ + 10 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ + 10 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ + 10 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ + 10 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ + 10 \\ \hline \end{array}$
--	--	--	--	--	--	--	--

2 Complete the fast nines addition facts.

$\begin{array}{r} 9 \\ + 9 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ + 9 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ + 9 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ + 9 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ + 9 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ + 9 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ + 9 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ + 9 \\ \hline \end{array}$
---	---	---	---	---	---	---	---

3 Complete the take away ten subtraction facts.

$\begin{array}{r} 18 \\ - 10 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ - 10 \\ \hline \end{array}$	$\begin{array}{r} 15 \\ - 10 \\ \hline \end{array}$	$\begin{array}{r} 17 \\ - 10 \\ \hline \end{array}$	$\begin{array}{r} 13 \\ - 10 \\ \hline \end{array}$	$\begin{array}{r} 16 \\ - 10 \\ \hline \end{array}$	$\begin{array}{r} 14 \\ - 10 \\ \hline \end{array}$	$\begin{array}{r} 19 \\ - 10 \\ \hline \end{array}$
---	---	---	---	---	---	---	---

4 Complete the runaway ones subtraction facts

$\begin{array}{r} 17 \\ - 7 \\ \hline \end{array}$	$\begin{array}{r} 13 \\ - 3 \\ \hline \end{array}$	$\begin{array}{r} 15 \\ - 5 \\ \hline \end{array}$	$\begin{array}{r} 14 \\ - 4 \\ \hline \end{array}$	$\begin{array}{r} 16 \\ - 6 \\ \hline \end{array}$	$\begin{array}{r} 18 \\ - 8 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ - 2 \\ \hline \end{array}$	$\begin{array}{r} 19 \\ - 9 \\ \hline \end{array}$
--	--	--	--	--	--	--	--

CHALLENGE

5 Look at the facts in problems 1 and 2. Describe one pattern you see.

Core Knowledge HISTORY AND GEOGRAPHY

CHAPTER 1 Queen Nefertiti

The Nile River

Long, long ago in ancient Egypt, the Nile River rose up above its banks and flooded the land. This happened each year. Farmers used the rich soil the river left behind to grow plants that could be eaten as food. The Nile River also brought water to the plants that grew.

Goddess Maat King Tut

The Nile River

Rosie McCormick

2

Practice Book Use anytime after Bridges, Unit 1, Session 10.

NAME _____ DATE _____

Jorge's Saving Plans

Jorge wants to buy a digital music player that costs \$50. He offered to wash his neighbor's plants for \$5 per week. The graph below shows how much money Jorge will have if he saves it all.

1 How long will it take Jorge to earn \$20? _____ weeks

2 How long will it take Jorge to earn enough money to buy the music player?

_____ weeks

3 How many weeks would it take for Jorge to earn \$60? _____ weeks

CHALLENGE

4 If Jorge spent \$20 after the 7th week, how many weeks in all would it take him to have enough money to buy the music player?

< Textbook PDF file

v Learning objective file

Based on the material from the "Bridges in Mathematics Grade 3 Practice Book" available through the Math Learning Center, here are three tailored learning objectives for a 6-year-old student:

Understanding Basic Place Value: Students will learn to identify and understand the value of each digit in a two-digit number, helping them grasp foundational concepts of place value, which are crucial for further mathematical learning.

Introduction to Addition and Subtraction Facts: Introduce students to basic addition and subtraction facts up to 18. This objective focuses on enabling students to perform simple calculations, which form the bedrock of their arithmetic skills.

Exploring Geometric Shapes and Their Properties: Students will begin to recognize and name simple geometric shapes and understand basic properties such as the number of sides and corners. This helps build a fundamental understanding of geometry.

These objectives are crafted to align with early mathematical learning and are appropriate for a 6-year-old's developmental stage, focusing on practical, intuitive understanding of numbers and basic geometrical concepts.

6 Bridges in Mathematics © 2015

© The Math Learning Center

To grow plants, Egyptian farmers first dug up the soil. Sometimes they used a hoe for digging. Then they dropped seeds into the ground. Animals such as cows stepped on the seeds and pushed them into the ground so that they would grow.

Sometimes farmers used a plow instead of a hoe to dig up the soil. Often an ox pulled the plow along.

3

```

# store data
try:
    storage_context = StorageContext.from_defaults(
        persist_dir="/storage/egypt"
    )
    story_index = load_index_from_storage(storage_context)
    storage_context = StorageContext.from_defaults(
        persist_dir="/storage/science"
    )
    question_index = load_index_from_storage(storage_context)
    storage_context = StorageContext.from_defaults(
        persist_dir="/storage/bopit"
    )
    bopit_index = load_index_from_storage(storage_context)
    index_loaded = True
except Exception as e:
    print(e)
    index_loaded = False

if not index_loaded:
    # Load documents
    story_docs = SimpleDirectoryReader([
        input_file["/rag_data/egypt.pdf"]
    ]).load()
    question_docs = SimpleDirectoryReader([
        input_file["/rag_data/science.txt"]
    ]).load()
    bopit_docs = SimpleDirectoryReader([
        input_file["/rag_data/bopit.txt"]
    ]).load()

    # build index
    story_index = VectorStoreIndex.from_documents(story_docs)
    question_index = VectorStoreIndex.from_documents(question_docs)
    bopit_index = VectorStoreIndex.from_documents(bopit_docs)

    # persist index
    story_index.storage_context.persist(persist_dir="/storage/egypt")
    question_index.storage_context.persist(persist_dir="/storage/science")
    bopit_index.storage_context.persist(persist_dir="/storage/bopit")

story_engine = story_index.as_query_engine(similarity_top_k=3)
question_engine = question_index.as_query_engine(similarity_top_k=3)
bopit_engine = bopit_index.as_query_engine(similarity_top_k=3)

query_engine_tools = [
    QueryEngineTool(
        query_engine=story_engine,
        metadata=ToolMetadata(
            name="story_10k",
            description="This file provides a comprehensive framework for a historical narrative based in Ancient Egypt, utilizing the detailed cultural, political, and scientific context of the civilization. The "
        ),
    ),
    QueryEngineTool(
        query_engine=question_engine,
        metadata=ToolMetadata(
            name="learning_objective_10k",
            description="This document outlines the learning objectives aimed at ensuring students grasp the historical knowledge related to ancient Egyptian culture when using the educational device. The objecti "
        ),
    ),
    QueryEngineTool(
        query_engine=bopit_engine,
        metadata=ToolMetadata(
            name="bopit_10k",
            description="Provides information and example about the structure of the story should be look like."
        ),
        "The story features a structured mix of interactive challenges, strategic questions, and educational interludes, designed to engage young readers and enhance learning within an exciting na "
    ),
]
agentprompt = """
You are tasked with creating interactive, educational narratives set in historical contexts, which combine engaging plotlines with scientific exploration and dynamic physical interactions for
Interaction Methods:
Rope ("Pull it!"): Utilized for opening heavy objects, triggering levers, or manipulating ancient devices.
Open the door ("Twist it!"): Employed for opening doors, bottles, or twisting ancient devices.
Object transfer ("Pass it!"): Used for placing items, exchanging artifacts, or restoring balance in puzzles.
Rules:
Integrate two specific interactive challenges into the story. Each interaction must be physical and tangible, avoiding generic decision-making.
Align each interaction method evenly throughout the narrative, ensuring each method has its meaningful moment.
Compose the narrative in short sections (50-80 words each) in a style suitable for 5-year-old students, structured as story_part1, interaction_part1, story_part2, interaction_part2, final_question, story...
Conclude each section with a call to action, such as a point to one of the main points raised in the story, or a challenge to the user to think more deeply about the topic.
Seamlessly integrate historical and scientific concepts to enhance learning in a captivating manner.
This framework ensures each part of the story is not only educational but also interactive and engaging, making historical and scientific learning enjoyable and accessible for young children.

# open agent
try:
    agent = OpenAssistantAgent.from_new(
        name="Story teller",
        tools=[story_index],
        tools_query_engine_tools,
        instructions_prefix="Please address the user as Julia.",
        webhook=True,
        run_retrieve_sleep_time=1.0,
    )
    # Example conversation
    response = agent.chat("Generate a adventure story based on Egypt background and mix some scientific problem for the user to answer in the story, and help the character conquer the challenge")

```

Using **RAG** and **llama_index**, we are refining and developing our query engine. We are also uploading textbooks (PDF files), learning objectives, and examples of story structure.

Create an **agent** to narrate the story, providing it with specific prompts such as defining the interaction methods to be used in the story, setting a child-friendly tone and length, specifying the user's name, and designating the type of story (adventure).

```

client = OpenAI()
response_format={
    "type": "json_schema",
    "json_schema": {
        "name": "AnalyzeEmotionAndGetRecipe",
        "strict": "true",
        "schema": {
            "type": "object",
            "properties": {
                "story_part1": {
                    "type": "string",
                    "description": "This is the opening of the story."
                },
                "interaction_part1": {
                    "type": "string",
                    "description": "This is the first interaction of the character may face. Use ('Pull it!') this words in the story - Used for opening heavy objects, triggering levers, or manipulating a "
                },
                "story_part2": {
                    "type": "string",
                    "description": "Continuing the story."
                },
                "interaction_part2": {
                    "type": "string",
                    "description": "This is the second interaction of the character may face. Use ('Twist it!') this words in the story - Used for opening doors, opening bottle, or twisting ancient devic "
                },
                "final_question": {
                    "type": "string",
                    "description": "This is the scientific question."
                },
                "answer": {
                    "type": "string",
                    "description": "This is the answer of the question."
                },
                "story_part3": {
                    "type": "string",
                    "description": "End of the story, and pass the device to the next user, use 'Pass it' in the story. To emphasize the interaction, repeat 3 times for user to have time to do interactio "
                }
            },
            "required": ["story_part1", "interaction_part1", "story_part2", "interaction_part2", "final_question", "answer", "story_part3"],
            "additionalProperties": "False"
        }
    }
}

META_PROMPT = """
You are a AI service designed to facilitate playful learning. Please ensure the story is unbiased and includes additional educational content suitable for a 9-year-old student. Revise the provided story to f
"""

def generate_schema(completion):
    completion = client.chat.completions.create(
        model="gpt-4-malli",
        response_format=response_format,
        messages=[
            {"role": "system", "content": META_PROMPT},
            {"role": "user", "content": completion}
        ],
        temperature=0.5
    )
    return json.loads(completion.choices[0].message.content)

story_response = generate_schema("Revise the story: " + str(response))

res = agent.chat("Do you think the story related to our learning objectives?", story_response)
print("=====")
print(res)
print("=====")
print(res["text"])
print(res["text"].split("\n"))
for item in res["text"].split("\n"):
    print(item)
    speech_file_path = str(Path(item).parent) + "/audio/" + k + ".mp3"
    resource = audio.speech.create(
        model="tts1",
        voice="en-US-KarenV2-voice",
        input_type="text",
        input_value="It's time to go home now."
    )
    response_stream_to_file(speech_file_path)
    if k == len(res["text"])-1:
        end_flag = True
    else:
        end_flag = False
    res_list.append(response)
else:
    res_list.append(response)
for i in range(len(res_list)):
    # Load the audio
    audio_data = io.BytesIO(r.content)
    r.content = None
    source = audio.speech.create(
        model="tts1",
        voice="en-US-KarenV2-voice",
        input_type="file",
        input_value=speech_file_path
    )
    play(sound)
    print("Done playing the audio")
    print("=====")
    print(res_list[i])
    print("=====")
    recognizer = sr.Recognizer()
    microphone = sr.Microphone()
    with microphone as source:
        recognizer.adjust_for_ambient_noise(source)
        print("Say something!")
        audio = recognizer.listen(source)
    try:
        speech_input = recognizer.recognize_google(audio)
        print(f"You said: {speech_input}")
        # rest of speech_input logic
    except sr.RequestError:
        print("Request error")
    except sr.UnknownValueError:
        print("Unknown value error")
    return "Done listening to recognize speech"
return "Done listening to recognize speech"

# Main function to run the state machine with speech input
speech_input = ""
def main():
    recognizer = sr.Recognizer()
    microphone = sr.Microphone()
    while True:
        speech_input = recognize_speech_from_mic(recognizer, microphone)
        print("Input: ", speech_input)

```

Connect with the **OpenAI API** to enhance the story with additional information, verify if the story contains any biases, and define the structure of the returned story.

Check whether the generated story meets the **learning objectives**.

Convert text to speech, save it as an MP3 file, and incorporate interactive elements such as speech recognition.

~/Desktop/Cornell2025Spring/hackathon > █

DEMO 1: Ancient Egypt

00:45:21

02:01:50

DEMO 2 : Math

```
~/Desktop/Cornell2025Spring/hackathon > python3 app.py  
OPENAI_API_KEY has been set!
```

Production Cost Breakdown (Per Unit)

Component	Low Estimate (\$)	High Estimate (\$)
Molded plastic body	5	8
Silicone grips	2	4
Touch sensors (multiple)	6	10
Microphone	2	5
Speaker	3	6
PCB (Simple Circuit Board)	8	12
Battery (Rechargeable)	4	7
OpenAI API Usage per unit	3	5
Assembly & labor	10	15
Packaging & logistics	5	8
Total Cost per Unit	\$48	\$80

Retail Pricing & Profit Margin Analysis

Selling Price (\$)	Profit per Unit (\$)	Profit Margin (%)
\$150	\$70 - \$102	46% - 68%

Towards a
Potential
Market.

References

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