AI NEEDS USER EXPERIENCE (UX) DESIGN

Tesla Model S “Autopilot”

Future of autonomous cars

How do we design the UX?
AI NEEDS USER EXPERIENCE (UX) DESIGN

Amazon Echo, Google Home, Baidu DuerOS & other Smart Speakers use Voice UI. How do we design them to deal with natural human conversation? How do we design to support multimodal input? (e.g., + screen or vision)
AI NEEDS USER EXPERIENCE (UX) DESIGN

Computer vision-based skin cancer detection getting better

What is appropriate to show a patient?

What should be the interface for the doctor?

Is there a set of design patterns for these Smart UIs?
HUMAN-CENTERED AI OPPORTUNITY

- smart assistance
- education & training
- health & wellness
More Questions than Answers
How do we help people become *better* at their tasks & activities?
How will people *communicate* with AI agents & systems?
How do we find balance between instructing systems on every small action or giving up total control to an automated system?
How do we *protect the privacy* of people’s data that these smart systems will collect?
How do we invent the important *interface metaphors* that will make understanding and using these systems easier (as WIMP did for the GUI)?
50% ABANDONED AFTER 6 MONTHS
WHO IS ZUKI?

chapters:
MULTI-CHAPTER NARRATIVES FOR BEHAVIOR CHANGE

Background narrative

Ambient display

- immediate feedback on activities
- weekly goal progress

Multi-chapter story

Murnane, Jiang, Kong, Park, Shi, Soohoo, Vink,... & Landay, CHI 2020
AMBIENT DISPLAYS TO ENCOURAGE BEHAVIOR CHANGE

lock screen

home screen wallpaper

in app

Murnane, Jiang, Kong, Park, Shi, Soohoo, Vink,... & Landay, CHI 2020
Thought **multiple chapters** would simply be more engaging

16-week study (n=40)
Multi-chapter (13) vs. single chapter narrative

**Results**
- single chapter users’ app engagement dropped over study
- multi-chapter users had higher level of narrative engagement
  logged more exercise
  completed more goals
  manually logged activities consistently
  surge of post-holiday exercise

Narrative is **key**, with multiple chapters boosting positive & buffering negative effects over time!
WHO IS ZUKI?

RESEARCH QUESTIONS

✓ Do multi-scene stories lead to longer engagement?

• Does mixing sustainability goals with physical activity goals lead to more sustainability?

• Does appropriate cultural feedback (e.g., positive vs. negative) have bigger impact?
Conformity and efficiency rather than innovation?

E D U C A T I O N

Conformity and efficiency rather than innovation?

填鸭式教育，还是创新？
68% of US 8th graders can’t read at grade level, & most will never catch up [the broad foundation]

68%的美国8年级学生不能达到——且他们之中大部分未来也难以达到——教学期望水平
FOR A FAIR SELECTION
EVERYBODY HAS TO TAKE
THE SAME EXAM: PLEASE
CLIMB THAT TREE

SCHOOL IS NOT
PERSONALIZED FOR
LEARNERS
And then she discovered a beautiful flower.
SMART PRIMER

Narrative + Fun Educational Activities + Personal Media + Physical Surroundings, Location & Context

Ruan, et al., IDC 2020
WHEN A CHILD STARTS A CHAPTER...

The child (and his/her adventure partner) will appear as the main protagonists.
TWO LONG, TOO HARD, & READING LEVELS/INTEREST VARIED

WHAT TO DO WHEN THEY GET STUCK?
A MATH TASK EXAMPLE

The tutoring bot can assess the child’s level & provide **adaptive hints** to help them solve a task.

Let’s start off by figuring out the total number of chocolates in the box. Let’s do this by estimating the height first.

How many chocolates fit along the **height**?

[Answer here] chocolates [Submit]

Don’t forget that we can use the chocolate and box on the table. Let’s bring them closer and figure out how many pieces of chocolates can fit along the length of the box.

To find how many chocolates fit along the height of the box, take your chocolate and move it along the box. We can use a pencil and mark on the...
SMART PRIMER STUDY WITH 72 GRADE 3-5 KIDS

Educational Task

Condition A

Educational Task + Narrative

Condition B

Educational Task + Narrative + Hint System

Condition C

Educational Task + Narrative + Chatbot

Condition D
SMART PRIMER STUDY WITH 72 GRADE 3-5 KIDS

Educational Task

Condition A

Educational Task + Narrative

Condition B

Educational Task + Narrative + Hint System

Condition C

Educational Task + Narrative + Chatbot

Condition D
NARRATIVE-BASED LEARNING IS MORE ENGAGING

User Engagement Score

Condition
- A: Task
- B: Task + Story
- C: Task + Story + Hints
- D: Task + Story + Chatbot

p < .05  p < .05
CHATBOTS MAKE LEARNING MORE EFFECTIVE

p < .05 for volume
REINFORCEMENT LEARNING (RL) TUTORING CHATBOT

- Uses RL to determine the message provided to students given their natural language inputs
- Requires zero training data
- Policy is based on the PPO algorithm (Schulman et al., 2017)

Ruan*, Nie*, et al., Machine Learning Journal, 2023 (to appear)
USER STUDY PROCEDURE

- 339 grade 3-5 kids participated in the online study
- RL chatbot performs batch update after every 5 kids
Try thinking about the concept of volume to solve this problem.

You've just about got it. Don't give up, yet!

Guided Prompting

Providing a direct hint

Sending encouragement

Acknowledging receipt

:)
CHILDREN LEARNING WITH CHATBOT YIELDED HIGHER LEARNING GAINS THAN THOSE LEARNING WITH CONTROL p < .05, effect size = 0.36
CHILDREN WITH NO OR LITTLE PRIOR KNOWLEDGE BENEFITED MUCH MORE BY INTERACTING WITH CHATBOT

P < .05, effect size = 1.13

P < .05, effect size = .30

Error bars represent +/- 1 standard error
Children learning with chatbot were more engaged than those learning with control.

Giggle Gauge (Dietz et al., 2020)

- < 3.0: poor engagement
- 3.0 - 3.6: moderate engagement
- > 3.6: high engagement

$p < .05$  effect size = .47
CHILDREN WITH LITTLE PRIOR KNOWLEDGE WERE MUCH MORE ENGAGED WHEN INTERACTING WITH THE CHATBOT

P < .05, effect size = 1.62

Error bars represent +/- 1 standard error
Carmine, find a tree that looks like a eucalyptus tree and take a picture of it!

Make sure you can see the trunk and the branches of the tree. Try not to capture too much of the ground in your picture.
Where do you think would be a comfy spot for me to jump onto? **Target the tree** where I should go!

Hold your phone still... Wheeeeee!
Once you've got the leaf, take a picture so we can see.

What are some things that you notice about the shape and smell of the leaf?

It is long and round and it smells sweet.
Now, place a marker on the base of the tree, where the tree meets the ground.

So if this tree is 39 feet tall, that means it could be as young as 6 years old!
I have a different idea.

I think they should stay.

I think we should remove some of them.

Good thing we have a human right here! What do you think, Carmine?

Why do you think some eucalyptus trees should be removed?

Wildfire is very dangerous
Outdoor study with 4th-6th graders (n=44)
Tested two variants of app: narrative vs. narrative+CV+AR

Results
- learning gains for both groups & both groups engaged
- enjoyed hands-on, multisensory interaction with nature
- many identified typing their answers as one of their favorite parts
  * app motivated them to write & express their opinion

Thought computer vision+AR would be more engaging

Cheng, et al., CHI, 2023
SMART PRIMER

RESEARCH QUESTIONS

✓ Does a compelling narrative motivate students to engage in learning activities?

✓ Can AI-based chatbots help students when they are stuck & can we make a chatbot effective by targeting a problem domain?

• How to best leverage context (e.g., location, objects) & Gen AI to make the story more engaging?