



Using Simulation and Language Intelligence to Support Digital Literacy Education: From Evaluation to Human-centered Chatbot Design

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The Pennsylvania State University



PennState

About Me

K12

Higher Education

Professional learning

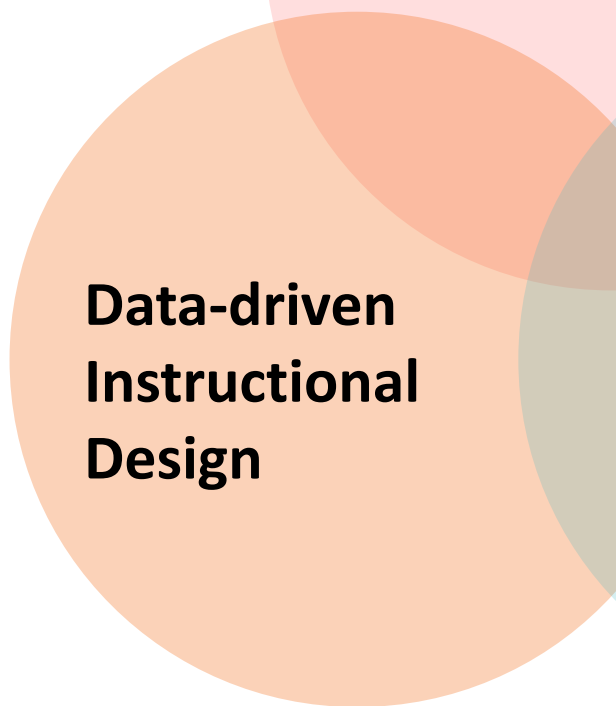
MOOCs



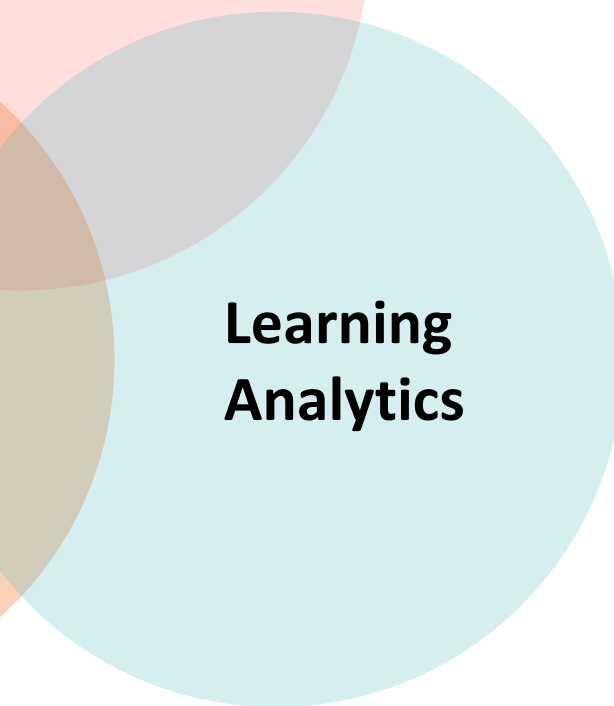
Learning Technologies

Adaptive Learning

Serious Games



Data-driven Instructional Design

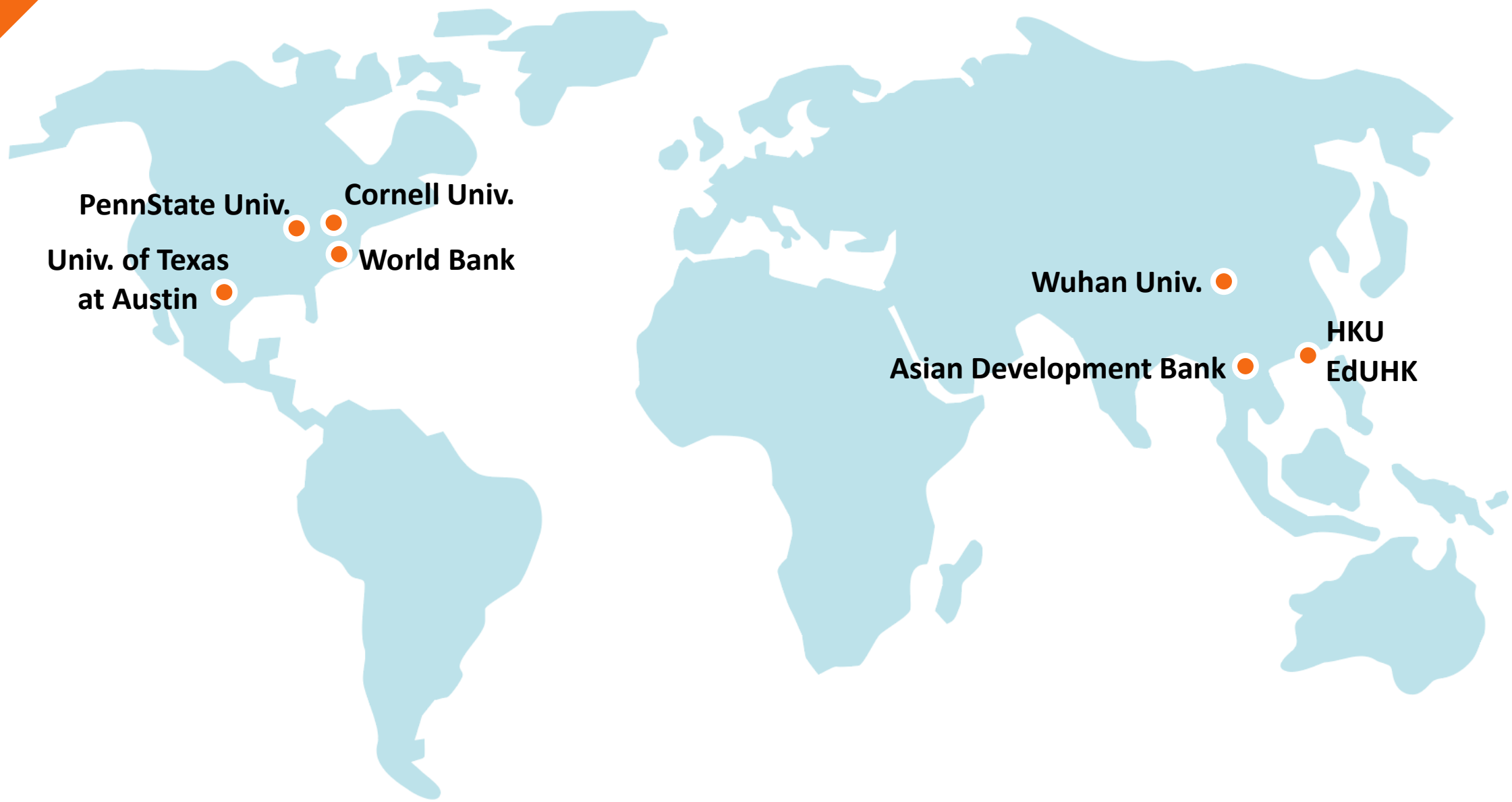


Learning Analytics

Learning Simulations

Augmented/
Virtual Reality

About Me

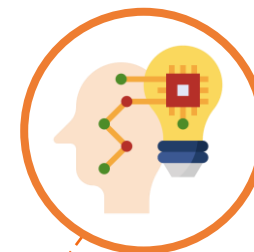


Study 1 – Using **Simulation to Support Digital Literacy Education**

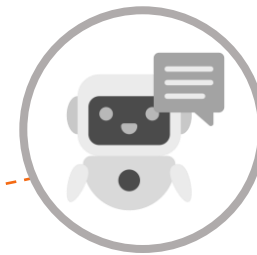


Study 2 - Using **Language Intelligence to Support Digital Literacy Education**

Q&A

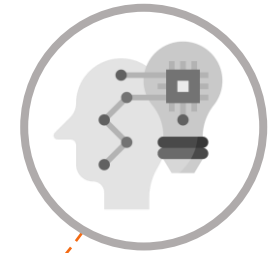


Study 1 – Using **Simulation** to Support Digital Literacy Education



Study 2 - Using Language Intelligence to Support Digital Literacy Education

Q&A



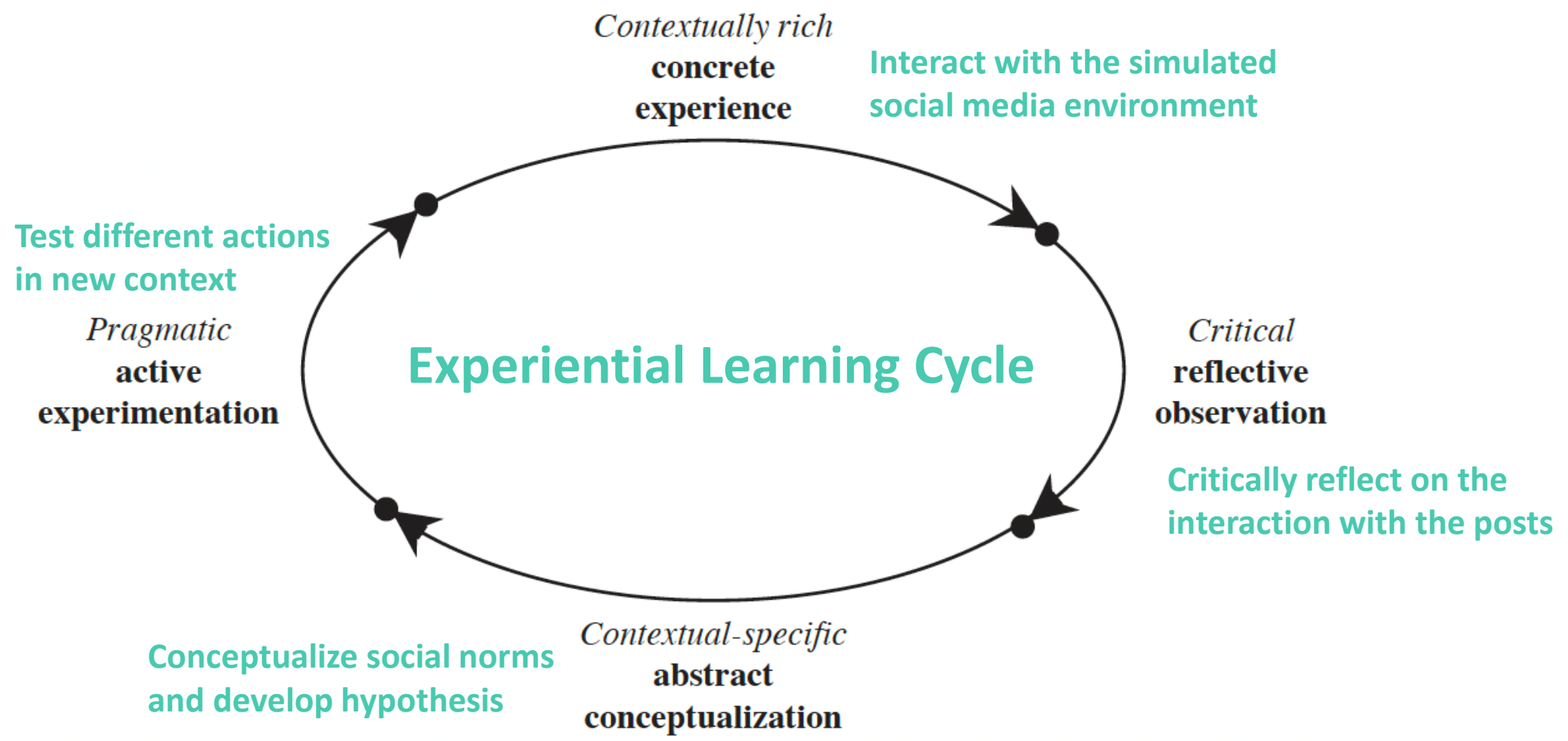
Social Media TestDrive (SMTD)

- Targeted at youth (age 9-13)
- Teach digital literacy and citizenship knowledge and skills
- Simulated environment that supports Experiential learning
- **12** modules covering broad topics
- Over **750k users**; over **5k active users per day**

The screenshot shows the Social Media TestDrive interface. At the top left is the logo for 'Social Media Test Drive'. To the right is a progress bar for the module 'How to Be an Upstander'. The progress bar has four steps: 'learn' (checked), 'practice' (checked), 'explore' (active), and 'reflect' (not started). Below the progress bar is a text box with the following text: 'Now you get to explore the TestDrive timeline! You can read what others have posted, respond, or make your own posts.' At the bottom right of the text box is a blue button labeled 'Next →'.

Social Media TestDrive – what’s inside?

<https://www.youtube.com/watch?v=4r9-moKGa84&t=3s>



RQ1. How does SMTD affect learners' social media literacy?

RQ2. How do learners' engagement patterns in SMTD affect their social media literacy?

Research Design

Randomized Control Experiment



CONTROL
17 classes/groups
n=211

Participant characteristic survey

Content surveys
2 domains
(randomly selected)

Content surveys
2 domains
(randomly selected)

Content surveys
2 domains
(randomly selected)



INTERVENTION
20 classes/groups
n=224

Participant characteristic survey

SMTD module 1 (randomly selected)
Content survey

SMTD module 2 (randomly selected)
Content survey

SMTD module 3 (randomly selected)
Content survey

SMTD module 4 (randomly selected)
Content survey

The Youth Social Media Literacy Scale *(Purington et al., 2022)*

Step 1: Exploration of Social Media Literacy Concepts



Step 2: Item Development



Step 3: Expert Review and Cognitive Pretesting



Step 4: Empirical Scale Validation

Example questions on *Privacy*:

Chloe is posting some pictures from the school's dance on her social media account. In one photo, her friend Jordan is acting pretty crazy. What should Chloe do?

- *Post the photos and add Jordan's name.*
- *✓ Ask Jordan for permission before sharing the photo.*
- *Text the photo to all her friends, but don't post it online.*
- *Edit the photo to make Jordan look more silly.*
- *I don't know.*

Scale available here:

Purington, A., Masur, P. K., Bazarova, N., Zou, E. W., & Whitlock, J. (2022). The youth social media literacy scale: Scale development and validation using item response theory. International Communication Association Conference 2022.

RQ1. How does SMTD affect learners' social media literacy?

| <i>Predictors</i> | Null Model | | | Intermediate Model | | | Final Model | | |
|--|-------------------|-------------|----------|---------------------------|-------------|----------|--------------------|--------------|----------|
| | <i>Estimates</i> | <i>CI</i> | <i>p</i> | <i>Estimates</i> | <i>CI</i> | <i>p</i> | <i>Estimates</i> | <i>CI</i> | <i>p</i> |
| (Intercept) | 4.52 | 4.08 – 4.95 | <0.001 | 4.03 | 3.50 – 4.57 | <0.001 | 0.07 | -2.77 – 2.91 | .96 |
| Condition (Experimental or Control) | | | | 0.90 | 0.27 – 1.52 | 0.005 | 1.05 | 0.41 – 1.70 | .001* |
| Age in years | | | | | | | 0.05 | -0.17 – 0.28 | .65 |
| Race/Ethnicity | | | | | | | 0.07 | -0.04 – 0.18 | .21 |
| Subjective social media literacy knowledge | | | | | | | 0.73 | 0.50 – 0.97 | <.001* |

RQ1. How does SMTD affect learners' social media literacy?

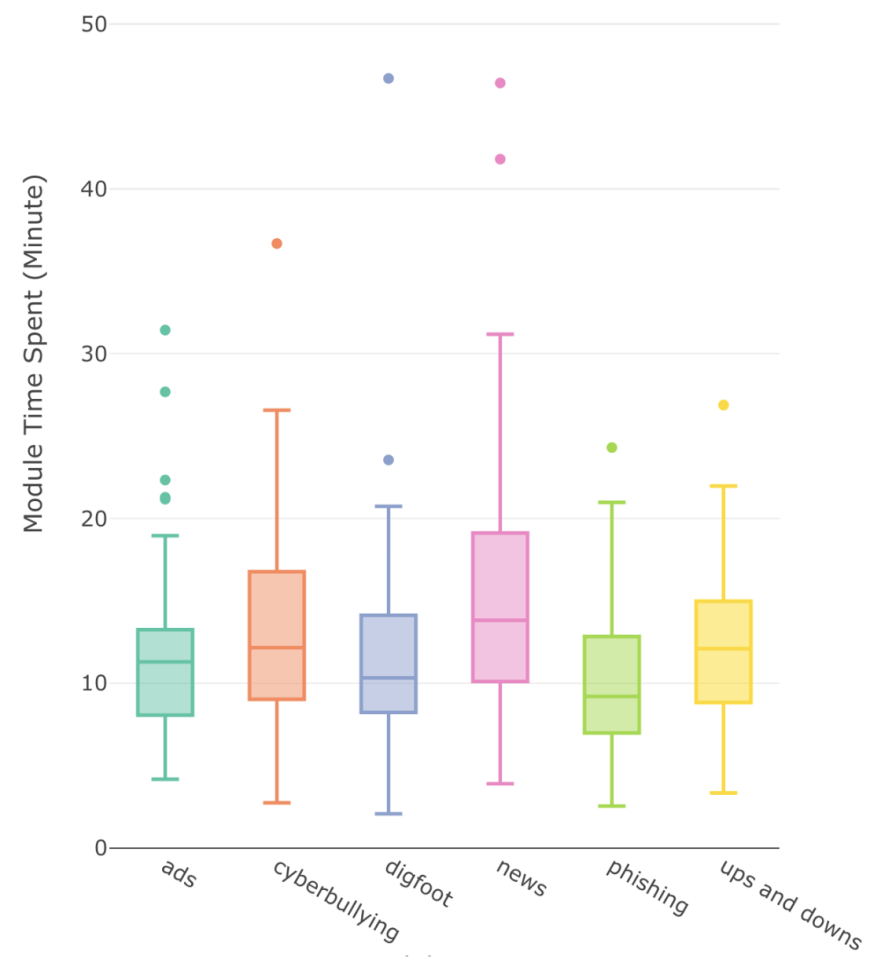
Effects of Condition on Social Media Literacy Knowledge within each domain

| | Intervention | | Control | | df | Difference | |
|--------------------------------|--------------|-----|---------|-----|------|------------|-------|
| | M | SE | M | SE | | t | p |
| * Ads on Social Media | 5.17 | .26 | 3.69 | .27 | 50.2 | -3.95 | <.001 |
| * How to be an Upstander | 5.30 | .27 | 4.46 | .26 | 52.3 | -2.22 | .03 |
| Shaping Your Digital Footprint | 5.06 | .26 | 4.42 | .26 | 49.3 | -1.73 | .09 |
| * News on Social Media | 5.14 | .26 | 4.29 | .26 | 47.9 | -2.30 | .026 |
| * Scams and Phishing | 5.56 | .26 | 3.98 | .26 | 49.2 | -4.25 | <.001 |
| * Ups and Downs | 4.55 | .25 | 3.58 | .26 | 46.7 | -2.63 | .01 |

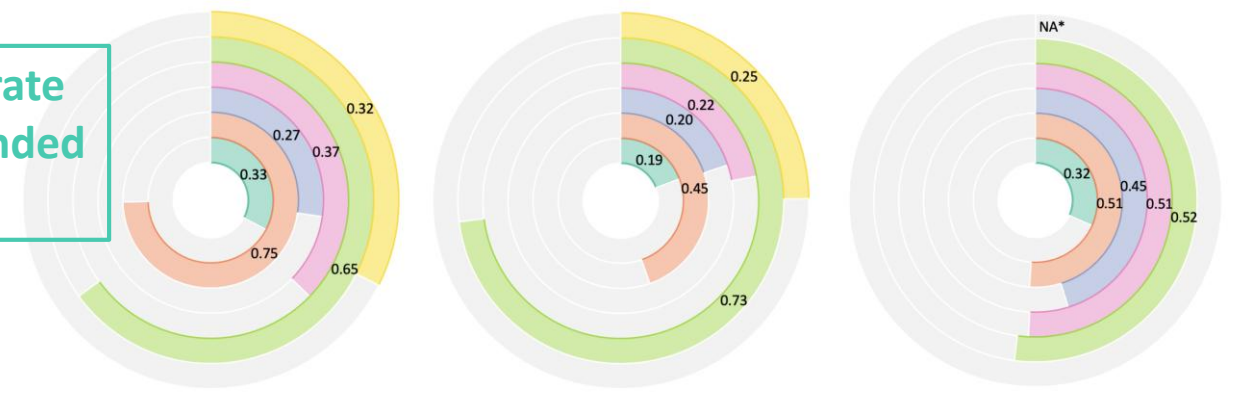
Pairwise comparisons reveal a significant effect of condition for all domains except the module *Shaping your Digital Footprint*

RQ2. How do learners' engagement patterns in SMTD affect their social media literacy?

Time spent in each module



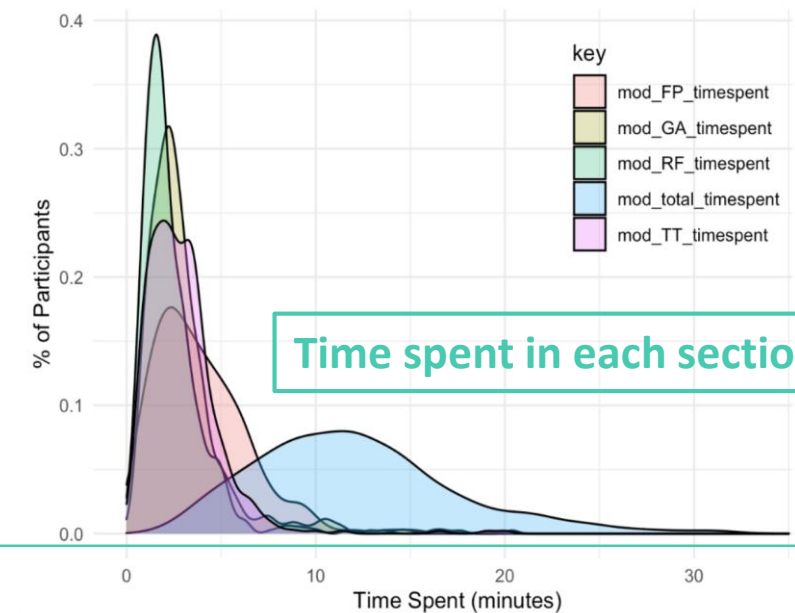
Completion rate of recommended actions



(a) Completion rate in GA (b) Completion rate in FP (c) Completion rate in RF

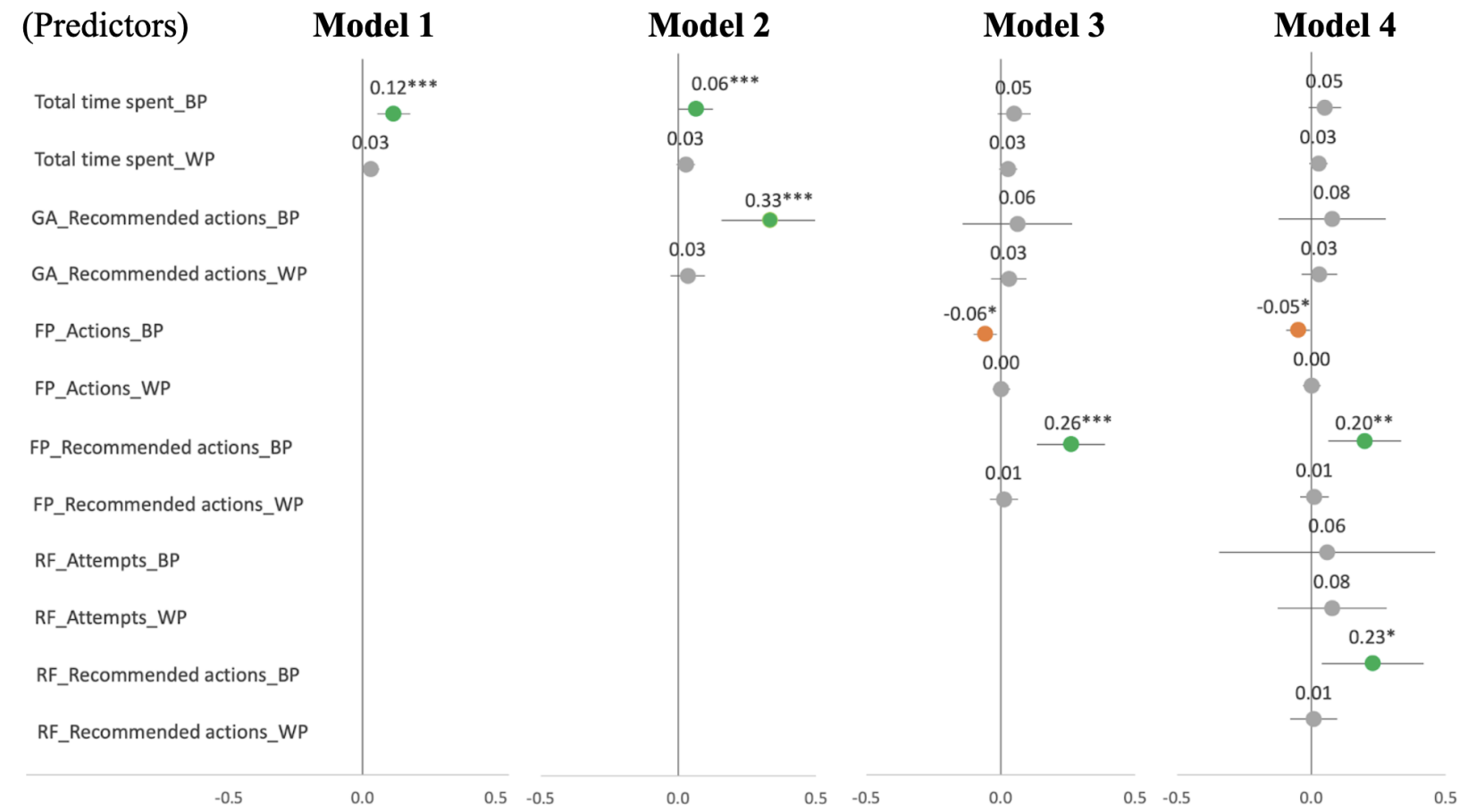
key: ads, cyberbullying, digfoot, news, phishing, ups and downs

Time spent in each section in a module



RQ2. How do learners' engagement patterns in SMTD affect their social media literacy?

- **Longer time spent** in the module predicts better knowledge outcome
- **Completing more recommended actions** predicts better knowledge outcome
- **Random actions** negatively affect knowledge outcome

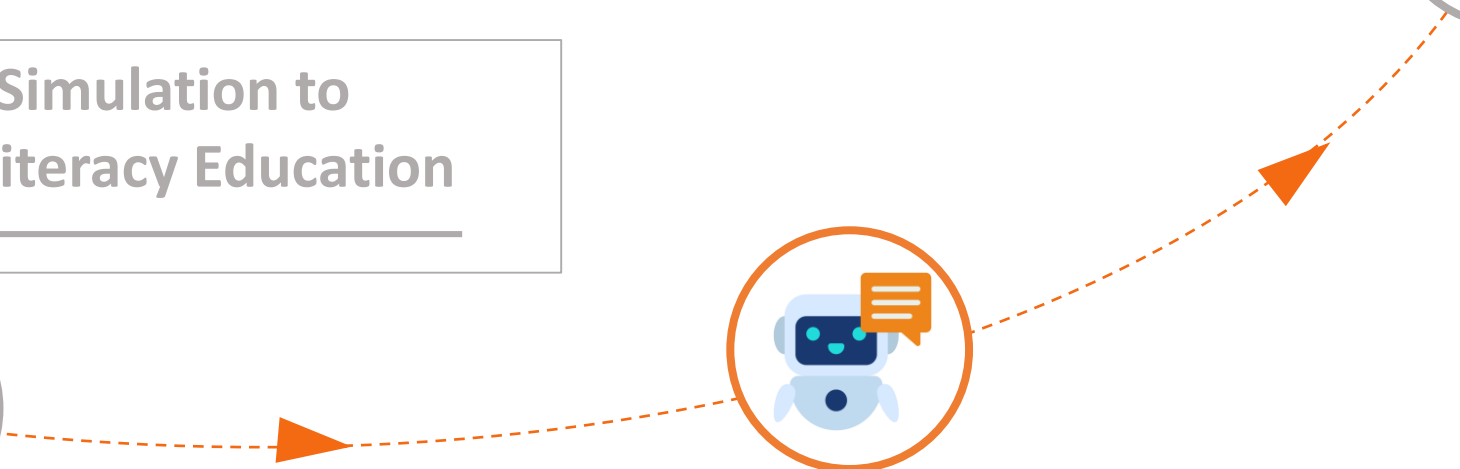


Study 1 – Using Simulation to Support Digital Literacy Education



Study 2 - Using **Language Intelligence** to Support Digital Literacy Education

Q&A



Social Media TestDrive

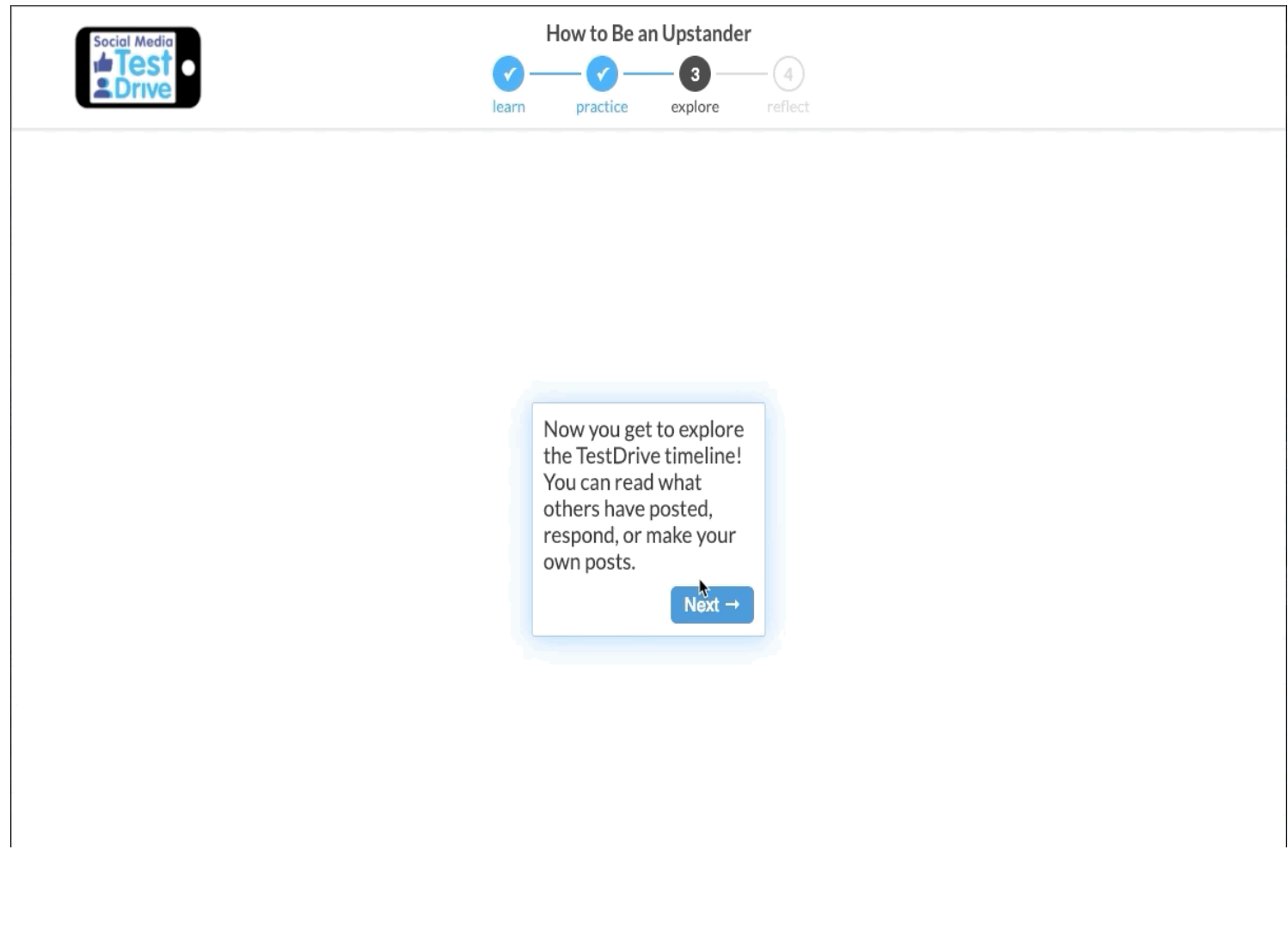
- Targeted at youth (age 9-13)
- Teach digital literacy and citizenship knowledge and skills
- Simulated environment that supports Experiential learning
- **12** modules; over **750k users**; over **5k active users per day**

Challenges:

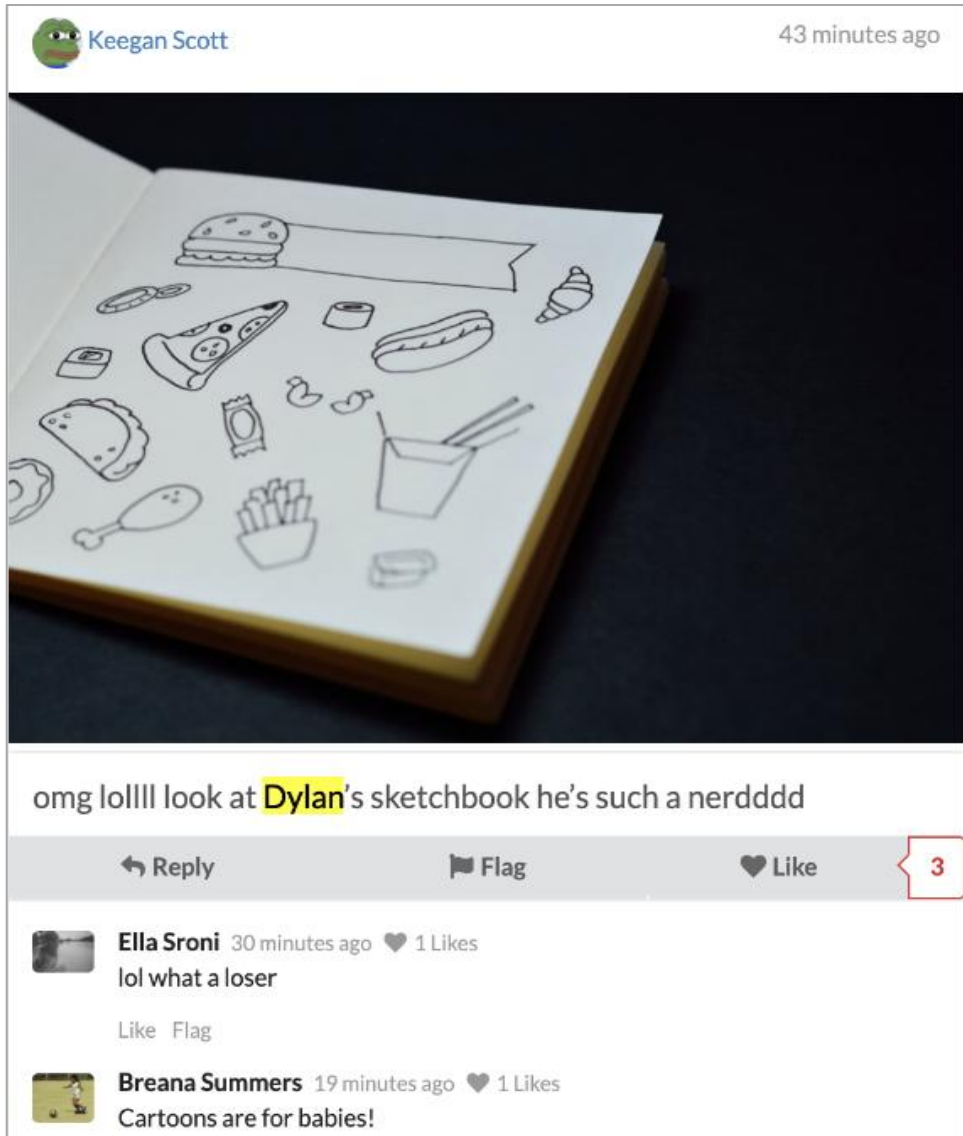
Large number of users, hard to provide personalized feedback

Solution:

Using AI to design a conversational agent to provide personalized and dynamic feedback



Data source: Over 100K posts from 12 modules



Selective inputs from learners



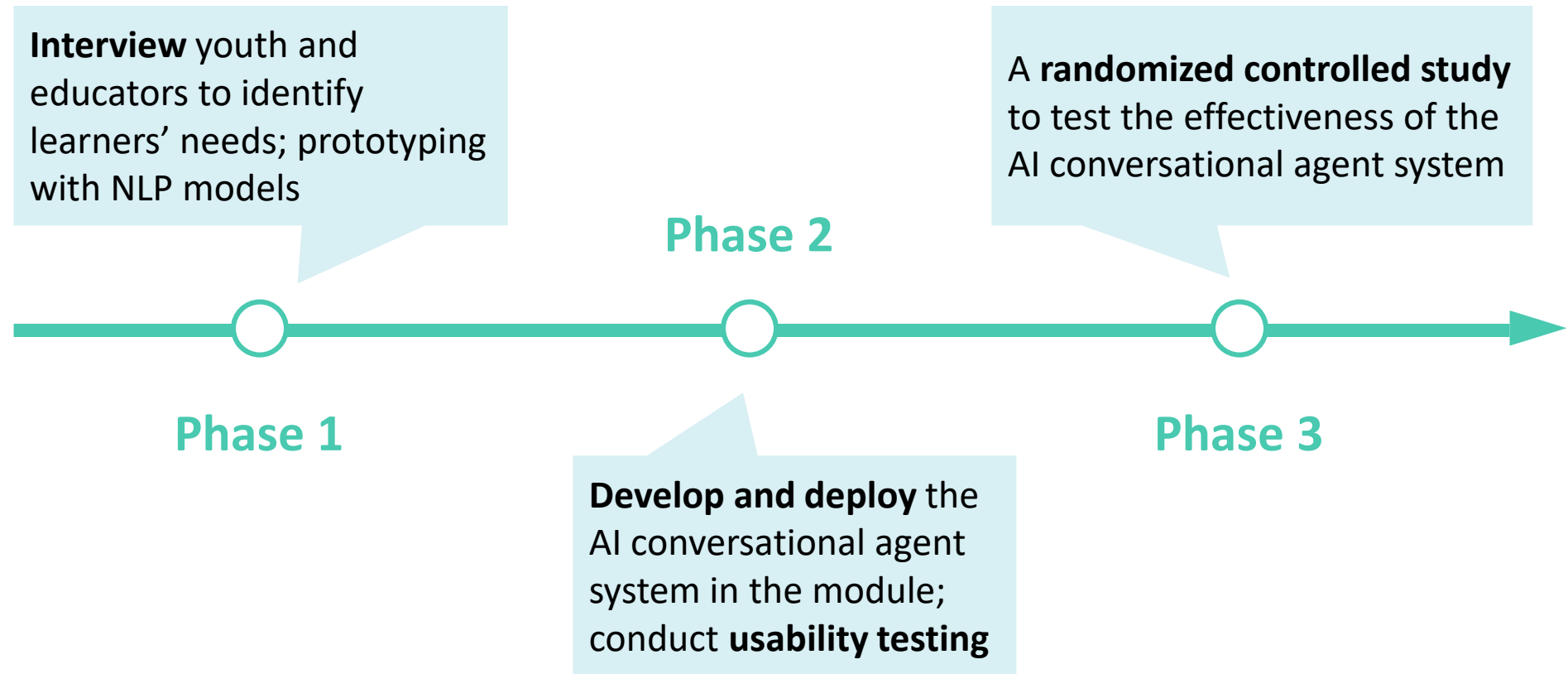
Pro-social comments

- “Dylan your drawing looks awesome!!”
- “Just ignore them, Dylan”
- “Hey guys don’t be mean to Dylan”
- “Hope you bullies get caught by the teacher”
- “I like drawing too”
- “LoL Dylan is such a Nerdddd...”
- “Yeah you draw like a baby too”
- “Shut up you ugly bully!”
- “Grow up you stupid losers!!”



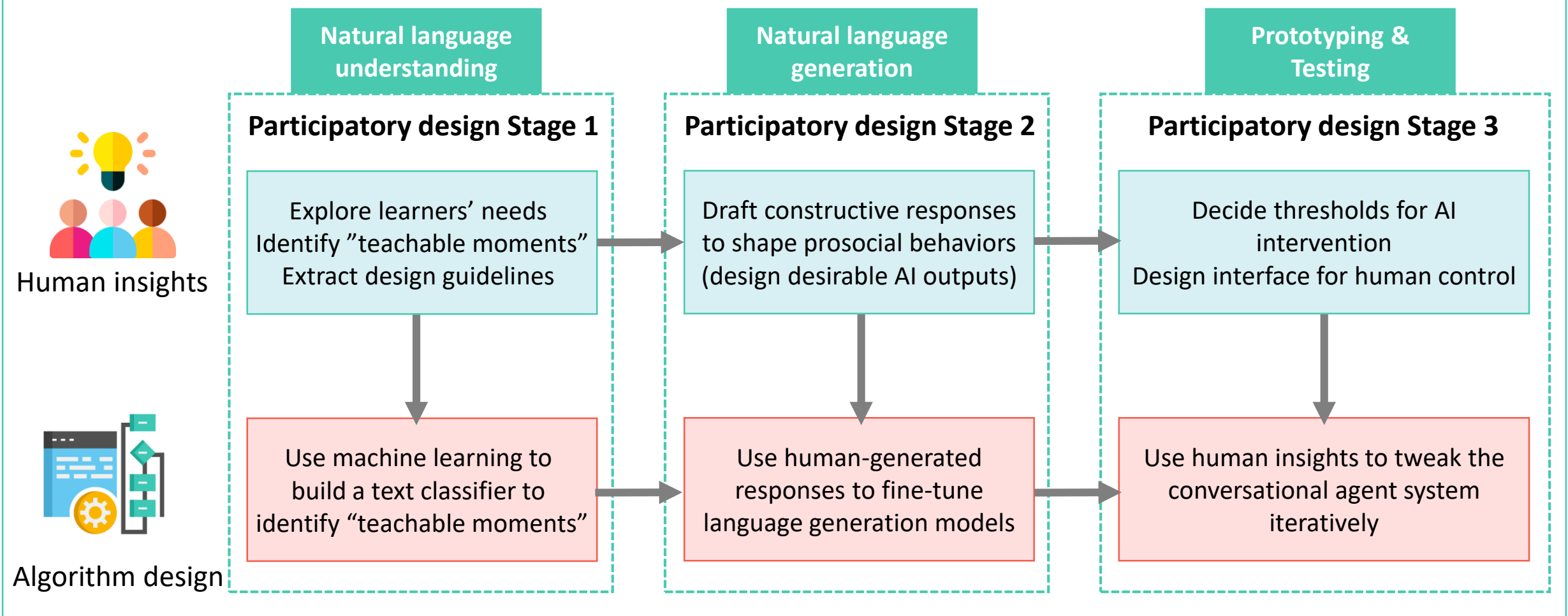
Anti-social/toxic comments

Participatory design with targeted users – Youth & Educators



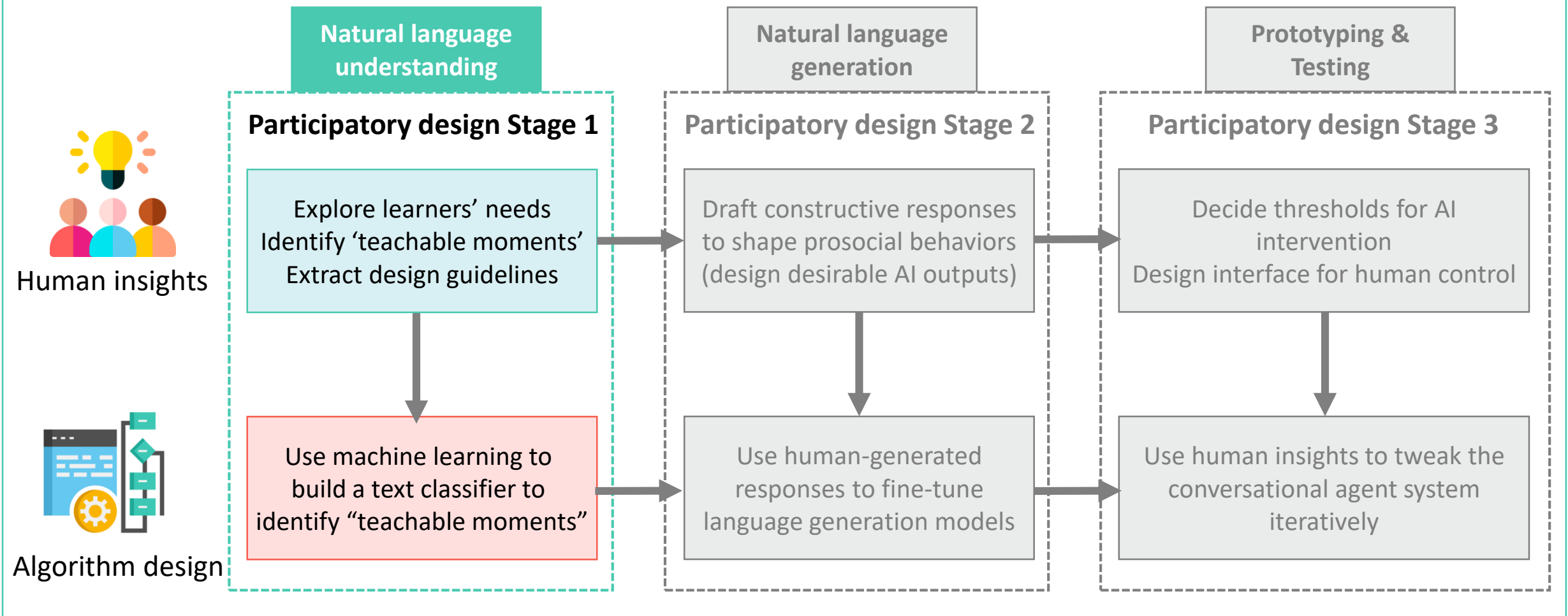
Participatory design of conversational AI with youth & educators

Translating human insights into algorithm design



Participatory design of conversational AI with youth & educators

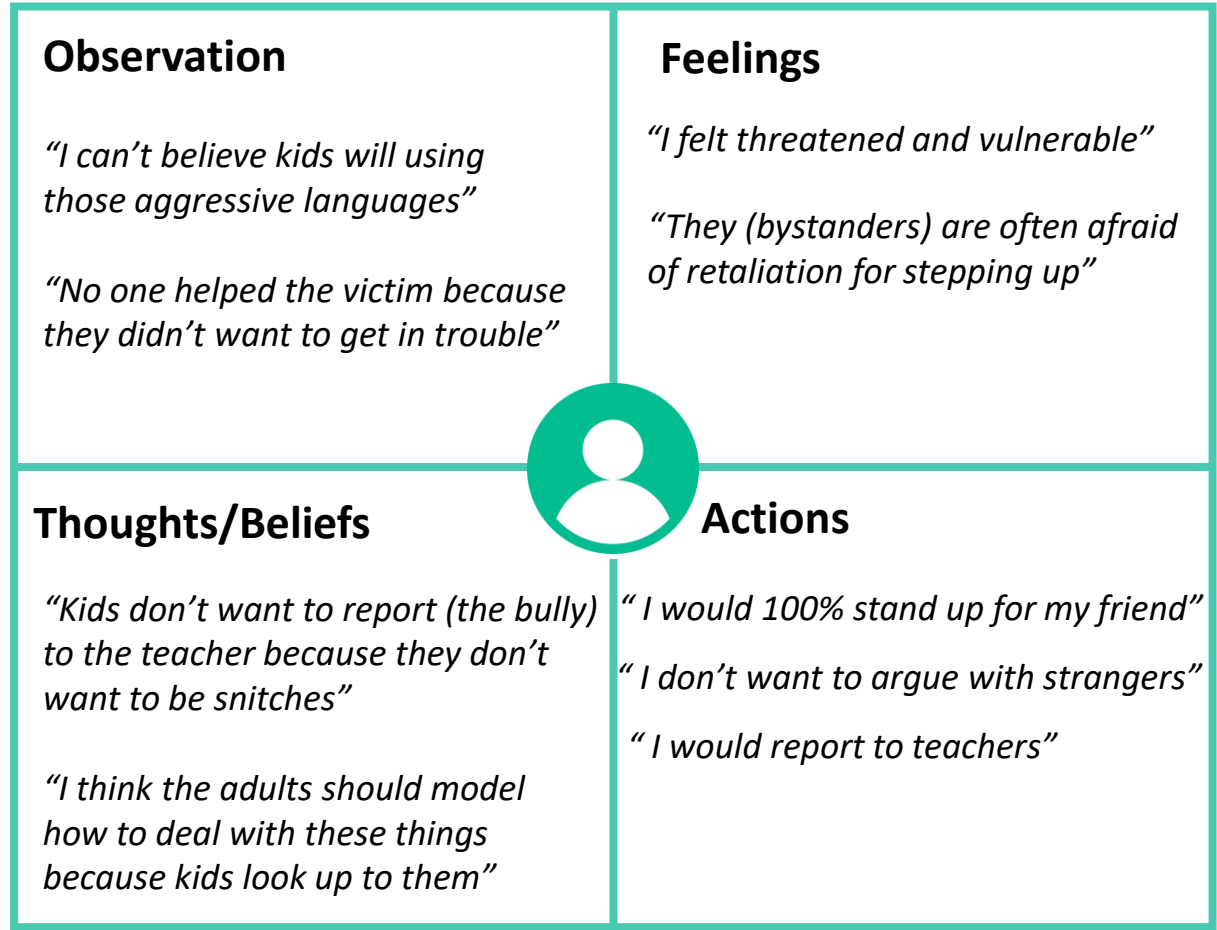
Translating human insights to algorithm design



Model building for Natural language understanding (NLU)

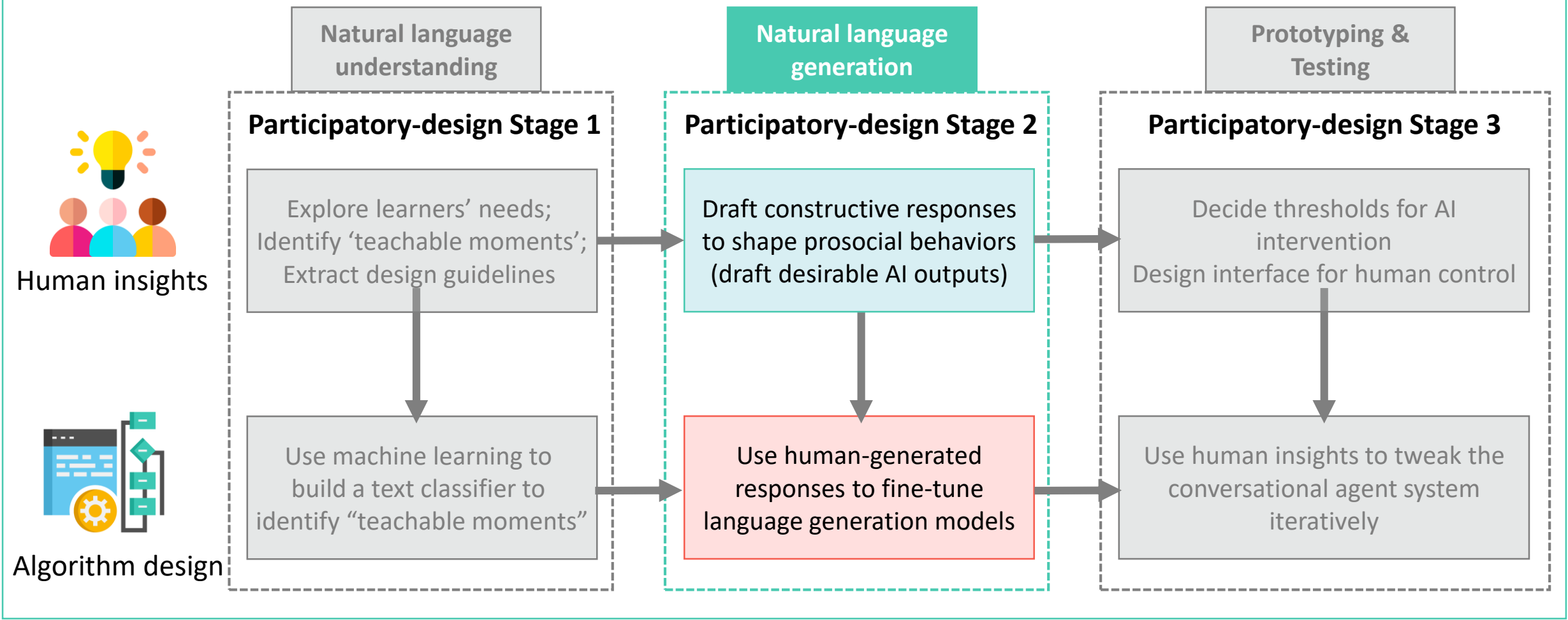
- Interviewed **9 educators** and **10 youth**
- Identify **instructional needs**
- Explore effective ways to **encourage upstanding behaviors** and **discouraging bullying behaviors**
- Derive **design guidelines** from participants' experience
e.g., Address the learners' feelings; Simulate the role of a supportive peer; Highlight the benefits of being an upstander, the consequences of being a bystander; Use reflective linguistic cues to trigger critical reasoning

Empathy mapping for participants' cyberbullying experience



Participatory design of conversational AI with youth & educators

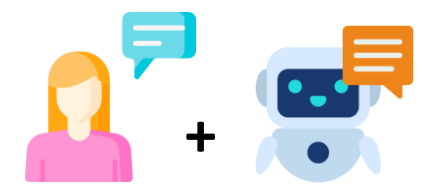
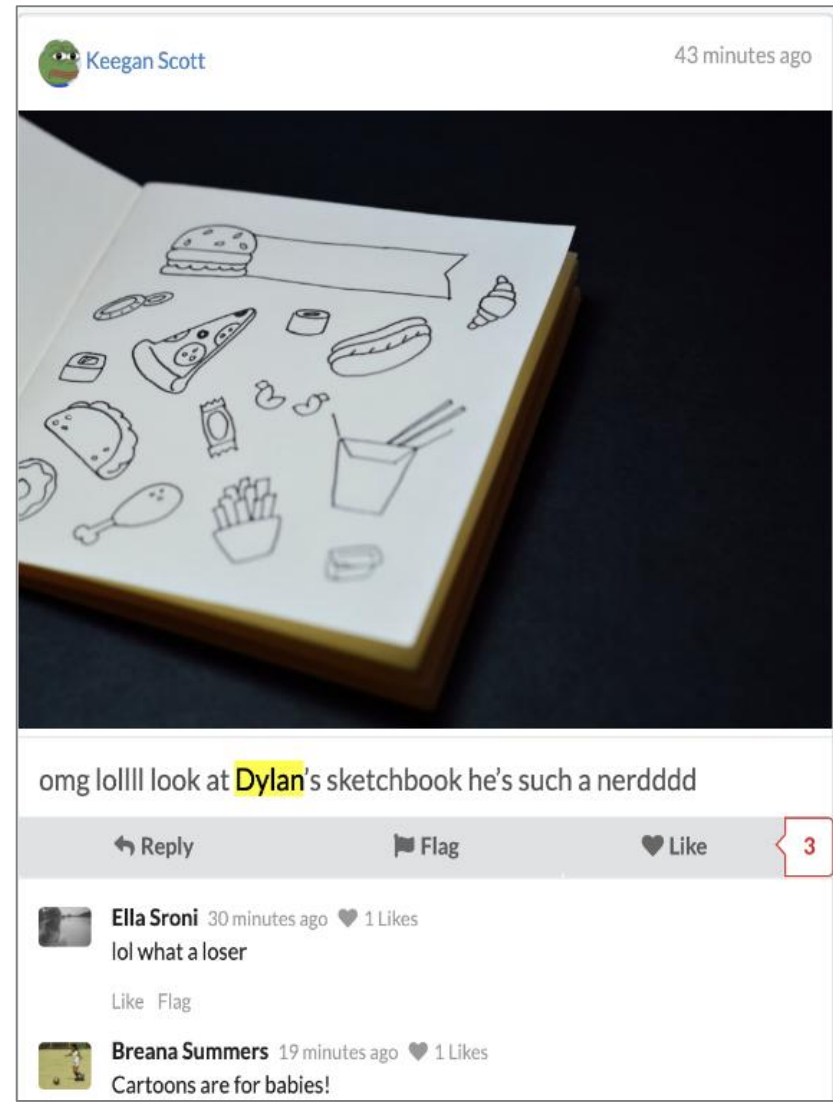
Translating human insights into algorithm design



Natural Language Generation (NLG) Model Building – Why human insights?



GPT3 NLG model



Human + GPT3

Scenario 1 – support victim

Learner: Dylan your drawing looks awesome!!

AI: Thank you! I'm glad you like it.

Scenario 2 – confront bully

Learner: Hope you bullies get caught by the teacher!!

AI: I hope so too. Have a great day.

Scenario 3 – bully the bullies

Learner: Grow up you retarded loser!!

AI: I'm sorry if I offended you. Please let me know how I can help you.

Scenario 1 – support victim

Learner: Dylan your drawing looks awesome!

Human-enhanced AI: Yes I agree! Dylan is lucky to have you as a friend!

Scenario 2 – confront bully

Learner: Hope you bullies get caught by the teacher!!

Human-enhanced AI: I hope so too! Thank you for supporting Dylan. You did the right thing!

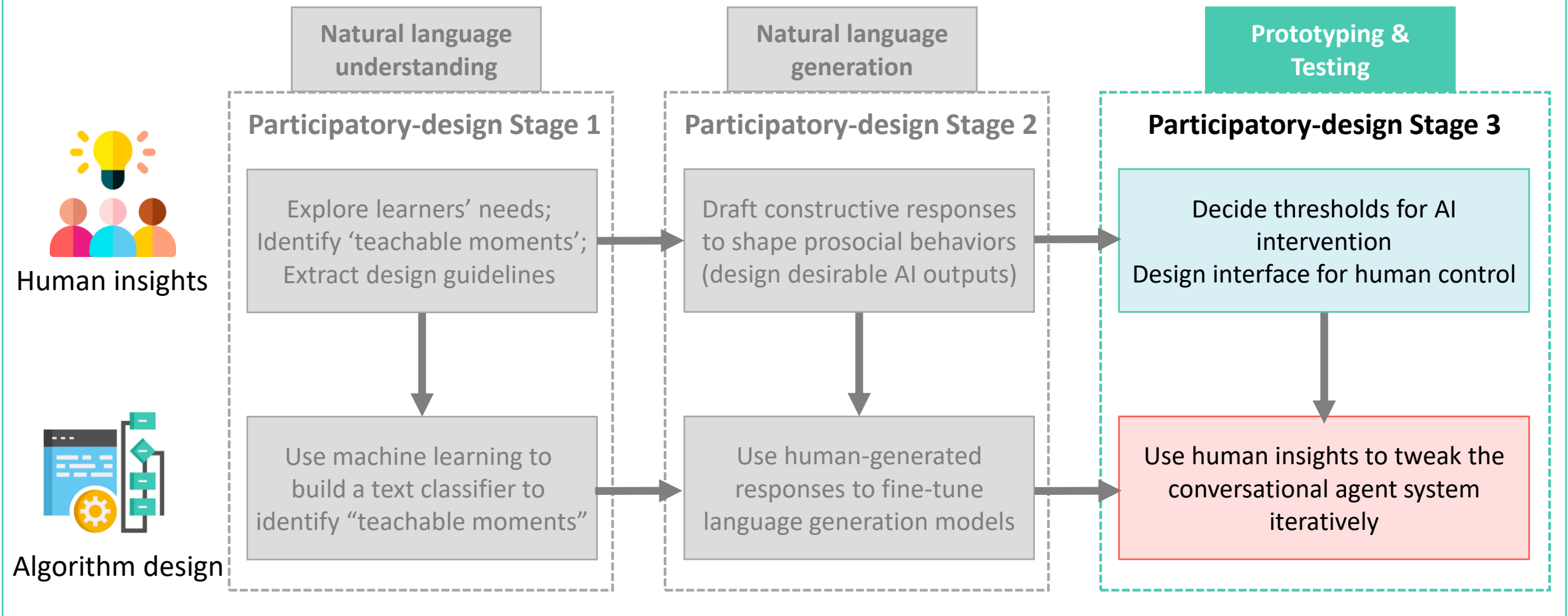
Scenario 3 – bully the bullies

Learner: Grow up you stupid losers!!

Human-enhanced AI: Dude, that's rude. Watch your language please. Not cool to bully others!

Participatory design of conversational AI with youth & educators

Translating human insights into algorithm design





Q & A
