

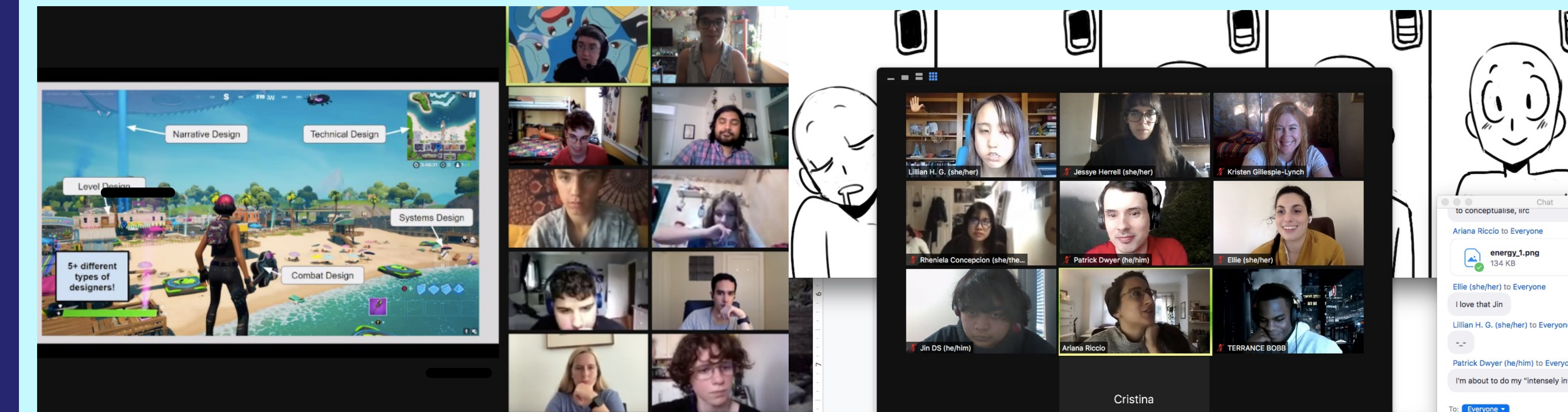
Collaborative Strategies Research: Promoting Engagement in Informal STEM Learning as a Path to Employment for Adolescents with ASD

Kristen Gillespie-Lynch¹, Amy Hurst², Beth Rosenberg^{2,3}, Jessye Herrell³, Eliana Grossman¹, Sharang Biswas^{2,3}, Eunju Pak, Cristina Ulerio³, Ariana Riccio⁴, Jin Delos Santos¹, Patrick Dwyer⁵, Sergey Shevchuk-Hill¹, Wendy Martin⁴, Lillian Hwang-Geddes³, Bella Kofner¹, Rheniela Faye Concepcion¹, Theresa Major¹, Saumya Dave³, Kyle Gravitch¹, & Terrance Bobb³
¹ College of Staten Island & Graduate Center, CUNY, ² New York University, ³ Tech Kids Unlimited, ⁴ Education Development Center, ⁵ University of California, Davis



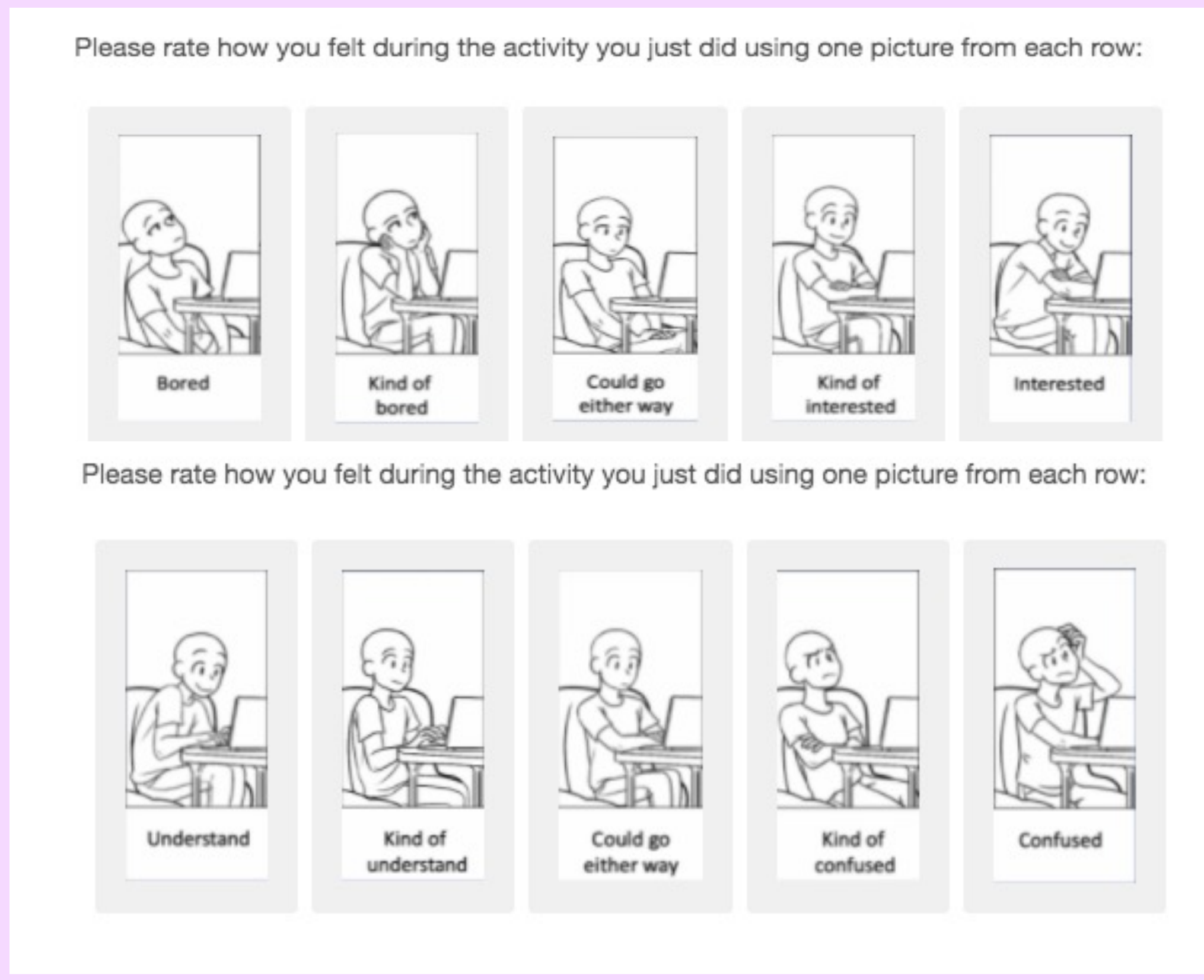
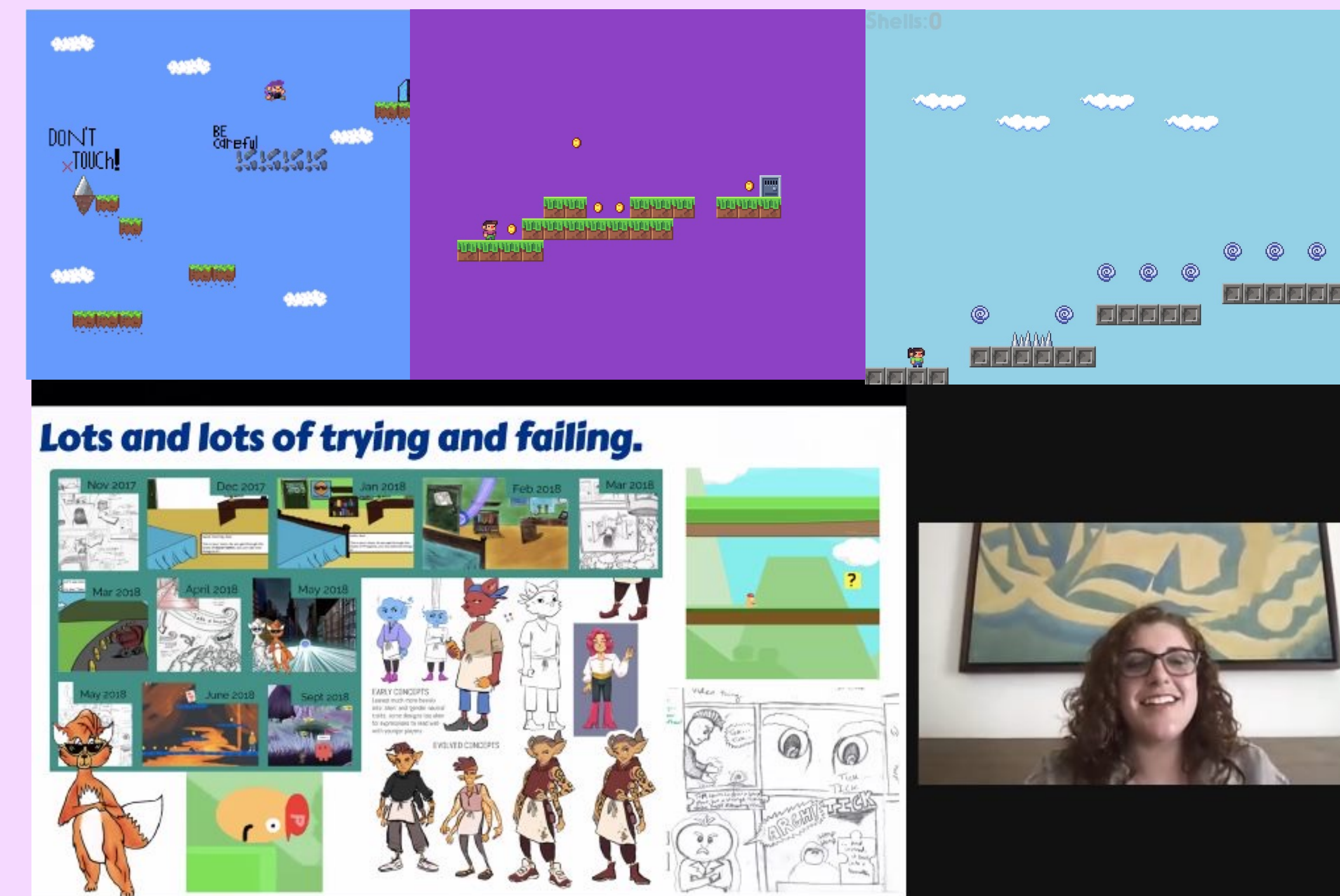
BACKGROUND

- In collaboration with an award-winning not-for-profit, informal technology education program, Tech Kids Unlimited (TKU), we aim to empower autistic youth to obtain their dream jobs.
- Autism is associated with strengths, including heightened attention to details and patterns.¹
- However, autistic people are chronically underemployed, despite often heightened interest in computers and STEM fields *and* a growing need for STEM professionals.^{2,3}
- Given the barriers people with disabilities face obtaining STEM careers⁴, strategies to help autistic youth engage agentically with STEM curricula are sorely needed.
- Universal Design (UD) places the burden of adaptation on curricula rather than learners.⁵
- Although often described as evidence-based, UD does not yet have a strong evidence-base.⁵
- Indeed, research suggests that the UD principle of providing multiple paths to representation might, at least sometimes, overwhelm learners.
- Mayer's Redundancy Principle in Multimedia Learning suggests that adding text to animation and voice decreases learning by distracting people.⁶
- Adapting the number of instructional supports to student needs may be more motivating than instruction paired with all supports or no extra supports.⁷



METHOD

- Year 1:** To identify pedagogical techniques that motivate youth with diverse attentional profiles to engage with STEM curricula, we conducted two 2-week game design workshops with 20 students each in Summer 2021.
- Students rated their engagement with different social structures and modalities using an adaptation of the AAPE (a measure of engagement developed by our participatory research team and drawn by autistic artist; Riccio et al., 2021).
 - Conducted 2 probes of each pairing of social structure and modality.
 - Instructors and researchers rated student engagement using the interested subscale of the AAPE.
 - Adapted instructional strategies based on findings from workshop 1 before conducting workshop 2.
- Year 2:** Guided by data from Year 1, we will adapt the initial 2-week curriculum to develop a month-long curriculum consisting of 3 weeks at TKU and 1 week of internship with a job coach. We will examine potential improvements in STEM self-efficacy, career interest and decision making self-efficacy among 20 autistic teens.
- Year 3:** In a pilot randomized controlled trial design, we will assign 40 autistic youth to 1 of 2 concurrent workshops in July and 40 youth to two workshops in August. We will use the same assessments as in Years 1 and 2.



Far left: Participatory research meeting, Center left: Guest talk Laura Michet; Right top: Student Flowlab games, Right bottom: Guest talk Vanessa Castañeda Gill (Social Cipher); Far right: Interest + Confused dimensions of AAPE

AIMS AND HYPOTHESES

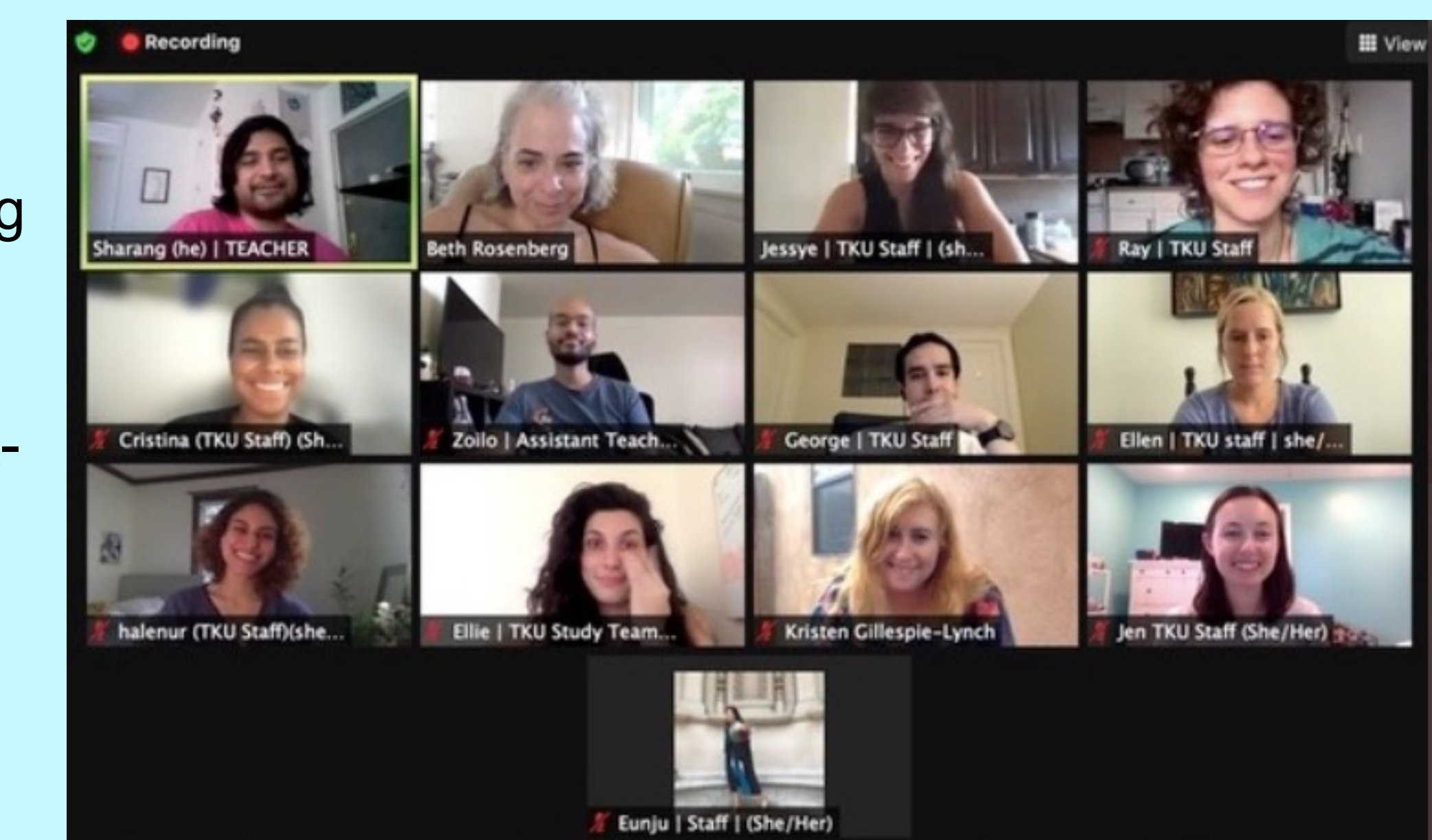
The goal of our project is to develop strategies that **effectively engage autistic adolescents** in **informal STEM learning opportunities** that promote the **self-efficacy** and **interest in STEM careers** that will **empower** them to seek out **career opportunities in STEM fields**.

The research aims are to:

- Identify evidence-based strategies to engage autistic youth in informal STEM learning opportunities that are well matched to their attentional profiles:
 - Hypothesis 1: Pedagogical strategies vary in how engaging they are for people with diverse attentional profiles; people with more focused attention prefer unimodal instruction and people with less focused attention prefer multimodal instruction;*
- Determine if engaging youth in informal STEM learning opportunities increases their STEM self-efficacy:
 - Hypothesis 2: Engagement with informal STEM learning opportunities promotes STEM self-efficacy;*
- Determine if engagement with STEM internship activities is associated with increased interest in STEM careers and career decision-making self-efficacy:
 - Hypothesis 3: Engagement with STEM internship activities promotes interest in STEM careers and career decision-making self-efficacy.*

INITIAL FINDINGS: WORKSHOP 1, YEAR 1

- Consistent with Mayer's redundancy principle, autistic students rated video + voice more engaging than video + voice + text *and* than video alone ($ps < .05$).
- Unexpectedly, preferring video + voice over just voice was *higher* among students with better attentional control ($p = .04$).
- Self-determination ($p = .02$), but *not* video game self-efficacy, STEM career self-efficacy or computational thinking, improved from pre to post-test.
- Unexpectedly, spatial planning also improved ($p = .01$).
- Findings provide initial support for Mayer's Redundancy Principle but suggest that individual differences must be considered.*
- Coding of interview data and students' games is ongoing.*



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