Reimagining Assessment: How Co-construction Shifts Agency in Computer Science Classroom

Eman Sherif
University of Washington
Seattle, WA, USA
emans@uw.edu

Rayana Lyons
University of Washington
Seattle, WA, USA
rlyons8@cs.washington.edu

Isabel Amaya
University of Washington
Seattle, WA, USA
iamaya@uw.edu

Amy J. Ko
University of Washington
Seattle, WA, USA
ajko@uw.edu

ABSTRACT

Computing assessments are an essential part of computing courses, but can create inequities that marginalize students. This study examines assessment co-construction as a student voice practice that honors the plurality of students' identities, cultures, and participation. During a six-week high school programming course, students and instructors co-constructed assessments through dialogue and negotiation. We identified four themes of student agency in assessment co-construction: instructor–student relationships fostered trust that legitimized co-construction; students' lived experience were assets in assessment design; assessment structure influenced participation; and unresolved conflicts impeded students' participation. These findings demonstrate that recognizing students' perspectives influences how they enact their agency.

CCS CONCEPTS

• **Social and professional topics** → *Student assessment*

KEYWORDS

Culturally-responsive pedagogy, assessment, student-voice.

ACM Reference format:
2026. Reimagining Assessment: How Co-construction Shifts Agency in Computer Science Classrooms. In *Proceedings of 2026 Conference for Research on Equitable and Sustained Participation in Engineering, Computing, and Technology (RESPECT 2026). ACM, Chicago, IL, USA, 10 pages.*

RESPECT 2026 June 08--10, 2026, Chicago, IL, USA

ACM ISBN 979-8-4007-2510-4/2026/06
https://doi.org/10.1145/3796496.3811802

1 Introduction

Computing assessments are used broadly to evaluate, characterize, measure, or model some aspect of student knowledge, skill, ability, or identity [18]. They can help students and teachers diagnose learning gaps [33], they can structure learning and motivation, and they can be a central part of evaluating mastery [14].

While ubiquitous, assessments can create inequities that disrupt students' learning, privileging dominant groups, erasing cultural knowledge and reproducing structural inequities [21]. For example, prior work in computing demonstrates how success in computing often assumes universal, neutral, or objectively defined standards [29]. Conventional computing education assessments may also value dominant groups' cultures, and erases students' cultural and linguistic knowledge as legitimate means of learning [22]. Moreover, the rules surrounding assessment can create inequities that cause students to make sacrifices to complete assessments, internalize failure, and feel less psychologically safe [31].

Central to creating equitable assessments are instructors designing for all students and their needs. To understand this diversity of needs, including student voice is a critical practice. For example, prior work outside of computing has explored the need for equitable power structures between students and instructors to encourage student voice [13]. In *Critically Conscious Computing* [18], computing education researchers apply Inoue's framework [13], arguing equitable computer science assessments should be responsive, participatory and educative. They describe how each aspect of the assessment such as the rubrics, deadlines, what students create, etc. should include student voice, and if the instructor decides an aspect of assessment cannot be modified, they communicate this to students. These principles position assessments as a collaborative process where student voice is central to creating them.

Although it is evident that student voice is central to creating equitable assessments, prior work has not specifically examined how to effectively elicit student voice. Some prior work has begun to address this gap. For example, Chase et al. utilized an intervention to investigate how engaging students' voices in many aspects of assessment can change students' perception of power,

motivation, and achievement of assessment. This intervention did not find significant effects on power, motivation, and achievement, but students who were from first-generation backgrounds showed increased performance on assessments [3]. This intervention, however, did not account for how student participation changed over time. Similarly, Kivuva et. al. utilized co-construction practices in a culturally responsive computational embroidery course to collaboratively design the course with instructors and students [16]. This work's focus was not evaluating the co-construction techniques effectiveness in incorporating student voice into assessment, but the authors found students were more motivated to learn computing and embroidery. These works show that there is promise in engaging student voice in assessment, but there is little guidance on how to meaningfully elicit student voice in the design of assessments.

Building upon these calls for student voice in assessment, and emerging evidence of the efficacy of including their voice in assessment design, in this paper we deepen our understanding of how students prefer to engage and which instructional practices can foster their participation. We examine *how students take up or resist agency when co-constructing programming assessments*? To answer this question, we taught a 6-week high school class that engaged in co-construction of assessments. Through student actions, surveys, and interviews, we carefully observed when, why, and how students shared their preferences on assessment design, or declined to. We discuss the implications of our findings on assessment design, and equitable CS teaching more broadly.

2 Background

Our work draws on several theoretical frameworks about learning and assessment in the secondary and post-secondary setting.

2.1 Student Voice

Student voice is a powerful pedagogical tool that can be used to shape learning. Paulo Freire [11] provides a theoretical foundation for student voice, arguing that students should be co-creators of knowledge, rather than passive participants of their education, allowing students' experiences, perspectives, and expertise to meaningfully shape their learning environments. Constructionism extends this stance by offering a learning theoretic framework through which student voice can be enacted, emphasizing learning as a socially mediated process of designing, creating, and sharing artifacts that externalize students' thinking [1, 25]. Through open-ended design activities, constructionist environments support learners in connecting abstract ideas to concrete representations, positioning students as epistemic agents with agency over what is created and how meaning is produced [15, 24].

There are many benefits and challenges to incorporating student voice practices in curriculum. Student voice allows learners to articulate their needs and preferences [6, 7] and helps instructors design course materials that incorporate students' interests and recognize their existing knowledge [2]. Meaningful involvement requires validating and authorizing students to represent their own ideas, opinions, knowledge, and experiences throughout education to improve their schools [10]. Additionally, it is imperative that student voice is understood through critical analysis of power by understanding that voice is relational, situated, and unevenly heard based on institutional norms that privileges some students and marginalizes others [27]. Prior work argues that student voice should be framed as an ongoing practice and reflexivity about who speaks, who is heard, and under what conditions [32]. Prior work identifies key pedagogical conditions that support student voice, including strong student–teacher relationships, interactive learning environments, culturally responsive pedagogy, differentiated instruction, and opportunities for student choice [5].

Efforts to incorporate student voice in computing education reveal significant tensions around expertise, power, and legitimacy, highlighting both the promise and difficulty of participatory approaches in a field shaped by hierarchical norms of knowledge. In a study to understand how school districts position youth as designers of computer science education systems [26], researchers found tensions surrounding gatekeeping because in some school districts students who were the most privileges were the only ones with the opportunity to participate, set-ups where students were only nominally allowed to act as leaders, and tokenization, where districts attempted to give students meaningful voice but did not prioritize student input. Moreover, other work engaged youth's skills and knowledge to reimagine computer science pedagogy [9]. To this end, researchers used speculative design to understand what an ideal CS learning environment might look like for high school students. Some findings included that students wanted CS pedagogy to have autonomy by allowing them to focus more on topics they are interested in learning and do work that can be applied to personal goals and community. Demonstrating the importance of utilizing youths' experiences as learners to shape the way teachers teach even if they do not have the expertise in the topic.

In similar work [28], computing education researchers investigated how marginalized students use their agency in a computing course. They found that many students utilized computing as a tool to resist their marginalization and assert their rightful presence in a computing classroom. This work also highlighted that centering students' lives in consequential ways within CS curricula and pedagogy is essential for fostering both deeper content engagement and student agency among underrepresented youth in computing. It also offered significant ways to incorporate student voice into computing by centering students' experiences and lived experiences in computing education and identify the tensions around power and legitimacy in incorporating student voice.

Due to the novelty of incorporating student voice into computing education, there is little guidance on how to incorporate authentic student voice practices into computing education. Computing assessments can be a transformational place to include student voice because of its ability to address the present inequities in assessments. In *Anti-racist Assessment Ecologies* [13], Inoue argues that assessments are an ecology made up of multiple different parts (power, *parts, purposes, people, products, place,* and *process*). Student voice can shape multiple parts of the ecology to collectively produce assessments. For instance, *parts* discusses

what artifacts should be used (rubrics, assignment descriptions, rules) and who creates them. Inoue argues that rubrics can be co-created with students and students should be involved in negotiating the rubrics language, determining what success is, and discuss who conducts the grading. The authors expand on grading and discuss how labor should be incorporated through labor-based grading contracts that ask students about their learning practices and constraints they need to navigate to be able to complete the assignment. Moreover, *people* highlights who is involved in designing the assignment and who holds evaluative authority. Additionally, attending to *power* enables students to reflect on whether dominant norms shape assessment practices and how culture, race, and gender influence how work is evaluated. Although Inoue situates this work in writing education, it demonstrates how student voice might function as a mechanism for enacting equitable assessment in any discipline.

2.3 Equitable Computing Assessments

Much of the existing work on equitable computing assessments has focused on reforming grading practices to reduce student stress and support learning. Some prior work on computing assessment grading [19, 34] has tried multiple alternative grading approaches (e.g., standards-based, mastery-based). These different grading practices have shown benefits to helping relieve students' stress and anxiety around assessments. In addition, instructors have incorporated different practices such as resubmission policies [4, 23] that allow students to resubmit their computing assessment for a higher grade. This led students to view learning as iterative and encourage students to reach mastery in a skill. Other prior work has focused on creating equitable grading rubrics by identifying areas of inequity in a computer science course through the Teacher, Accessibility, and Equity rubric, which helped instructors provide accommodations for students who faced inequities [35].

Other research has explored equitable assessment through project based culturally relevant approaches that broaden definitions of success in computing. One exemplar is the *COMPUgirls* program [30] that centered Black and Latine girls' culture and identity alongside technical skill building. This program assessed students' knowledge through projects they designed and built tied to a social justice or community issue, which empowered students to apply computing to real issues and create a broad definition of success. This work demonstrates an example of assessment that utilizes culturally relevant pedagogy [20] to align computing education with students' cultural knowledge and address inequities that arise from traditional computing assessments.

Other work has utilized a "co-construction" method to design assessments for students. Co-construction extends constructionism by emphasizing dialogue, negotiation, and shared agency between teachers and students in the creation of learning goals and evaluative criteria [8], framing assessment as a socially constructed process. For example, [16] describes a cultural computational embroidery course in which students co-constructed assessments by designing projects connected to their own cultural identities while collectively negotiating how those projects would demonstrate engagement with the course's programming environment. The assessment required students to both pursue personally meaningful work and meet shared technical expectations, illustrating how co-construction can support ownership, relevance, and disciplinary learning through collaborative assessment design.

Despite growing attention to student voice and participatory practices in computing education, prior work offers limited insight into how these commitments are enacted in everyday classrooms. Research has yet to examine how authority is shared, resisted, or reconfigured when students participate in shaping consequential aspects of computing courses, such as assessments. As a result, we lack accounts of how assessments can be organized to legitimize student voice in ways that meaningfully support students' learning rather than reproducing existing power hierarchies.

3 Methods

Building on prior work, we co-constructed assessments with high school students in a 6-week summer introductory programming course. Designing and teaching the course using a co-construction approach was central to this study because it positioned students as active participants in shaping assessments, allowing agency to emerge and affording the flexibility to observe spontaneous interactions, negotiations, and refusals that could not be anticipated. High school students were a relevant population for this work, as adolescents are actively developing independence.

Three authors served as the primary instructors to remain responsive to students' shifts in participation during co-construction. Data sources included notes of students' participation in assessment co-construction sessions, survey reflections, instructor observations, and student interviews, which were analyzed using inductive qualitative methods. The study received IRB approval, with parental consent and student assent obtained for all participants.

3.1 Participants

We offered *"Language, Culture, and Computers"* as an elective course to Upward Bound students in summer 2024. Upward Bound is a federally funded program that supports first-generation and/or low- income students in grades 10–12 to prepare for post-secondary education. Upward Bound defines first-generation as someone whose parents or legal guardians did not complete a bachelor's degree and low-income as the family's income should not exceed 150% of the poverty level. In 2024, approximately 150 students attended the six-week summer program at the University of Washington, which included a stipend to encourage participation. Students took core subjects such as language arts, mathematics, a college readiness course, and an elective. Elective placements were based on student rankings and availability. No prior programming experience was required to take our course. Eleven students, from diverse cultural and linguistic backgrounds, successfully completed the course and participated in the study. Table 1 includes self-reported free-response participant demographic information for students enrolled in the course.

Table 1: Participant demographics

Participant ID	Race	Gender	Prior Programming
S-1	Asian	Girl	No
S-2	Asian	Boy	Yes
S-3	Asian	Boy	Yes
S-4	Asian	Boy	No
S-5	Asian	Boy	Yes
S-6	Latina	Girl	No
S-7	Latino	Boy	No
S-8	Asian	Girl	Yes
S-9	Asian	Girl	No
S-10	Asian	Girl	No
S-11	Latina	Girl	No

3.2 Positionality

The 1st author and instructor drew upon on her lived experience as a Black woman whose cultural knowledge is oftentimes overlooked in education and would constantly need to confirm herself to meet computing culture standards. She was a novice teacher and therefore had no experience incorporating student voice into classes. She recognizes that marginalized students in computing, such as those enrolled in this course, experience inequities that discourages their participation in computing.

All members of the analysis team drew on their lived experiences to recognize that assessments often function as a gate-keeping tool to keep marginalized students out of computing. As instructors we did not have experience using co-construction or student voice as a teaching tool and methodology but were excited by the findings of previous work on how co-construction enables students to be collaborators in designing curricula and how student voice can increase relevance and engagement for students. Our research was grounded in our belief that students' lived experiences can be a powerful tool in shaping assessment.

3.3 Course Description

We designed our course to introduce programming by engaging students' culture and native language to create and share stories, poetry, and games through code. Because students in the course were multilingual, and some were English learners, the instructional team utilized *Wordplay*, a multilingual, educational functional programming language that enables users to create interactive typography in multiple languages. Wordplay is accessible to youth who are low-vision, deaf, or hard of hearing and legible to students who do not read English [17].

Table 2 describes the 6-week course structure. Each class was 1 hour, Monday to Thursday. Students and instructors collaboratively designed and completed 3 assessments in weeks 2, 4, and 6.

Table 1: Weekly Course Structure

Week	Topic	Assessment co-construction
Week 1	• Get to know each other • Introduction to Wordplay • Typographical transitions in Wordplay	
Week 2	• More typographic transitions in Wordplay • Assessment 1 co-construction sessions	Assessment 1: Poetry
Week 3	• Interactive input streams in Wordplay • Conditionals and Lists	
Week 4	• Assessment 2 co-construction	Assessment 2: Interactive chatbot
Week 5	• Functions • Assessment 3 co-construction	
Week 6	• Assessment 3 co-construction • Final project presentations	Assessment 3: Cultural games

3.4 Evolving Co-construction Process

Each assessment underwent an evolving co-construction process, adapting to student feedback and challenges that emerged. In this section, we describe the method we used by describing the instructors' goals, the topics students learned, and what students discuss. Figure 1provides a visual guide for the structure of each co-construction process.

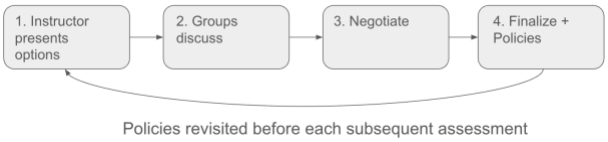

Figure 1: Evolving co-construction process for each assessment process

3.4.1 Assessment 1: Introducing Wordplay *through poetry.* During week 1, students learned the basic mechanics of Wordplay, including creating new projects, arranging text in a sequence, and applying basic transitions such as scale, color, position, and rotation. Students practiced the transition with different text. We wanted the assessment to revolve around poetry as it was a low stake way for students to share their culture. Instructors shared examples from their culture as guidance.

During the assessment discussion, we presented students with two options to help them envision different assessments. The first

option to create a poem in Wordplay in which each line used a different transition and included a flashcard explaining how the poem they chose related to their culture. The second was for students to create a presentation on the significance of a poem and create a program using a sequence of phrases to represent the poem. The co-construction session had two parts: first, students reviewed assessment options, then discussed preferences in groups. Students independently explored example Wordplay projects of animated poems, instructors explained their cultural or linguistic relevance, and demonstrated transitions. Instructors asked students to discuss which assessment option interested them, what they wanted to change, and questions they had about the assessment. The instructors and students negotiated what requirements should be included in the assessment. At the end of the co-construction session, the instructor re-wrote the assessment for students, and they reviewed it to ensure accuracy.

3.4.2 Assessment 2: Using interactive input to share students' culture. During week 3, students learned how to incorporate input into their programs. Wordplay has a concept of input streams, which are values that update automatically, and cause program re-evaluation when they change. For example, `Volume, Time, Chat, Random,` and `Button`. To utilize these different input streams students also learned conditionals and lists within Wordplay.

For this assessment, the instructors' wanted students to create an interactive program that utilized input streams. The instructors created two example assessments. The first example was creating a cultural chatbot that would be able to answer questions about the students' culture. The students would need to use at least 4 of the 5 inputs they learned in class and write a 4-6 sentence description on how the questions are related to their culture and language and were creative. The second example was to find a problem impacting students' communities and to create a program that explained the problem and possible solutions. The students would use at least 4 of the 5 inputs they learned in class.

This co-construction process followed a similar structure in 3.4.1 but included time for students to independently reflect on the assessment options. We gave students two example programs (a chatbot that used inputs and transitions to display emojis and words related to different animals and an interactive story that used inputs and transitions to explain the impacts of tree inequity on the instructor's community). Next, students individually reflected and met in groups to discuss their sentiments surrounding the assessment and their proposed changes. Instructors took notes on students' discussions. Then, each group shared what they wanted to do for the assessment. To finalize the assessment, the instructors created guiding questions to help combine group ideas and address concerns, including ideas for future assessments, creativity, submission format, and input requirements.

3.4.3 Assessment 3: Utilizing functions to create cultural games. During week 5, students learned functions, including how to call and create them. During assessment 2 co-construction, students expressed they were interested in creating games. In week 5, the instructors focused on teaching students how to create different game components such as score, determining a winner, levels, and keyboard input.

During the session, the instructor focused on understanding what students perceived as a game. In groups students discussed what games they enjoyed the most, what were components of those games, and how many game components their assessment should have. They also discussed how they could incorporate a function into their game and what would be alternatives if they could not. Moreover, they discussed what would be included in the written portion of the assessment. One instructor joined each group to help guide conversation and take notes. After discussions, each group shared their reflections, and the instructor facilitated combining students' ideas together. This co-construction session took more time because there was no starting assessment description.

3.4.4 Assessment Policies and Rubric. After the co-construction session for assessment 1, students and instructors decided on assessment policies and rubric for grading. The instructors used observational notes to create guiding questions for students to discuss the assessment policies and rubric. The instructor described assessment policies as rules that dictated how students could complete the assignment. Students worked in groups to discuss allowed resources, collaboration rules, and who grades their work. Additionally, they discussed rubric components, who should grade their work, and feedback processes. Because course grades contributed to students' GPA and college credit, grading structures represented a high-stakes aspect of the course, making students' participation in shaping assessment policies particularly consequential. Following each assessment co-construction session, students and instructors revisited the assessment policies and rubric students created and determined if there needed to be changes. Each time, instructors and students determined that they did not need to change general policies and made minimal changes to the rubric. Engaging students in creating policies and rubrics redistributed instructor authority, positioning students as contributors to their evaluation.

3.5 Data Collection

3.5.1 Co-construction sessions. In each co-construction session, instructors took observational notes on which aspects of assessment design students focused on, who participated, and areas of confusion students had. After students discussed in groups, the lead instructor would ask each group to share what they discussed and took detailed notes on group share outs. This helped us understand how students participated or refused to participate.

3.5.2 Assessments. Students completed assessments were shared using a gallery feature, which allows students to share projects with a group. Students submitted the written portion of the assessments on canvas. Students received feedback from instructors through canvas. Students' assessments helped us understand how they interpreted the assessment and met learning objectives.

3.5.3 Survey. Students completed 4 surveys. Three were after each assessment session and one gathered their co-construction experiences. The post-assessment survey asked students what they enjoyed most and least about the assessment, their sentiments surrounding co-construction, how they believed their opinions were valued, their experience using Wordplay, and any suggestions. The co-construction survey focused on what aspects of co-construction were their favorite parts, what was confusing, if they felt empowered, and if they would like to do co-construction in other courses such as math, science, or English class.

3.5.4 Interviews. The 1st author conducted interviews with students during the last week of classes. She utilized students' survey responses and notes during co-construction to design questions about their participation. She asked how co-construction impacted their experience with assessments, what encouraged their participation, what motivated them to continue participating, and how they believed their participation changed over time. The interviewer took detailed notes to capture student responses. The interviews helped us understand how students overall experience with co-construction and incorporating student voice into assessment design.

3.6 Data Analysis

Our analysis follows the arguments of Hammer and Berland [12], who argue that qualitative thematic analysis produces interpretative claims about data, not data itself. Therefore, instead of reporting inter-rater reliability, we discuss our analysis process and disagreements that arose.

To understand how students take up or resist agency during co-construction, we conducted inductive qualitative coding on our data. We first identified students' actions during activities and developed codes describing how they used agency to design assessments. The analysis team then met to discuss codes and resolve disagreements; none arose in this round. Next, we analyzed student sentiments from survey reflections and interviews, coding what they liked about the process. The team again met to resolve disagreements, which centered on whether evidence sufficiently supported codes. Although some data suggested differences in motivation to participate, we did not code motivation because the data did not adequately explain motivations across instances. Finally, the team used both codebooks to inductively generate broader themes explaining how students took up or resisted agency during co-construction; no disagreements occurred at this stage.

4 Results

Our analysis produced 4 themes demonstrating how students took up or resisted agency while co-constructing assessments, revealing what encouraged or discouraged student participation. We present each theme and representative vignettes as evidence.

4.1 Instructor-student relationships fostered participation in assessment design

It was imperative instructors and students trusted and respected each other so they could participate in co-construction.

Vignette 1: Fostered community. In the 1st week of class, instructors focused on helping students build relationships to facilitate the co-construction process and create a classroom culture. Instructors created various activities blending elements of culture, technology, and computing. One activity involved identifying AI-generated versus real images of food, jewelry, and places, which students then used to decode a message. A simple activity that put students' cultural knowledge as a resource needed to complete the activity sparked lively discussions, with students carefully analyzing the images and pointing out inconsistencies. For example, a Mexican student noted that a image with tacos was AI-generated because it only contained salad, prompting others to point out additional flaws. This community-building laid a foundation for collaboration but did not fully alleviate students' hesitancy in the first co-construction session.

After the community building activities, the instructor explained what co-construction was and how we will be using it to design assessments. Initially, the instructor believed the students understood what would be required of them and feel comfortable participating. However, during the assessment 1 co-construction session, many students were very hesitant to participate and were quiet. Some mentioned they liked the first option because it did not require students to talk in front of the class and they would be able to practice programming in Wordplay more. Instructors agreed with students and they seemed visibly relieved. The instructors agreed because they wanted students to know they cared and trusted their decisions. Other students asked what parts of the assessment they were allowed to change and what needed to stay the same. Students expected instructors to guide how they participated and did not completely trust the co-construction process. During the interviews, one student mentioned that they initially thought instructors wanted to use co-construction because instructors were not prepared with assessments for the course. This shows the importance of clearly demonstrating why instructors care about student voice.

Students wanted community and collaboration. When creating the assessment policies, the policies they were interested in was how they can work with their peers. They wanted to share code with each other if the students did not copy each other. Additionally, students created policies for the gallery walk. Students wanted to require that they gave feedback to at least 3 other students, were on time, and prepared. Instructors believed, the gallery walk was a great opportunity for students to learn about other students. Additionally, they were able to interact with their programs and learn more about each other culture. One Latine student discussed during the interviews how they liked being able to see other Latine students' work during assessment 2 because the other students would say things differently in Spanish. These contributions showed how students directed their energy toward embedding community and cultural exchange into the structure of assessments.

During assessment 1 reflection, students discussed how using their voice made them feel valued and more confident when completing assessments. One student who was more apprehensive during the co-construction sessions said:

> *"I felt that my ideas for assessment 1 and assessment 1 guidelines were valued because the ideas for the guidelines I had for how the assessment could look like were being considered. Also, when we were discussing about the assessment guidelines we had a group agreement."*

Another student who appreciated giving their input stated:

> *"Keep asking the class what we want, I think that's very considerate and a good idea because it builds trust with the teacher and students, and the students can feel like there are no surprise assessments or something along those lines."*

Vignette 2: *Gained students' trust.* By the time we reached the co-construction of assessment 2, the instructors were more knowledgeable of how students participated. For assessments 2 and 3, instructors prioritized community building, trust, and individual reflection to increase student participation. For example, designing the interactive input assessment took multiple days as students analyzed its requirements to determine what they could complete and what needed changes. They were able to explain how some parts of the assessment could be difficult to complete based on time because it required research and students had limited time during class. While instructors believed the research was manageable, they adjusted the assessment to support students' needs. One student discussed how they wanted to tailor assessments to fit their needs because "*It made me enjoy what I was doing*". By giving students agency, they were more motivated to work on the assessment. One student mentioned "*I feel like having control over the decision making of assessments made it a lot easier to complete assessments*." After the final assessment, one student who was more apprehensive about the course shared they were comfortable, they said:

> *"I now know that I have people around me that want to help me and want me to succeed."*

4.2 Affirming students lived experiences and knowledge

Students were more willing to participate in co-constructing assessments when they believed their voice mattered. After establishing trust, it was imperative students consistently saw their perspectives impacting assessments and the overall course. This led to fruitful discussion surrounding culturally relevant assessments, increased self-efficacy and allowed students to guide instruction.

Vignette 1: Students created culturally responsive assessments. Rather than instructors making assumptions, students determined which forms of cultural expression were meaningful in assessments. For the first assessment the instructor wanted students to create a project that incorporated poetry from their culture into the assessment. While some students had ideas for culturally relevant poetry, others said poetry was not significant in their culture or were unfamiliar with it. Some preferred using song lyrics as those were popular in their culture. Other students loved music from other cultures or wanted to write their own poem. The instructors embraced these diverse preferences, allowing students to include any written work, such as song lyrics, poetry, or book excerpts.

Students made decisions about the assessment based on what could apply to their culture. During the second co-construction session, they found the story-based assessment limiting to some students' culture due to its reliance on Unicode characters. However, the chatbot assessment was a more feasible option to include everyone's culture and allowed students to think creatively about what questions the chatbot could answer. One student shared that researching their Dad's culture for the assessment helped them feel more connected to their heritage: "*I get to explore my culture deeper, and it's nice to be more educated on my personal culture*." Here, co-construction gave students time to reflect and find how computing was related to their culture.

Vignette 2: Increased self-efficacy. It became evident that a primary driver of students' voice in shaping requirements was trying to align their expectations with their self-efficacy. In the 2nd co- construction session, students were overwhelmed by the number of different inputs they learned. Students had the most trouble grasping using the input stream `Time`. The instructor had a difficult time teaching `Time` and needed to take a break and come back to it for the next session, and it was the last input students learned and had very little practice with it before the co-construction session. When the instructors presented students with assessment choices it required students to use 4 of the 5 input streams. Many students did not feel comfortable using `Time` and wanted more choice in which inputs they used in their program. Students proposed that they would only be required to use 3 of the 5 inputs. The instructors understood students' worry but saw this as an opportunity for learning. The instructors wanted students to understand their needs are heard by giving them more opportunities to practice before finalizing the assessment. Students became more comfortable with using Time, then were more confident doing 4 of the 5 inputs and were excited to use many different inputs. A student described how co-construction of assessments motivated them to improve.

> *"Making decisions about the assessment influenced my understanding on the course material by choosing on what I wanted to work on and improve on."*

This demonstrated how co-construction increased students' self-efficacy by supporting them through understanding difficult topics and making space for opportunities for learning.

Vignette 3: Collaboration improved students' self-efficacy. While self-efficacy was key in negotiating assessment 2, it became even more prominent in assessment 3. During the 3rd co-construction session, students were eager to create games. Students were thinking of making quiz games about their culture (e.g., lotería, badminton, and a k-pop lyrics quiz). Students only had a week to complete this assessment, which included the requirement of adding or completing a function in their game. With only 4 sessions left, some students were anxious about completing the assessment on time. Students expressed that they wanted to work

in groups to help each other. Instructors thought this was a great idea and many groups were able to complete their games. This demonstrated how students were able to advocate for themselves and use collaboration to be able to meet assessment learning objectives.

Vignette 4: Students guided instruction. Students gave instructors direction of new concepts they would like to learn, helping guide instruction to fit their interests. During the second co-construction session, some students expressed interest in creating a game for an assessment. They discussed different things like how they could use certain Wordplay functions such as `Random` to move objects in different positions. Other students were interested too but then started to question whether they had the skills to create certain game components in Wordplay, like keeping score. The instructor proposed creating games for the next assessment if students felt unready. Students agreed, and the instructor took note of that for the next assessment. This demonstrates how aligning the learning content to students' interests helped them find new possibilities and recognize practical applications of their skills.

4.3 Assessment criteria limited conversations, dictating how students chose to advocate

Instructors used guiding questions and specific requirements to clarify the assessment and to help guide conversation. While these criterions guided discussion, students treated them as a checklist, limiting the aspects of the assessment they chose to change.

Vignette 1: Students wanted direction. For the 1st assessment, instructors set few criteria to encourage students to explore various possibilities and actively participate in the co-construction process. The instructors saw that the students did not have enough direction on what aspects of the assessment could be changed and had little discourse on changing the assessment topic or requirements. Instead, students focused on aspects such as the due date or resources they could use during the assessment. One student who was confused during the first co-construction discussion:

> *"What was confusing the first time was when there wasn't enough detail in the assessment of what was the expected outcome."*

The instructors felt the assessment's open-ended requirements led to varied complexity and creativity in student work. Another student discussed they wanted to be able to reflect individually:

> *"A suggestion I have for the class creation process is having the chance to first brainstorm on your own about how you sort of want the assessment to look like and then share in groups or to class."*

This demonstrates how little criterion and detail impacted students' ability to participate in co-construction. Students needed some facilitation to be able to get conversations started.

Vignette 2: Limited students' participation. To help guide students, the instructors added more requirements to the proposed assessments to help students understand the requirements. Students were surprised by the number of requirements and focused on discussing their necessity and how to meet them, rather than changing them. While this helped clarify the instructors' reasoning, it limited creative discussion. Instead, students analyzed each requirement and tried to interpret why each requirement was necessary in the assessment. Some students discussed how much time each assessment would take. Other students discussed how they did not like vague guidelines, such as including "creativity." The instructors and students discussed how they could explain their creativity through the research they did or the topics they created their program on. The instructors were surprised no other aspects of the assessment changed because they believed the added requirements would encourage critical thinking. This showed that rigid constraints limited students' creative thinking, narrowing the scope of their discussion.

4.4 Students turned to the instructor for conflict resolution when they could not agree

During the co-construction sessions, there were times students could not agree. When this happened, they turned to the instructor for guidance, and they used various approaches to resolve conflict.

Vignette 1: Reassurance. During co-construction sessions, students sometimes disagreed on changes. During the 1st session students had trouble determining the due date for the assessment. Some students stated it should be one week after the co-construction session, while others stated it should be two weeks. Students turned to the instructor and asked what the instructor believed should be the due date. The instructor chose a 1-week deadline, as it was favored by most students and would keep them on track for the course. Some students expressed nervousness about meeting the deadline. The instructors reassured students and said that if they needed more time, we could extend the deadline. Students visibly looked more relieved after the instructors reassured them and all students were able to finish the assessment by the due date. One student said "*I had to compromise. It was fine because we wanted an assessment that worked for everyone*." This demonstrated how instructors needed to assure students that they would get the support they need to succeed even if their preference was not selected.

Vignette 2: Students compromise. During the 3rd co-construction session, students discussed the requirement to create a function for their game. Many were unsure about their ability to do so, but one student argued that it was important to demonstrate their learning of functions because it was the main topic that students learned that week. The instructors agreed with the students but also needed to consider the wants of most students. Instead of deciding for students, the instructors asked students to consider in groups how they would want to demonstrate their knowledge of functions. Some groups suggested that students who did not incorporate a function into their game could complete a function for a game the instructors created. This demonstrated how the instructor plays a vital role in conflict resolution by helping students find solutions to conflicts.

5 Discussion

Together, these findings reveal that students' participation in assessment co-construction was shaped by choices about instructional structures, strongly influencing how students took up or resisted agency. These findings reveal the importance of trust building and fostering community before eliciting student voice. They show that students' participation changes when instructors affirm their lived experience and knowledge. Moreover, we found that structure can invite or discourage negotiation and discourse about assessments, requiring a balance between guidance and freedom. Lastly, we found that navigating conflicts between students was essential to creating safe spaces for disagreements to sustain agency.

There are many limitations in this study that may impact the generalizability of our findings. First, the study was conducted in a small elective course over a 6-week period. The shortness of the course and the few assessments could be unrealistic for other computing courses that have longer classes. Additionally, the instructors also served as researchers, giving them insight into both roles and prompting course adjustments to encourage participation.

With these limitations in mind, these findings have many implications for the broader literature on student voice and equitable computing assessments. Across our findings, students' uptake of agency during co-construction varied depending on if students trusted instructors that their decisions could impact assessment design and if they believed decisions they made could support their interests. This reinforces prior work by emphasizing the importance of positioning students as legitimate contributors to educational decision-making [7, 10], and extend it by demonstrating that student voice is a evolving process that necessitates clear communication, trust, and multiple opportunities to elicit student voice.

Additionally, while critical student voice scholarship highlights the role of power in shaping whose voices are heard [13, 32], our study provides detail on how power is actively negotiated when instructors redistribute authority. Specifically, our findings demonstrate how students give up power when constraints and too much structure are imposed. Instructors must find a balance between providing structure and giving room for students to participate and have impact over assessment design.

In contrast to participatory approaches that emphasize minimal instructor involvement or "hands-off" facilitation, such as some implementations associated with constructionist classrooms [15, 24], our findings demonstrate instructor mediation and participation enables students to compromise. During conflict, students no longer wanted to participate and turned to instructors to mediate conflict. Mediation can maintain participation, without disrupting agency by teaching compromise and stabilizing risks associated with agency.

Lastly, our findings show assessment is a way for students to express their identity and culture. These findings suggest that attending to students' cultural knowledge and affirming students' actions and perspectives as legitimate sources of insight can inform the design of assessments that better support students' learning and confidence, reinforcing prior arguments that legitimizing students' lived experiences can support learning in computing [13, 28].

Future research should explore how different instructor mediation practices can impact how students' participation changes throughout co-constructing assessments. Moreover, we must examine how different approaches can impact students' emotional well-being, perceived risk, and self-efficacy to increase participation. Future research should investigate how to prepare instructors to share power with students and understand better ways to support conflict and negotiation between students.

Our findings have many different implications for practice. Overall, they show that key to equity is intentional, reflexive engagement with power, negotiation, and shared decision-making. This suggests that for teachers to use assessment co-construction to include student voice in assessment design, they must scaffold this process, using examples to surface possibilities, but make it known that the assessments can change. Additionally, teachers should align assessment design with skills students are most confident and proud of. Moreover, constraints in the assessment scaffolding can be beneficial to have conversation but should not be a checklist of what students should be discussing. Teachers should be prepared to mediate conflict without discouraging future participation.

As teachers explore assessment co-construction methods, and research advances our understanding of how, this work advances a view of more equitable computing assessments as an orchestrated negotiation between instructors and students rather than simply giving students power in assessment design. This is just one part of shifting computing assessments norms from strictly instructor-designed structures towards assessment design that deliberately engage trust-building, opportunities for students to define relevance, and a role of instructor not as final decision maker, but one of facilitator, of conflict arising from tensions between the diversity of instructor and peer needs. This change is one that will give students agency and ensure that every student has what they need to learn.

6 Acknowledgments

This material is based upon work supported by the National Science Foundation under Grant No. 2417014, 2031265, 2100296, 2122950, 2024372363 and unrestricted gifts from Microsoft, Adobe, and Google.

References

[1] Edith Ackermann. 2001. Piaget's constructivism, Papert's constructionism: What's the difference. *Future Learn. Group Publ.* 5, 3 (2001), 438.

[2] Catherine Bovill. 2017. A framework to explore roles within student-staff partnerships in higher education: Which students are partners, when, and in what ways? *Int. J. Stud. Partn.* 1, 1 (2017), 10–14.

[3] Manisha Kaur Chase. 2023. Effects of Student Voice Intervention in STEM Classroom Assessment on

Psychosocial Outcomes. *Res. Pract. Assess.* 18, 2 (2023), 65–85.

[4] Chen Chen, Gerhard Sonnert, Philip M Sadler, and David J Malan. 2020. Computational thinking and assignment resubmission predict persistence in a computer science MOOC. *J. Comput. Assist. Learn.* 36, 5 (2020), 581–594.

[5] Jerusha Conner, Dana L Mitra, Samantha E Holquist, and Ashley Boat. 2025. How teachers' student voice practices affect student engagement and achievement: exploring choice, receptivity, and responsiveness to student voice as moderators. *J. Educ. Change* 26, 1 (2025), 89–118.

[6] Alison Cook-Sather. 2006. Sound, presence, and power:"Student voice" in educational research and reform. *Curric. Inq.* 36, 4 (2006), 359–390.

[7] Alison Cook-Sather. 2006. 'Change based on what students say': preparing teachers for a paradoxical model of leadership. *Int. J. Leadersh. Educ.* 9, 4 (2006), 345–358.

[8] Jayne Everson, F Megumi Kivuva, and Amy J Ko. 2022. " A Key to Reducing Inequities in Like, AI, is by Reducing Inequities Everywhere First" Emerging Critical Consciousness in a Co-Constructed Secondary CS Classroom. In *Proceedings of the 53rd ACM Technical Symposium on Computer Science Education-Volume 1*, 2022. 209–215.

[9] Jayne Everson, Rotem Landesman, F. Megumi Kivuva, and Amy J. Ko. 2025. Dreaming of Difference: Imagining the Future of CS Education Pedagogy with Secondary Students. In *Proceedings of the 2025 ACM Conference on International Computing Education Research V.1* (*ICER '25*), 2025. Association for Computing Machinery, New York, NY, USA, 394–406. https://doi.org/10.1145/3702652.3744203

[10] Adam Fletcher. 2005. Meaningful student involvement: Guide to students as partners in school change. *Olymp. WA SoundOut Books* (2005).

[11] Paulo Freire. 2020. Pedagogy of the oppressed. In *Toward a sociology of education*. Routledge, 374–386.

[12] David Hammer and Leema K Berland. 2014. Confusing claims for data: A critique of common practices for presenting qualitative research on learning. *J. Learn. Sci.* 23, 1 (2014), 37–46.

[13] Asao B Inoue. 2015. *Antiracist writing assessment ecologies: Teaching and assessing writing for a socially just future*. Parlor Press LLC.

[14] Seyed ISMAIL, D.R Rahul, Indrajit Patra, and Rezvani. Formative vs. summative assessment: impacts on academic motivation, attitude toward learning, test anxiety, and self-regulation skill - ProQuest. Retrieved April 15, 2026 from https://www.proquest.com/docview/2713128815?pq-origsite=gscholar&fromopenview=true

[15] Yasmin B Kafai. 2006. Playing and making games for learning: Instructionist and constructionist perspectives for game studies. *Games Cult.* 1, 1 (2006), 36–40.

[16] F. Megumi Kivuva, Jayne Everson, Camilo Montes De Haro, and Amy J. Ko. 2024. Cultural-Centric Computational Embroidery. In *Proceedings of the 55th ACM Technical Symposium on Computer Science Education V. 1* (*SIGCSE 2024*), 2024. Association for Computing Machinery, New York, NY, USA, 673–679. https://doi.org/10.1145/3626252.3630818

[17] Amy J Ko, Carlos Aldana Lira, and Isabel Amaya. 2025. Wordplay: Accessible, Multilingual, Interactive Typography. In *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems*, 2025. 1–20.

[18] Amy Ko and Anne Beitlers. *Critically Conscious Computing: Methods for Secondary Education*. Retrieved July 3, 2024 from https://bookish.press/undefined

[19] Shao-Heng Ko, Alex Chao, and Violet Pang. 2025. Satisfactory for All: Supporting Mastery Learning with Human-in-the-loop Assessments in a Discrete Math Course. In *Proceedings of the 56th ACM Technical Symposium on Computer Science Education V. 1* (*SIGCSETS 2025*), 2025. Association for Computing Machinery, New York, NY, USA, 589–595. https://doi.org/10.1145/3641554.3701854

[20] Gloria Ladson-Billings. 1995. Toward a Theory of Culturally Relevant Pedagogy. *Am. Educ. Res. J.* 32, 3 (September 1995), 465–491. https://doi.org/10.3102/00028312032003465

[21] Susan Lyons, Mark Johnson, and Fiona Hinds. A Call to Action: Confronting Inequity in Assessment.

[22] Tia C. Madkins, Nicol R. Howard, and Natalie Freed. 2020. Engaging Equity Pedagogies in Computer Science Learning Environments. *J. Comput. Sci. Integr.* 3, 2 (2020), 1. https://doi.org/10.26716/jcsi.2020.03.2.1

[23] Nadia Najjar, Debarati Basu, Tess Hagstrom, and Liam Custer. 2025. Assignment Resubmission: Examining Student Perception and Performance in Public and Private Institutions. In *Proceedings of the 2025 Conference on Research on Equitable and Sustained Participation in Engineering, Computing, and Technology*, 2025. 236–244.

[24] Seymour A Papert. 2020. *Mindstorms: Children, computers, and powerful ideas*. Basic books.

[25] Seymour Papert and Idit Harel. 1991. Situating constructionism. *constructionism* 36, 2 (1991), 1–11.

[26] David Phelps and Rafi Santo. 2021. Student leadership, systems change: Opportunities and tensions for youth impact on district-wide computer science initiatives. *ACM Trans. Comput. Educ. TOCE* 21, 4 (2021), 1–39.

[27] Carol Robinson and Carol Taylor. 2013. Student voice as a contested practice: Power and participation in two student voice projects. *Improv. Sch.* 16, 1 (2013), 32–46.

[28] Jean J Ryoo, Tiera Tanksley, Cynthia Estrada, and Jane Margolis. 2020. Take space, make space: How students use computer science to disrupt and resist marginalization in schools. *Comput. Sci. Educ.* 30, 3 (2020), 337–361.

[29] Kimberly A. Scott, Kimberly M. Sheridan, and Kevin. Full article: Culturally responsive computing: a theory revisited. Retrieved April 15, 2026 from https://www.tandfonline.com/doi/full/10.1080/17439884.2014.924966

[30] Kimberly A Scott and Mary Aleta White. 2013. COMPUGIRLS'standpoint: Culturally responsive computing and its effect on girls of color. *Urban Educ.* 48, 5 (2013), 657–681.

[31] Eman Sherif, Jayne Everson, F Megumi Kivuva, Mara Kirdani-Ryan, and Amy J Ko. 2024. Exploring the Impact of Assessment Policies on Marginalized Students' Experiences in Post-Secondary Programming Courses. In *Proceedings of the 2024 ACM Conference on International Computing Education Research-Volume 1*, 2024. 233–245.

[32] Carol Taylor and Carol Robinson. 2009. Student voice: Theorising power and participation. *Pedagogy Cult. Soc.* 17, 2 (2009), 161–175.

[33] Elise Trumbull and Andrea Lash. 2013. Understanding formative assessment: Insights from learning theory and measurement theory. *San Franc. WestEd* (2013), 1–20.

[34] Robbie Weber. 2023. Using alternative grading in a non-major algorithms course. In *Proceedings of the 54th ACM Technical Symposium on Computer Science Education V. 1*, 2023. 638–644.

[35] David Weintrop, Merijke Coenraad, Jen Palmer, and Diana Franklin. 2019. The teacher accessibility, equity, and content (TEC) rubric for evaluating computing curricula. *ACM Trans. Comput. Educ. TOCE* 20, 1 (2019), 1–30.