The Intersectional Experience of Black Girl High School Students in Advanced Placement Computer Science

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Abstract

Equity and diversity issues persist in computer science education. Prior research has identified marginalizing factors prevalent in the computing fields that discourage women and people of color, while also highlighting experiences that help them persist. Extending prior studies and applying an intersectional lens, this study aims to center the voice of Black girl high school students and present their experiences taking Advanced Placement (AP) Computer Science (CS) courses. We investigate how and why they persisted by conducting semi-structured interviews with eight Black girl students who have completed at least one AP CS course, and connect their stories to prior work. Applying situated expectancy-value theory (SEVT), our findings reveal examples of marginalizing and empowering social interactions within learning environments, students' awareness and active construction of social support networks, and conscious effort to resist inequity as motivation for studying CS. Our findings build upon prior studies of Black women's experiences in post-secondary and computing careers, and extend this research to secondary education contexts.

CCS Concepts

• **Social and professional topics → K-12 education**.

Keywords

Computer science education; intersectionality; broadening participation; APCSA; APCSP

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1 Introduction

Equity and diversity issues persist in computer science education. In 2021, only 21.5% of the students enrolled in undergraduate CS programs across the reporting institutions were women, 14.6% were Hispanic/Latinx, and 10.4% were Black, all relatively underrepresented compared to the overall undergraduate population [36]. There have been initiatives to recruit and retain Black girl students in undergraduate CS courses with mixed results, in large part due to inequitable access to programming experiences in K-12 education which leaves underrepresented students more likely to struggle in post-secondary classes [29, 32].

While a significant amount of CS education research is directed at post-secondary education, as the CS education pipeline extends to earlier grades, CS education equity in high schools requires more scrutiny. In Advanced Placement (AP) Computer Science A (CSA) and Computer Science Principles (CSP), both courses which prepare high school students for college-level computer science, the extent of underrepresentation of Black girl students is stark. Despite making up 7.5% of all US public school enrollment in 2022, Black girl students constituted 1.4% of AP CSA and and 3.1% CSP exam-takers that year [12, 25].

CS education equity is a persistent and complex issue, encompassing factors along multiple dimensions , such as the capacity of schools to teach CS, the accessibility of CS courses to students, the participation rate of students, and the experience of students in CS classrooms [15]. To recognize the complexity and diversity of individual lived experiences navigating the CS education system, this study takes a qualitative approach and applies an intersectional lens. It also seeks to avoid deficit framings that attribute marginalization to individual identities. Using semi-structured interviews and presenting the findings as case studies, we seek to privilege the voice of Black girl students, explore their lived experiences holistically, and understand the experiences by applying situated expectancy-value theory (SEVT), a framework that integrates both expectancy constructs (e.g. self-efficacy, goals, social identities) and value constructs (e.g. interests, motivations) [11]. This study seeks to answer the following research question:

RQ. How and why do Black girl high school students persist in AP Computer Science courses?

This study makes contributions to the current body of knowledge in three ways. It extends previous interview studies that explore Black girl CS students' experiences in post-secondary institutions and workplace environments by focusing on AP CS learning environments. As admission to undergraduate CS programs becomes increasingly competitive it is increasingly important for students to have exposure to programming before post-secondary. Consequently, inequities in high school can be transferred and amplified in higher education [26]. We also apply SEVT to understand the experiences of high school AP computer science students [11]. While traditional expectancy-value theory has been influential, accounting for the situated nature of student experiences can grant new

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insights. Lastly, this study complements the larger-scale quantitative findings about the importance of social support to CS students by focusing on detailed social interactions [2].

2 Prior Work

2.1 Inequalities in CS Education

Underrepresentation of women and people of color in computer science education is persistent and has complex causes. One framework to help understanding the different dimensions of CS education equity is CAPE, which identifies the four components of capacity, access, participation, and experience [15]. In terms of capacity and access, residential segregation and the resulting inequitable distribution of education resources cause schools serving large populations of students of color to be less able to offer advanced CS courses [19]. Educators, such as principals and counselors, can become gatekeepers of CS . They can actually discourage women and students of color from taking CS due to stereotypes about who succeeds in CS [22]. Within CS classrooms, minoritized students can face oppressive learning environments, where they experience cultural imperialism, marginalization, exploitation, and other forms of discrimination [19, 23]. At the individual psychological level, women and students of color often express less self-efficacy, interest, and sense of belonging regarding CS compared to their White male peers [4, 20]. This study focuses on student's individual lived experiences, but will situate those experiences within their learning environments and sociocultural backgrounds.

2.2 Intersectionality

In a simplified perspective, intersectionality matters to studying underrepresentation in STEM because women of color face a 'double disadvantage', i.e. being marginalized due to both gender and race/ethnicity identities [3, 27]. However, while it is viable to quantitatively measure student outcomes based on intersectional gender and racial categories, the lived experiences of people are in no way homogeneous within each group identity [14, 28]. Neither does intersectionality merely entail an 'addition' of identities, as gendered racism is not merely the additive effects of sexism and racism [9]. As such, applying an intersectional lens requires understanding how youths' social experiences are influenced by culturally constructed identities, such as their gender and race, and how they consequently construct their own identities and perspectives [3, 18].

Specific to broadening participation in computing, a quantitative survey study of college students found that fewer Black women report being introduced to CS via family or friends and were more often being introduced to computing at school, compared to Black men and non-Black women [34]. The same study reports that being introduced to CS at school is negatively correlated with CS career retention, and the authors emphasized the importance of Black women making CS friends at school [34]. Within CS classrooms, gendered racism faced by Black women is not effectively addressed by various gender-focused interventions [29, 31, 33, 38]. Interview studies with Black women studying CS in college or working in the tech industry surface the prevalence of marginalization in CS environments, such as the expectation from others to stay silent and not raise questions [30, 31]. Conversely, researchers found that empowering environments, such as historically Black college and universities (HCBUs), can help promote Black women's participation and retention in CS [21]. Furthermore, marginalized intersectional identities should not be understood merely as risks, but also as strengths and empowering forces [24]. Thus, this study adopted the intersectional computing perspective, which recognizes the diversity of lived experiences within the field of computing and centers the voices of Black girl high school students.

3 Methodology

3.1 Recruitment

After receiving IRB approval, we recruited interviewees in two ways. Some interviewees were participants in 'Sisters Rise Up,' a free program that offers remote help sessions to students in AP CS courses led by near-peer undergraduate mentors [13]. Recruitment emails were sent to previous participants who have finished CSP. Other interviewees were recruited via AP CS teachers to students who finished their courses. Interested students were asked to complete an assent form and have their parents complete a consent form. They were also asked about their age, grade, gender, and racial/ethnic identity (checking all that apply from US census categories). Upon receiving full assent and consent, we scheduled and conducted the interviews. The students were given a $30 gift card after completing the interviews.

In total, eight of the interviewed students self-identified as Black and female. Among these students, three were high school juniors, four were high school seniors, and one was a college first-year student. At the time of being interviewed, P5 and P8 had finished CSP but not CSA, P2 and P4 finished CSA but not CSP, and the others finished both CSP and CSA. Table 1 presents the AP course contexts of the students.

3.2 Data Collection

The first author conducted one-hour semi-structured interviews with the students over Zoom. The interview protocol was informed by previous research on CS student persistence and Black women's intersectional experiences [10, 24, 29, 34]. It included questions that have been found to affect persistence in CS, such as family, peer, and teacher support. It also included psychological constructs including sense of belonging, self-efficacy, and interest. The interview protocol was tested during three pilot interviews with previous participants of Sisters Rise Up and revised by adding questions about the students' access to CS courses at school and their future plans related to CS. The interview protocol was roughly divided into four sections, with example questions shown in Table 2.

3.3 Analysis

Several aspects of this study make a case study analysis approach ideal. These include that this study does not involve an intervention, includes participants from extremely diverse contexts, and was exploratory [5]. The learning context is crucial and inseparable from the phenomena (persistence in CS). Since the interviewed students shared both similarities and differences in how they persisted, the cases will be compared and contrasted to highlight the students' respective learning environments and experiences.

To analyze the data and prepare the case studies, the first author processed the interview data through multiple stages. While

Student	School Size	CS Class Size	School Demographics	CS Class woman students	CS Class Racial Demographics
P1	3,000	20 in CSP and CSA	diverse, 25% White	3/20	diverse, 25% White
P2	4,000	20 in CSP and CSA	diverse, large South- and East-Asian populations	4/20	2 Black students, diverse
P3	1,500	30 in CSP, 20 in CSA	majority White or Asian	4/30 in CSP, 2/20 in CSA	majority White or Asian
P4	300	10 in CSP and CSA	majority White, 6 Black students	even split in CSP, 8/10 in CSA	majority White
P5	500	9 in CSP	majority Hispanic/Latinx, large Black populations	3/9	7 Hispanic/Latinx, 2 Black
P6	2,000	10 in CSP and CSA	majority Black	1/10 in CSA	majority Black
P7	2,000	20 in CSP, 28 in CSA	majority Black	8/28 in CSA	majority Black, a few Asian students
P8	500	13 in CSP	majority Hispanic/Latinx, large Black populations	3/13	7 Black, 1 Arab, 5 Hispanic/Latinx

Table 1: School and CS Classroom Information of the Interviewed Students

Interview Section	Example Question
Exposure to CS	What motivated you to take your first CS course?
Classroom practices	What book(s) or instructional videos did you use?
Social experiences	Did you make friends with others in the class?
Future plans	Do you plan to choose CS major in college?

Table 2: Example questions from the interview protocol

conducting the interviews, the first author took brief field notes while speaking to the students to highlight noteworthy experiences and interesting comments [1]. After each interview, the first author reviewed the field notes and wrote memos.

To ensure the validity and reliability of the analysis, we applied Birt et al.'s Synthesized Member Checking method [6]. Each interviewee's included quotes and the study's analyses and conclusions were sent back to them for comments and feedback. All eight interviewees responded to the member checking request and all agreed the quotes were accurate and the analyses were reflective of their experiences.

3.4 Positionality Statement

The first author, who led the collection and analysis of data, is an East Asian male PhD student. The second author is a faculty member, who sent out recruitment emails but did not interact with the interviewees. The first author has no lived experience in the US secondary education system. During the interview process, the first author approached the conversations with an outsider positionality that influenced the questions he raised and the course of the conversations. The positionality of the first author influences his ability to qualitatively analyze the data, likely introducing biases and assumptions. As such, this study does not attempt to speak on the students' behalf or make interpretations without the students' input. Instead, it centers the voice of the students, invited the students to review the quotes and analysis, and connects the results with the findings of other scholars.

4 Case Studies

This section will focus on the cases of three of the students to illustrate their distinctive experiences. The other students' accounts will be referenced in the cross-case comparison section to complement these cases.

4.1 P1's Experience

P1 came from an immigrant family in California, where she attended a high school that serves a racially diverse population of 3,000 students. When she entered high school, her parents originally encouraged her to pursue a medical career, but P1 thought *"the doctor idea wasn't really my idea, it was mainly my parents… I had sort of an idea of what I like, but I didn't know really."* When it was time to choose elective classes, P1 initially found that nothing really interested her in her course catalog, until she happened upon a TikTok video: *"I was scrolling. I remember it was this one that said 'best fields to go into if you don't know what you want to do.'… the top one was computer science. And so I was like, 'oh, there's a computer science class at the school, so I might as well take it.'"*

P1 told her parents about her choice, and her parents were supportive of it. P1's school offered AP CSP and CSA, taught by the same teacher, two game development courses, and an IT course. Due to the size of her school and the large number of classes, *"computer science wasn't something that was very much promoted,"* according to P1. She eventually completed both CSP and CSA sequentially.

When asked about how she remembered interacting with her peers in her classroom, P1 first recalled her experience when taking CSP: *"I think I was the only freshman in the class, because most of the class of computer science was taken by upperclassmen, so like juniors and seniors. There were two other sophomores. So it was me, two other sophomores, and then everyone else was a senior… I only talked to one of the sophomores. I didn't talk to anyone else, because I kind of felt intimidated I guess, because they were all seniors."*

Reflecting on her experiences taking CSP, she noted that *"none of my friends were taking it. I didn't have any friends in the class, and I was really quiet."* Before starting to take CSA, she decided to *"encourage my friend to do it with me"* and talked to a friend who took one of the game development courses: *"I really didn't have anyone else. I really begged her. And honestly, I think it was mainly the idea of a grade bump (at many high schools AP classes are more heavily weighted during GPA calculation) that got to her… I told her about that. I was like, 'it's a grade bump, and then we can help each other and be partners on the projects.' And so she took it with me."*

However, after completing CSP and CSA, no more advanced CS courses were available, leaving P1 uncertain if she should commit to studying CS: *"For the next two years, we have no more computer science classes, because it's only Principles and A, so it didn't really inspire me to start going into more of a field of technology and less medicine, like I originally was thinking."*

P1 attributed her current motivation of taking more CS courses to the friend that she convinced to take CS together: *"Honestly, it's really my friend. She really enjoyed computer science just as much as I did. And I think both of us are planning to at least have some of it in the future. And so both of us kind of motivate each other into doing it."*

4.2 P3's Experience

P3 went to a high school with a majority White or Asian population in Indiana with 1,500 students. Her school offered CSP, CSA, and a cybersecurity course. According to P3, people at her school, such as the principal and counselors, encouraged students to take CSP, but not necessarily CSA, resulting in over 100 students per year taking CSP across four periods, while CSA had around 40 students in total: *"I feel like a lot of people are told to take CSP, but CSA is for someone who actually wants to do it. And at my school, I don't think most people are interested in it at all. We do have a lot of robotics kids and kids interested in STEM, but those are like a typical demographic. Those are kids that have been doing STEM things since middle school. So I don't think a lot of kids branch out or are encouraged like, 'Hey, you should try this.'"*

P3 was not initially interested in CS. She took CSP because she needed more AP credits and her mother added the class to her schedule after receiving a recommendation from a friend working at the College Board. She recalled her mother saying *"you're gonna do computer science. Just try it."* and consequently, *"that's what I ended up doing. Not that I still feel forced to do it now. But in the beginning, that's what it was."* She also picked her CSP class period based on the teacher's gender, given that both teachers are White: *"There's a male teacher that teaches Computer Science Principles, and a female teacher. I got the female teacher, so I definitely think that impacted my success, and how I really wanted to stay in it, honestly."*

Discussing her social interactions in CSP, she remarked that *"when I'm in CSP, my table was really funny, we would make jokes a lot… I actually have people to talk to in there… A friend I made in there, I still talk to him today."* However, among all the interviewees, P3 experienced the most hostile learning environment in her CSA classroom, where she was the only Black girl student: *"I hated being in there so much… the kids in my class specifically, they would make racist jokes and say other things. And while I'm trying to learn, there's a bunch of other stuff going on that could have impacted how I felt about computer science as a whole… And my teacher, she's kind of dismissive. Like, she's not gonna laugh at the jokes, but she's gonna like, tune it out… So while boys are making a bunch of jokes and stuff, it's just like, 'oh, I hate being in here.'"*

Feeling excluded from her classroom, when asked what she would do if she was struggling with something when taking CSA, she responded: *"I'm going to be honest, if I had too much trouble with an assignment, and they got to a point where I did not know how to do it, like at all, I would just not turn it in."* For example, she recalled how she sought help when struggling with a coding project: *"One time I saw this guy on TikTok… he has a Discord server for help and stuff. I went on there and they have like a help channel. So I went in there and I said, 'Hey, I have this problem with my code.' I tried what they recommended, and it still wasn't working. When I needed help with something I might have just asked my teacher or asked a classmate, I guess. But that was a time where I just gave up completely."*

Despite her struggles, when asked if she felt like she had a sense of belonging in the field of computer science, she responded that: *"There's units where we have to learn about people in history. And I'm like, "of course, there are prominent computer scientists that are women, and a part of the LGBTQ community and Black." So looking at them, sometimes at the end of the day, there were times where I wanted to cry, because of how suffocated I felt in the classroom. But seeing other people that are successful there, if they've done all of this, I realized that, 'okay, I can still be successful in computer science,' even if people don't think I am or see me as capable of being intelligent in this field. So that was kind of my mindset."*

Looking towards her future, she had interest in both language learning and CS, and hoped she could combine her interests in college and beyond by working on language learning apps. When discussing whether she felt confident to continue to thrive in CS, she said: *"I think so. I just hope I'll be in an environment where like, I feel supported to do that… Just like friends to be there with, or people that I can relate to, that are like, 'Hey, we can work on this together.' Or just someone to guide me through the process. Because I know it's going to be super hard."*

4.3 P4's Experience

Coming from Michigan, P4 had most of her CS journey at her local math and science learning center, rather than at her high school. The math and science learning center has an application process and serves a majority White population of 300 students from surrounding communities. P4 remarked on the demographics of the center: *"I think there are around six African Americans out of 300. So it is definitely weird at times, and intimidating. But everyone is really welcoming there. So it's fine. But yeah, it's weird sometimes."* For context, her local community's demographics is more than one-fifth Black. She suggested that the strict admission policy should be made more flexible and open to younger middle school students, so they could have more time to prepare.

Hoping to have a breadth of experience and taking many STEM courses, P4 found that *"computer science [has] a lot more problem solving, instead of just memorizing."* Also encouraged by her counselor, P4 thus enrolled in the CSA course at the learning center as well.

As described by P4, the environment at her learning center positively reinforced students' interests in CS in multiple ways. For example, she further described how the previously mentioned peers passionately talked about their experiences: *"They talk about the amount of opportunities you can gain from it, and they just really like it. So I guess they would really love to push their love of CS to other people… Interested boys are always, always talking about it. You hear it every day, there's never a day where you're not hearing them talk about their CS assignments and things, that's just how they are."*

The teachers at the learning center were also relatively experienced with the discipline. When asked how many teachers taught CS-related courses at the center, P4 replied that all seven of them (one of which was an alum of the center) knew about each other's courses, and *"you could talk about anything with any teacher."*

Students at the center were all required to take CSP, and the teacher would encourage all the woman students in the class to apply for an award at the National Center for Women & Information Technology (NCWIT).

While taking CSA at the center, P4 described sometimes feeling intimidated by more experienced peers: *"I did feel intimidated because there are a lot of boys who are like 'I got it done, I'm on to*

the next USACO (United States of America Computing Olympiad, a programming competition).' I definitely felt that at my learning center, because a lot of them do practice outside of school, like they're learning Python, other languages. So they really are, they do know a lot. So I get that many students, that they felt intimidated."

Nevertheless, P4 found it easy to seek help from these passionate peers: *"it's really easier to go up to someone who you know, loves CS. As opposed to just a classmate who's required to take the course."* She also answered that she considered them her motivation for continuing taking CS: *"I think the students, my classmates that are really passionate about it, because you can go to them for questions and the likely know, or have an answer to."*

Supported by her peers, P4 sought to support others to follow her footsteps and mentored them with their applications to enter the center: *"I think the seventh and eighth graders, they're also looking to get into my math and science learning center… So a lot of them came up to me, and they're asking me questions outside of the course. It was a lot more of a mentorship. When they are at the center as freshmen, a lot of them will still wave and say 'hi' when they see me."*

Regarding her future plans, P4 was interviewing for top-tier universities, where she hoped to combine her passions in CS and neuroscience and eventually pursue a medical career. P4 believed that her computer science skills can be applied to solve real world problems and *"you can make an impact in the world if you further your education in computer science."*

5 Cross-Case Analysis

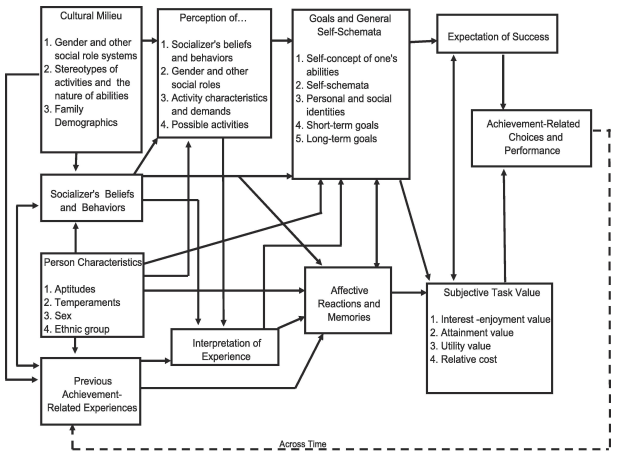


Figure 1: Eccles Expectancy-Value Model, adopted from [11]

In traditional expectancy-value theory, broad and contextual factors such as gender role systems are arranged to the left side of the framework [39]. Their influences are mediated by one's interactions with the systems in the middle of the framework, becoming internalized self-schemata and goals to the right side of the framework, ultimately shaping one's expectation of success and subjective task value [39]. When updating it to situated expectancy-value theory (SEVT), Eccles and Wigfield noted that social, cultural, and historical forces not only manifest on the left side of the framework, but are suffused across every factor in SEVT [11]. Through the theoretical lens of SEVT, we will examine the important factors that influenced the interviewees' intersectional experiences in their AP CS classrooms.

5.1 Cultural Milieu and Socializer's Behaviors

Following the SEVT, some interviewees' accounts belong to left-side broad factors in the framework, such as the cultural milieu, socializer's beliefs, and their behaviors.

P3 mentioned that her counselor did not encourage people to try CSA. P2 experienced more direct discouragement from her counselor. Living in Pennsylvania, P2 had programming experience with writing Lua scripts to build games in Roblox. However, when P2 discussed with her counselor about her interest in taking CSA, she recalled that: *[the counselor] basically just sat me down and was like, "you're gonna need a lot of time for this. It's kind of like learning a new language. So you're not just like mindless rote thinking or mindless memorization, you're gonna have to start thinking."*

In contrast, P5 and P8 had their principal actively encouraged students to take CSP. Their school is STEM-focused and served 500 students, with a student demographic of majority Hispanic/Latinx, with Black students being the second largest group. The principal would encourage students to take classes during the summer, so they could have a spot in their schedule to take CSP during the fall semester, regardless of their pathway.

The interviewees reported various negative effects. P2 reported experiencing stereotype threat, where the awareness of negative stereotypes and the pressure of not affirming them undermined her performance [35]. P2 mentioned *"last year, my CS class, there's three girls. So being in a class with, like, males, it gets kind of overwhelming because if you're in projects and you happen to not know this, you kind of feel like you have to overcompensate."*

Access to CS learning opportunities also played a significant role in encouraging or dissuading students. P1 and P2 were both limited by the lack of more advanced CS classes at their schools. While some students might be oblivious to their relative lack of opportunities and show up at a college classroom under-prepared [19], these students showed that they are acutely aware of the gap between their experiences and their future post-secondary CS peers [21, 22].

5.2 Perception and Interpretation of Experience

Based on SEVT, as students interact with socializers and the learning environment, they interpret their experiences, which in turn influences their behaviors [11]. Multiple interviewees, including P1, P5, and P8 mentioned their proactive effort of seeking peer support, as opposed to being passively influenced by their peers. For example, P1 reflected upon her positive CSP experience and realized the importance of peer support before taking CSA, and persuaded her friend to take it so they can 'be partners on the projects.' This demonstrates that she had agency over seeking support. P5 received direct social support from the principal, but she was uncertain and also sought peer support.

Lending further evidence to the idea that the interviewees were conscious of the importance of social support upon interpreting their experiences, multiple students explicitly connected their motivation to study CS or their self-efficacy with having social support. P2 and P3 both reflected on their experiences and remarked on

the negative impact of not having peer support. P3 also mentioned her hope of having social support in the future. P1, P4, and P8 all attributed their continued motivation of taking CS to their friends.

Aside from peer social support, role models also shape students' perception. P3 and P4 explicitly remarked on how their teachers' gender identity influenced their class choices. The students' attention on their teachers' gender even before taking a class aligns with findings that similar role models can help alleviate stereotype threat and increase self-efficacy [7, 8]. However, previous research on role models found that gender does not fully determine the effectiveness of CS role models; rather, the important factor is that the role model counters harmful stereotypes about CS [8]. P3's disappointment with her female teacher for not intervening on her behalf against racist jokes lends support to that finding, because even though her gender identity aligned with that of P3, her behavior affirmed harmful stereotypes about CS.

Others, like P5, reported positive role model effects from teachers. In P5's case, her teacher had industry experience, and she appreciated that he shared his experiences and advice: *He talks about his journey during his engineering years. So he was saying that he didn't like computer science at all, and had he had a better foundation of it during high school, he would have had an easier time during his college years.* Teachers as role models can be particularly impactful for high school students, because the students are at the stage of exploring and forming their identity and seeking information about whether they can succeed in different careers [7].

5.3 Affective Reactions and Goals

Moving to the right side of the SEVT framework, students form goals, self-schemata, and affective reactions based on their perceptions and interpretations of their experiences [11]. Several interviewees, including P3, P4, P6, and P8 all expressed their awareness of the extent of underrepresentation and marginalization faced by women and students of color in CS, and aligned their goal of studying CS with resisting inequity.

For instance, P6 explicitly discussed her decision to study CS after learning about how Black women are underrepresented in CS: *"I was the only girl in both my computer science classes so [the teacher] told me, there's like a big difference of girls and guys in computer science, especially like Black females. So that really got me into wanting to do something with computer science because I know there's not a lot of Black females that do computer science."* P8 also discussed how the initiatives to encourage women in STEM should be applied to all STEM fields, including CS: *"It was just three girls in my class… there should be more women in STEM. And that part of STEM (CS)…"* These sentiments demonstrate a positive and proactive response to underrepresentation. These beliefs provided attainment value based on student identities, suggesting that students developed strong social or political identity and view taking CS as aligning with their identities [11, 37].

6 Discussion

RQ. How and why do Black girl high school students persist in AP Computer Science courses despite systematic marginalization?

The interviewed students' accounts of negative experiences in their high school classrooms extend previous findings about marginalization to secondary education contexts, including psychological violence from others via exclusion and racist jokes [30], stereotype threat triggered by harmful stereotypes [23], and inequitable environments that do not address the needs of Black women [29]. They also show that problems identified in CS education in high schools persist, such as lack of access to advanced CS courses [19] and gatekeeping counselors [22].

Despite still frequently facing marginalization of various forms when studying AP CS, the interviewed Black girl high school students identified sources of empowerment in their learning environments as well, which supported their persistence. In terms of the students' experiences, interviewees who explicitly connect their persistence and motivation to their intersectional identities align with findings that students can counter marginalization by maintaining positive racial and gender identifications, self-determination, and agency [24, 30]. They also reflect a reinterpretation of the value of studying CS that aligns with their social agency and value [16, 37].

Students' active seeking of social support and awareness of the importance of social support to their persistence are similar to previous findings about Black women in CS graduate programs joining student organizations and research groups to actively build their social support networks [33]. It validates previous findings on the importance of social support in persistence [10, 34], and yields new insights into students' sense of agency over social support.

The important roles played by teachers and role models as mentioned by the interviewees are consistent with past research [29, 34]. Specifically, the frequent mentions of their teachers' gender as a salient factor before taking the class, but later adjustment of their impression based on the teacher's behaviors aligns with the previous finding of CS role models' gender being less important than their affirmation or refutation of CS stereotypes [8]. The reported importance of seeing historical role models on persistence extends the findings about peer role models and teacher role models, suggesting the effectiveness of adding historical role models to curricula as a potential role-model-based intervention [17].

7 Conclusion

This study contributes to current research by providing evidence based on the lived experience of eight Black high school girls who took at least one AP CS course. It provides insights that can help explain the results of quantitative studies, such as the effects of social support on CS student persistence. This study extends the studies that report on intersectional experiences of Black women in post-secondary CS education and the tech industry by studying students in high school contexts. By conducting semi-structured interviews with eight Black girl students taking AP CS, this study identified factors that make them feel marginalized and help them persist, notably actively seeking social support, identifying role models, and viewing resisting inequity as a subjective task value.

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