Teachers' Perceptions of Barriers Influencing African American and Hispanic Students with Disabilities' Participation in K-12 Computer Science Education

Shetay Ashford-Hanserd
Department of Organization, Workforce, and Leadership Studies, Texas State University
San Marcos, TX
sashford@txstate.edu

Shailen Singh
Department of Organization, Workforce, and Leadership Studies, Texas State University
San Marcos, TX
shailen@txstate.edu

Ada Muoneke
Educounts Consulting
Austin, TX
ada@educounts.org

Phillip Eaglin
Changing Expectations
Austin, TX
phillip.eaglin@changexpectations.org

Abstract— **The Students with Disabilities in Computer Science (SWDCS) Research Alliance is conducting an NSF-funded study on teachers' perceptions about the barriers to increasing computer science (CS) awareness among African American and Hispanic students with disabilities (SWD). The SWDCS Research Alliance is a research-practitioner partnership of computer science and special educators. The purpose of this preliminary study is to increase African American and Hispanic students with disabilities' interest, engagement, learning, knowledge, and persistence in CS and STEM (science, technology, engineering, and mathematics) careers. This project employs a project-based voice user interface (VUI) and artificial intelligence (AI) instruction, and tech mentoring. Of the 21 teachers participating in the Alliance, the research team identified a convenience sample of eight teachers to participate in semi-structured, focus group interviews. Using an inductive thematic analysis approach, the researchers identified the following emergent themes: limitations of school or administrative policies for African American and Hispanic SWD enrolling in CS classes, lack of CS-focused interventions for African American and Hispanic SWD, lack of formal teacher preparation for CS teachers to work with SWD, and structural barriers limiting SWD, Hispanic, and Black students' enrollment in CS classes. This study fills the gap in the literature concerning minority SWD's experiences in CS education.** *(Abstract)*

Keywords—component, formatting, style, styling, insert (key words)

I. Introduction

The Students with Disabilities in Computer Science (SWDCS) Research Alliance consists of computer science and special educators. The Alliance aims to increase African American and Hispanic students with disabilities' interest, engagement, learning, knowledge, and persistence in computer science (CS) and science, technology, engineering, and mathematics (STEM) careers. This project employs a project-based voice user interface (VUI) and artificial intelligence (AI) instruction, and tech mentoring. The purpose of this qualitative study was to investigate the Alliance CS and special educators' perceptions about the barriers associated with African American and Hispanic students with disabilities participation in CS and STEM careers. The overarching question guiding this study

was: What are the barriers to increasing awareness of CS for SWD?

II. Literature Review

To fully understand the barriers associated with increasing African American and Hispanic special education students' participation in CS-related courses, we must focus on the multiple administrative processes related to Special Education in general. These administrative processes long resulted in diverse parents and children feeling marginalized and ostracized from a system designed to serve their best needs. Therefore, for the outputs (meaning increased African American and Hispanic SPED student participation in computer science) to be improved, the SPED pipeline itself must be adapted.

A. Placement in SPED Programs

Placement in SPED programs is primarily based on multiple factors, including overall academic achievement and the socio-economic demographics of the individual school [1]. The unique characteristics of the school result in a phenomenon termed as a "frog-pond effect" [2], [3], where teachers measure a students' ability relative to their peers within the school. A student with mild learning disabilities might be immediately placed within a special education setting when enrolled in a school with a high achievement rate but might not receive similar placement in a school with lower academic standards. The subjective nature of special education placement, especially for students with high incidence disabilities. This subjective nature of classification has resulted in an over-representation of minority (specifically African American students) in special education settings, as compared to their majority peers within the same school settings [4]. Furthermore, the vast majority of these diagnoses are focused on subjective interpretations of behavioral issues instead of a health-related focus [4]. The subjective interpretation of behavioral issues as disability-related, combined with underfunded special education units, can often result in an artificial ceiling being placed on a student's potential.

B. Defining Services

A student's SPED services are largely defined by the Admission, Review, Dismissal (ARD) process. This process is

intended to be individualized for each student and determines whether a student either receives an Individualized Educational Plan or is eligible for accommodations based on Section 504 of the Rehabilitation act of 1973. The framework for how these meetings are structured is defined by the Individuals with Disabilities Education Act (IDEA). IDEA defines the parameters by which the ARD meetings are to occur, including both including and valuing the anecdotal feedback and participation of parents and caregivers. Indeed, parents and caregivers are defined as key components of the ARD team but are rarely treated as such. The ARD meeting is intended to be a thorough conversation where all parties' opinions and observations are combined to create a comprehensive educational plan for the specific student. But instead, the process ends up being highly legalistic, jargon-filled and often categorized by parents as being a pointless routine [4], [5]. Moreover, because educational plans are considered confidential under the Federal Education Rights and Privacy Act (FERPA), parents are unable to get example plans of what services their child might be entitled to as a result of a successful ARD meeting.

This process disproportionately impacts minority families, who often walk away from conversations surrounding their child's needs feeling helpless and railroaded, and perhaps unlikely to participate in future meetings [6], [7]. This, combined with the aforementioned bias against minority students by teachers and administrators, can result in students within the SPED program not having access to the same programs and services as their non-sped counterparts. This lack of access to services and resources results in an achievement gap that starts from the beginning of students' educational experiences and only widens over time [8]. The underrepresentation of disabled minority students in CS-related fields is attributed to the systems by which their disabilities themselves are governed. Therefore any interventions designed to increase representation/participation must address the system itself as a root cause of the underrepresentation in the first place.

III. METHODS

This section outlines the methods followed in this preliminary qualitative study.

A. Participants

The SWDCS Alliance consists of 21 teachers across Years 1 and 2 on the project. Of the 21 participants, the research team identified a convenience sample of eight special education and computer science teachers.

B. Data Collection

Upon obtaining verbal consent, we utilized a semi-structured, focus group interview protocol to interview our participants. We conducted two data collections in the Spring and Fall of 2020. A follow-on data collection is currently underway (Spring 2021). The Institutional Review Board approved this study at Texas State University on May 13, 2020. An amendment including revised questions was submitted and approved on August 20, 2020.

C. Data Analysis

The research team analyzed the data using an inductive thematic analysis approach [9] to identify emergent themes aligned with the priority topic areas identified by the SWDCS Research Alliance. Before conducting data analysis, the graduate research assistant transcribed the interview audio file verbatim. To recall, analyze, and summarize the emergent themes, the researchers followed [9] six-step thematic analysis process. First, we read the interview scripts for familiarity. Second, we derived a list of codes from the interview protocol and manually entered research questions into a Microsoft Excel document. Third, we employed an inductive process to code interviews by manually organizing participants' quotes under each associated code in the Excel document, and performed open coding by adding new codes as needed while reading the interview transcripts [10]. Fourth, the list of codes were reviewed and refined. Fifth, high-level themes were identified and the codes and the associated quotes were manually regrouped under these themes. Finally, we produced the final report of emergent themes with the associated participants' quotes. The coding results were verified by another researcher who reviewed the emergent themes and related quotes. We conducted a second iteration of coding to identify sub-themes. Finally, the focus group transcript was loaded into the NVivo qualitative data analysis software to ease accessibility for comparison with future studies.

D. Data Trustworthiness

The research team employed data triangulation methods [11] and member-checking [12] by emailing the CS and special educators a copy of the transcripts to obtain their feedback. The research team is committed to exclude any language that the teachers deem necessary. The researchers obtained a 100% inter-rater reliability agreement.

IV. PRELIMINARY FINDINGS

The following emergent themes categorize our preliminary results: A) limitations of school or administrative policies for African American and Hispanic SWD enrolling in CS classes, B) lack of CS-focused interventions for African American and Hispanic SWD, C) lack of formal teacher preparation for CS teachers to work with SWD, and D) structural barriers limiting SWD, Hispanic, and Black students' enrollment in CS classes.

A. Limitations of School or Administrative Policies for African American and Hispanic SWD enrolling in CS Classes

Teachers from both school campuses indicated school and administrative policies limit African American and Hispanic SWD ability to enroll in CS classes.

I think at a middle school level, a barrier would be if they are receiving certain services that take away an elective, so to speak, then they don't have that. They lessen their chance of being enrolled in that class because they're having to meet other needs if that makes sense.

Additionally, they indicated that these students' disabilities might limit them because of conflicts with their course schedules.

And so sometimes their disability may limit them because of their class schedule to where they may not even be. It's not that

it's not offered. It's just, what's the likelihood that that student, depending on what services they receive, could end up in that class.

Another teacher commented on the absence of "inclusion electives" (or inclusive electives), suggesting that there are limited electives available for students with disabilities.

"So that is a, a such a valid point to bring up just okay, they get in the class, but with supports are in place for the teacher, that's teaching the class and the student that's trying to learn in that setting as well, because there is no inclusion and no inclusion electives. Last time I checked."

B. Lack of CS-focused Interventions for African American and Hispanic SWD

One teacher expressed that there is a lack of CS-focused interventions for African American and Hispanic SWD. They said, "Or even if we had an intervention like tutoring time, if there was like a CS focused, um, group, they necessarily won't ever get to be in there because they would be intervention."

C. Lack of Formal Teacher Preparation for CS Teachers to Work with SWD

Additionally, they highlighted the lack of formal teacher preparation that CS teachers receive to work with special educators. They said: "Okay. And I think it's the same way because our computer science teacher, I don't think she would be prepared to work with our special education students and special education program." Another teacher proposed that administrators implement policy to enforce SPED teachers to co-teach computer science to mitigate the risk of counselors deterring SWD, Hispanic, and Black students from enrolling in CS classes.

And then if they're not, and they're just not of a program, it needs to be a change to where we can get someone to actually co-teach with a regular computer science teacher, because otherwise if it's not Saturday program, they're not going to be able to work with those kids. They need constant redirection."

D. Structural Barriers Limiting SWD, Hispanic, and Black students' Enrollment in CS Classes

The teachers also uncovered structural barriers that limit African American and Hispanic SWD and Black and Hispanic students in general from enrolling in CS classes.

I think that's where we need to really, really talk to them, and have the counselors understand that even our special education kids or our Hispanics and black kids need to be in those classes and have to be very high functioning that they can enroll.

One teacher voiced concern about engaging counselors in this project due to their seemingly uncaring response when asked if they had time to join one of our meetings.

And I, I, uh, asked one of our counselors, the main counselor, a couple of times. I was, I wouldn't mention for the, we were doing these meetings and if she had time to join us,

Uh, Nope. So I don't know how to even approach the counselors to tell them how important this is for our kids..

V. DISCUSSION AND IMPLICATIONS

Regardless of race, disability or socio-economic status, all students should have a right to an equitable education [13]. We utilized an educational equity framework [13] to interpret our preliminary findings. This framework promotes three primary standards to measure indicated levels of equity in K-12 education: *access standard* (i.e., access to all updated educational options), *participation standard* (i.e., equal participation of African American and Hispanic students with disabilities in all educational programs), and *outcomes standard* (i.e., educational outcomes among African American and Hispanic students with disabilities who participated in the school offerings and programs). The findings of this study indicate African American and Hispanic students with disabilities have limited access and participation in CS education, which impede their educational outcomes in K-12 CS education.

A. Access to K-12 Computer Science Education

The teachers' perception indicated that African American and Hispanic students with disabilities lack equitable access to K-12 computer science education in comparison to their counterparts. Access to special education services and resources is defined primarily through the ARD process. The intent of these processes is for parents and administrators to work together to determine appropriate supports and interventions for the student in question.

However these processes often result in parents of Black and Hispanic children feeling marginalized, and thus being unable to advocate on behalf of their child [6], [7]. This lack of advocacy due to structural barriers, combined with common prejudices regarding minority students disabilities being primarily behaviorally focused [4], results in students being restricted from consideration from computer science programs.

B. Participation in K-12 Computer Science Education

Limitations in district-level policies and structural barriers have impeded African American and Hispanic students with disabilities' participation in K-12 computer science education.

Placement in SPED programs is largely based on multiple factors, including overall academic achievement and the socio economic demographics of the individual school [1]. The individual characteristics of the school result in a phenomenon termed as a "frog-pond effect" [2], [3], where teachers measure a student's ability relative to their peers within the school. A student with mild learning disabilities might be immediately placed within a special education setting when enrolled in a school with a high achievement rate but might not receive similar placement in a school with lower academic standards.

This subjective nature of classification has resulted in an over representation of minority (specifically African American students) in special education settings, as compared to their majority peers within the same school settings [4], however can also result in these same students being denied opportunities designated for high achieving students (i.e., access to computer science programs).

C. Implications

These preliminary findings provide some implications for policymakers and practitioners to consider.

Policymakers at the district level should address structural and systemic barriers associated with how black and Hispanic students are both classified into and provided special education services. As previously mentioned, the ARD process is characterized as arduous and over-reliant on legal jargon, thus impeding parents' ability to be able to 1) understand all the resources their child might have access to and 2) advocate for their child to take part in appropriate outside of class activities. Districts should work to ensure that the processes surrounding special education are accessible and understandable to all families.

Furthermore, district administrators need to shift their paradigm away from special education being focused on remediation and look towards the growth opportunities associated with shifting the opportunities students are given to both express and develop an understanding of topics. Computer science-based interventions can provide disabled students with unique modalities by which to both engage with academic content and also working alongside their neurotypical counterparts in a supportive and academically focused environment.

The research team is in the process of completing the second wave of data collection for Year 2. Data analysis activities are underway and scheduled to be completed during Summer 2021. Future studies should also focus on students' perceptions and the intersectionality of race and disability.

REFERENCES

[1] J. Hibel, G. Farkas, and P. L. Morgan, "Who is placed into special education?," *Sociol. Educ.*, vol. 83, no. 4, pp. 312–332, 2010.

[2] J. A. Davis, "The campus as a frog pond: An application of the theory of relative deprivation to career decisions of college men," *Am. J. Sociol.*, vol. 72, no. 1, pp. 17–31, 1966.

[3] G. Farkas, D. Sheehan, and R. P. Grobe, "Coursework mastery and school success: Gender, ethnicity, and poverty groups within an urban school district," *Am. Educ. Res. J.*, vol. 27, no. 4, pp. 807–827, 1990.

[4] N. Gumas, "Socio-economic and racial disparities in public special education: Alleviating decades of unequal enforcement of the individuals with disabilities education act in New York City," *Colum. J. Race L.*, vol. 8, p. 398, 2017.

[5] V. M. Zeitlin and S. Curcic, "Parental voices on individualized education programs:'Oh, IEP meeting tomorrow? Rum tonight!,'" *Disabil. Soc.*, vol. 29, no. 3, pp. 373–387, 2014.

[6] M. Wagner, L. Newman, R. Cameto, H. Javitz, and K. Valdes, "A national picture of parent and youth participation in IEP and transition planning meetings," *J. Disabil. Policy Stud.*, vol. 23, no. 3, pp. 140–155, 2012.

[7] R. Larios and A. Zetlin, "Bilingual and monolingual parents' counterstories of the Individualized Education Program (IEP) meeting," *Urban Educ.*, p. 0042085918804003, 2018.

[8] A. J. Reynolds and B. Wolfe, "Special education and school achievement: An exploratory analysis with a central-city sample," *Educ. Eval. Policy Anal.*, vol. 21, no. 3, pp. 249–269, 1999.

[9] V. Braun and V. Clarke, "Using thematic analysis in psychology," *Qual. Res. Psychol.*, vol. 3, no. 2, pp. 77–101, Jan. 2006, doi: 10.1191/1478088706qp063oa.

[10] J. Saldaña, *The coding manual for qualitative researchers*, 2nd ed. Thousand Oaks, CA: SAGE Publications Inc., 2013.

[11] E. Brantlinger, R. Jimenez, J. Klingner, M. Pugach, and V. Richardson, "Qualitative studies in special education," *Except. Child.*, vol. 71, no. 2, pp. 195–207, Jan. 2005, doi: 10.1177/001440290507100205.

[12] J. W. Creswell, *Research design: Qualitative, quantitative, and mixed methods approaches. 4th Edition*, 4th Editio. California, 2014.

[13] W. B. Brookover and L. Lezotte, "Educational equity: A democratic principle at a crossroads," *Urban Rev.*, vol. 13, no. 2, pp. 65–71, 1981, doi: 10.1007/BF01956008.