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Psychology and Rehabilitation Awareness through Computer Science Education for Special Education Students

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Abstract

The concept of equality is well-known among people working in the area when it comes to increasing access to computer science in special education classrooms through programs like CS for All. Because stakeholders define the term "equity" in different ways, this has a huge impact on how CS education is implemented in schools. Our study examines how district actors' beliefs about equity manifest themselves in the development and implementation of district-wide computer science education programs. District faculty interviews, district planning documents, meeting transcripts, and on-the-ground observations were used over an 11-month period in five cooperating school districts to support and investigate district-wide Computer Science education activities in a research-practice partnership. We highlight three ways district participants perceived equity in their efforts to teach computer science, using equity frameworks from computer education literature: Third, all students, regardless of gender, ethnicity, or socioeconomic level, must have equitable access to computer science. It is obvious from the data that different districts have taken different approaches to teaching computer science depending on how they see it. The findings of this study should be closely scrutinized by academics and legislators who are committed to making computer science education accessible to all students, regardless of socioeconomic status.

Keywords: Computer Science Education, special education

Introduction

All students in SPECIAL EDUCATION classrooms should have equal access to computer science education (CSed). This is a widely accepted principle in the community and in the "CS for All" programs in SPECIAL EDUCATION classrooms. Education stakeholders' differing perspectives on equity affect how computer science is taught and learned in schools. Some similarities can be drawn between this landmark case, which defined equity as equal treatment for all students, and a definition of equity as correcting historical social inequities, but these subtle differences can easily manifest in different educational approaches and policies. As an example, When equity is put into practice in the classroom, a lot depends on how it is defined. There are many different meanings of equality, and it's important to take that into consideration when introducing computer science into SPECIAL EDUCATION classrooms, where it is still very young. As an example, we might examine where and how existing efforts are achieving essential components of equity and where improvement is still needed.

SPECIAL EDUCATION computer science educators, researchers and policymakers have expressed a variety of equity-related concerns. Most important are efforts to increase the number of participants. both tackling challenges of under-represented groups in the STEM industry as well as making computer science accessible to everyone Hadwen-Bennett, et al. (2018) have stated their goal of making computer science accessible to everyone. Discussions about how to make education more equitable for various groups, such as people with disabilities, women, ESL students or members of the black and brown communities, are intimately related to this. Hernandez & Burrows, a partnership (2021). Technology, such as cellphones and computers, can contribute to social inequities, prompting some activists to request that computer science courses include teachings on computing's impact in society. Crick, et al., (2021).

As far as SPECIAL EDUCATION educational systems and CS education go, what do these concepts mean in

the real world, and how are they being implemented? The study examines how district actors' views of equity manifest themselves in the setting of district wide CSed programs in SPECIAL EDUCATION schools. Qualitative data was acquired through teacher interviews, board meeting transcripts, district planning materials, and board meeting field observations, according to Zuckerman & Wilcox (2019). Students and teachers were asked to complete surveys regarding their experiences working on computer science curricula at district and school levels. As a result, participating districts were able to use improvement statistics to influence their decisions.

CSE stakeholders saw equality in three ways: (1) who Computer Science is for, (2) how it is taught, and (3) an emphasis on content equity. According to the data, different ways of thinking about CSed led to different sorts of decisions in respective districts. This study's findings have important implications for equity-oriented CS education academics, as well as for policy-makers and education leaders who are trying to promote equitable computer science education in their own institutions.

Social Equality And Computer Science Education In The Third Grade

Equity-focused discourses are prevalent in SPECIAL EDUCATION computer science education, each concentrating on a particular set of goals and ties to the concept of equity. Determining what constitutes equitable computer science education can be a challenge, but districts can pursue a variety of equity-related goals when they implement computers in their classrooms.

As part of a broader effort to provide universal access to computer science learning experiences, the term "for all" has come to represent equity in computing education (2020). All kids, regardless of gender, ethnicity, ability, or financial situation, should have access to computer science education, which has acted as a rallying cry for numerous local and national programs to promote access to computer science education in SPECIAL EDUCATION settings (e.g. CS4TX).

With a focus on "broadening participation," the NSF hopes to address the paucity of women, minorities, and people with disabilities in STEM fields and businesses. Rather than focusing on access, the "widening participation" framing seeks to address the issue of under-representation in the computing industry.

It's not just about diversity in the computing industry when underrepresented groups participate in CSed; it's about economic injustice. As well as Santo (2020). Those with lower incomes, particularly those who are underrepresented in computer-related professions, can benefit from high-paying computer occupations, according to this opinion. By emphasizing the link between computers and equality as a way to alleviate poverty for underrepresented groups, rather than focusing on representation, this movement emphasizes economic mobility.
Access to computer science education is closely linked to questions of appropriate pedagogy for specific groups. Students with special needs should not only be present in CS classes, but they should be taught and designed in a manner consistent with universal design for learning principles Milne & Ladner (2018) advocate (2018). Similarly, educators who work with students of color, English language learners, and indigenous groups believe that achieving equity in computer science education necessitates a shift away from traditional teaching methods and toward ones that are more culturally and linguistically responsive and long-term. Dickinson & Gronseth, LLP (2020). People who have access to computers have a significant impact on how computer science (CS) is taught.

As part of their computer science education, students should be taught about the societal consequences of computing. It's students who are at the center of this equity notion, because of the myriad of social injustices and ethical dilemmas that come along with computer technology and platform use. His given name is Bhattacharya (2020). This is stated in the key conceptual area of the SPECIAL EDUCATION Computer Science Framework: "An informed and responsible individual should be aware of the social implications of the digital environment, including equity and access to computer technology. Manheim & Kapla (2019) uses computing technology and artifacts to improve or perpetuate inequities of knowledge and opportunity for those who are underrepresented (2019). Also noted is the importance of creating an inclusive computer culture, which includes tackling "bias in interactions, product design, and development processes." As an example, such ethical and social challenges recognise the rise of algorithmic discrimination. Using networked technology has a negative impact on democracy and civic society, according to Lion et al. (2020). Carter & Egliston, Inc. (2021).

School Districts as a Context for Implementing Computer Science Education Policy

It's possible that some of the ideas about equality we've covered so far seem a bit theoretical or even philosophical. These discrepancies must be examined as part of an overall effort to introduce computer science training into SPECIAL EDUCATION schools because school districts are so huge, dispersed, and complex

That's why the US Senate exists. This country's education system was built by both state and local district actors, resulting in a decentralized reform strategy. Districts make important decisions about curriculum, evaluation, graduation requirements, and teacher training. In order to achieve their goals, experts and advocates of universal computer science education acknowledge that understanding policy implementation is critical, but there are few studies examining the relationship between policy implementation, equity, and instructional decisions (Marshall and Grooms, 2022).

A wider body of literature on policy implementation in school districts provides the conceptual framework for this study, which looks at how decisions are made and how it influences the creation of cohesive educational systems. According to Costa and coworkers (2022). Many aspects of educational systems, such as vision, goals, pedagogies, curriculums, professional development, and organizational routines, must be considered in order to ensure that they are aligned in order to be effective. When considering instructional coherence, it is important to keep in mind that teachers' professional development opportunities, curriculum choices, and routines all need to be in sync with the district's pedagogy.

To better understand equity issues, frameworks that attempt to evaluate district policy implementation can be useful. These frameworks aim to understand classroom contexts and organizational systems, rather than just looking at classrooms and teachers in isolation. Concept of coherence in education systems aims to comprehend how stakeholders' goals and values are represented in their decisions regarding various parts of an instructional system that mediate fairness in educational systems.

By focusing on district-level decisions about CS educational systems, we hope to provide light on concerns of equity, as illustrated by the varied approaches to equity described in the preceding section.

Data Collection Methods and Analytical Approaches

According to Costa and colleagues (2022), the data was gathered as part of an RPP for SPECIAL EDUCATION school districts. Members of the RPP include academics and a non-profit organization dedicated to computer science education. Each of the Mid-Atlantic region's sixteen district teams received financial assistance from the initiative. They assisted districts in developing and implementing CS implementation plans that addressed a variety of curriculum, leadership, professional development, goal definition and data-driven decisions connected to CS education. Time at work, financial recompense, and consultation with RPP team members were all made available to the team to help them plan their projects. These strategic planning sessions with district teams took held over the course of the year, and a subset of them met with the RPP team in person or via videoconference. In these meetings, RPP and district teams worked together to devise techniques for analyzing data on district development and preparing for their own projects. As part of the exchange, they talked about the work they were doing at the time and exchanged ideas about how to put it into practice. In total, there were six to twelve district teams, which were selected based on factors such as the size of the districts, the demographics of their students, and the availability of CSed resources. Small districts ranging in size from those with less than 1,000 students to those with more than 5,000 students.

For this project, there were a lot of meetings with district officials, principals, and professors as well as field notes and artifacts from workshops hosted by RPP where teams developed implementation plans. Their efforts in computer science education had been documented in written notes and recorded meetings and interviews, as well as 130 hours of field trip recordings and more than a dozen district-produced documents, such as budget plans and proposals for external fund-raising, which they had collected over the years. We shall employ pseudonyms for each of the five districts in our study throughout this report.

As part of our study, we are interested in how local school district actors' notions of justice are reflected in their efforts to provide comprehensive special education computer science education programs. An existing theoretical framework for school district decision-making and instructional systems was used by three members of the study team to develop the coding scheme for the qualitative data. It's Neumann & Nordine again! (2021). The codebook covered both the decision-making and action components of the codebook (e.g. defining goals, suggesting activities, carrying out tasks) as well as the educational system element (e.g. a decision or action) (e.g. leadership, curriculum and instructional materials, professional learning, etc.). Any mentions of equity

issues, whether implicit or explicit, were coded over the course of the project. Secondly, we went back and re-examined the data pertaining to equity in computer science education, including the previously indicated frameworks for extending participation, in order to better understand the findings. In order to reach as many students as possible, Phelps & Santo's mission is to Lehman et al., culturally and linguistically appropriate computing pedagogies. Students with special needs are targeted. Mouza and others (2020) Tomas and colleagues' investigation of the ethical and social ramifications of computer science education inequalities in the labor market can be reduced by increasing access to high-paying technological jobs, as suggested by Crick, among others (2020). At the same time, we were looking for data that could throw light on district participants' and teams' rationales and behaviors, as well as those that could be considered as indicative of those values.

Findings

Using data from the districts we studied, we identified three broad and interrelated methods to conceptualize equality in local computer science education programs. All pupils, regardless of their financial status or prior educational background, must have access to computer science.

Computer Science should be accessible to a wide range of people

In accordance with the widely held belief that computer science should be taught to all SPECIAL EDUCATION students, one concept of equity found in data was focussed on resolving concerns of equity in the classroom. Warren Central School District (WCSD) made clear in their initial proposal that student equity was a priority for the district, and that their involvement in the partnership would help them achieve this goal. This was indicated as an objective for their next CSed program in the application, stating that "providing assured experiences for all kids, independent of their teacher, socioeconomic background, native language or handicap status is a top priority."

As stated by the Unified School District (USD), all students "represent and solve problems using computational and systems thinking," regardless of ethnicity, social class, gender, language, or ability level." Central School District (CSD) assistant superintendent, one of the project's cross-district contacts, gave a presentation on internal district discussions about the development of CSed:

One of the most important aspects of our investigation was how to address the issue of equity. All pupils are encouraged to participate. Our special education children — especially females and boys, in some situations — should be included in and take advantage of such opportunities. A cross-district phone contact was made to Assistant Superintendent Juan Garcia on May 10th, 2018.

As stated by WCSD, "assured experiences for all students" is a key component to ensuring equity in computer science education, and this is reflected in all three of these initiatives. In addition to the broader "for all" frame, these initiatives also note specific sub-groups historically underrepresented in computer science education, including those who are underrepresented because of their gender, race, socioeconomic status, language, or special needs.

When looking at this list of pledges, it may appear that they are simple, but it is critical that we look at the precise ways that districts have implemented these pledges to ensure that all students have equal access to computer science.

For instance, at one of the RPP's workshops on strategic planning, one of the activities was aimed at helping participants connect their reasons for CSed adoption with the consequences for how their districts planned to do so. They worked with a rationale they had developed during this activity, which said that CSED "creates equal chances for all students in a SPECIAL EDUCATION context and in the post-secondary world," in order to implement it in their classrooms. According to a paper created on January 23rd, 2018, Warren Central School District outlined the following activities as having the following ramifications for their initiative:

Assured experiences at every grade level from kindergarten to high school
Keep track of statistics on student enrollment.
Pro-active outreach to underserved groups about CS opportunities
Prerequisites should be eliminated or minimized.
Constraining scheduling problems
Promoting a "everyone can and should contribute" mentality amongst faculty

However, when they worked to define their initiative's specific learning objectives for the Spring semester of 2018, WCSD leaders and faculty realized that their commitment was more concretely defined as a set of specific learning outcomes that could be achieved by all students in the WCSD community.

When it comes to computer science education, the Westchester County School District (WCSD) has defined its aims differently since they are purposely wide, which includes a diversity of approaches to CSed and other areas like digital citizenship and media arts that have variable overlaps. Warren's team gave us with an in-depth explanation during our curriculum assessment. Figure 1 shows this clearly.

With this broad definition, they included Herb Simon's "computer science as an umbrella term for all things related to computers," which was shared with the participating districts during one of the RPP's strategic planning meetings. WCSD's computer science effort includes several'subcomponents,' such as "digital citizenship," "digital literacy," "information technology," "media arts," and "programming/coding." These will be taught in WCSD.

We are defining Computer Science as the study of computers and ALL the phenomena that arise around them.

Subcomponent	Definition
Digital Citizenship	The safe and responsible use of technology.
Digital Literacy	The ability to process information and communication technologies to find, evaluate, create, and communicate an output.
Information Technology	Understanding of the technical infrastructure for digital operations such as hardware, software, and networks.
Media Arts	Construction and branding of digital artifacts to optimize presentation and consumption.
Programming/Coding	Utilizing computational thinking to formulate a protocol to accomplish a task.

Fig. 1. An example of Warren's five-part characterization of computer science learning goals.

As a result of Warren's leadership, teachers were more likely to accept their CS definition, which in turn led to more equitable learning opportunities for students. Teachers in Warren's newest schools are receptive to incorporating computer science activities like Hour of Code and other similar initiatives into their regular lessons (such as the Common Core State Standards). While many older teachers believe that learning programming languages before teaching computer science to their pupils is a necessary ability, this is not always the case. She defined the extent of Warren's curriculum audit of computer science to our team thus way:

"I think certain teachers are very comfortable with [CSed] and with teaching any sort of computer science and some aren't, which could account for why students have diverse experiences depending on who the teacher is." Is there a way to measure how much of your education currently incorporates computer science? How effective are you at using those tools as a professional? And how much of your curriculum instruction assessment incorporates those skills? " - Interdistrict phone call, April 18, 2018, from Assistant Superintendent Molly, WCSD.

As a method to get more instructors on board and enhance equity, a more inclusive definition of computer science allows the subject to be taught in more places than just the few stand-alone programming classes in the school district. How CS learning goals are set, teacher buy-in and what instructors need to know about CSEd all come into play when making decisions in this case. Teaching computer science to all students may be possible if the district's leadership reformulated the goals of computer science education such that teachers had a better understanding of the subject matter.

This example highlights how hard decision-making may be when it comes to a fairly simple and ubiquitous topic of fairness in CSed. The objective of reaching all kids rippled through the design and implementation process, influencing how district leaders characterized the initiative's curriculum approach and professional learning initiatives.

Affirmative Action in Computer Science Education

Computer science education is one aspect of data equity that has been extensively studied. Instead of focusing on who received computer science instruction, this equitable idealist movement turned its attention to the methods used in the classroom. Additionally, this notion widened the definition of "equitable access" to take into consideration how diverse curricula, technologies, and pedagogical approaches aid or impede equity for various student groups.

Several district judgments were described as having "eq- uity" by the Greenwood Central School District, the district's spokesperson said. Goal-setting work in the early stages of the GCSD team included looking for curricula that was sensitive to the identities of historically underrepresented or marginalized groups.

GCSD faculty members who were participating in the project's planning process were aware of the disparities in involvement between high school and college-level computer science courses. Additionally, there are non-AP computer science courses and CADD classes offered to students in secondary schools (CAD).

"Many high-quality goods are available for you to chose from. There is, however, a lack of diversity and size in the students we're targeting. In all of these classes, the same students sign up "That is what he says.
- Technology Integration Specialist at the GCSD: Jenny (July 16th, 2017):

In the coming summer, teachers and curriculum committee members from throughout the GCSD's computer science planning teams began studying the prospect of developing new multidisciplinary and integrated computer science courses for high school students. That way, "the same pupils" wouldn't be enrolled in current electives explicitly branded as computer science.

Teachers in the GCSD's Tapestry program will learn how to teach high school computer science to students of any gender, race, or ethnicity. This demonstrates the district's commitment to preparing teachers to teach CS to a diverse variety of kids.

Because of the GCSD's dedication to an emphasis on how CS is taught, rather than who it is taught to, there are significant ramifications in practice for the notion of equal computer science education. We should have paid more attention to what students were actually learning instead of just assuming that they needed more computer science exposure, as evidenced by the above-described conclusions. Culturally and linguistically relevant CS teaching methods allowed students of all backgrounds to benefit from CS instruction. – Students' particular needs were a priority, thus they made a significant investment in the education of their teachers. New learning possibilities were created by shifting the focus away from just delivering computer science electives and toward creating new classes that incorporated other fields and student interests, like the humanities, the arts, and the business world. As a result, they show how district-level decisions can be made when equality is seen as a problem with how CS is taught.

The teaching of computer science with equity

When it came to district planning and decision-making, the final idea of CS equity was to make sure that computer science was taught in a way that was fair to all students. It was not until this promise was made that it became clear that the focus was no longer on who should be taught and how, but rather on what sorts of knowledge and capabilities should be included in the CS curriculum in order to satisfy equitable objectives.

Several school districts implemented equity-oriented ideals into their curriculum planning, which would have a substantial impact on the curriculum's learning objectives. With a focus on professional opportunity and mobility that might address concerns of economic inequality, the Lakeville Central School District team underlined that "our children need opportunities to develop work and career skills derived from computer science." (Italian emphasis) They didn't elaborate on how computer science education may help students become more aware of and wary of "big organizations - government, media, enterprises." It's easy to understand how these principles could affect a school's curriculum. An internship program in local technology companies could help CCSD focus on economic mobility and employment prospects for underprivileged students.

The Starling Central School District's planning documents show a closer link between equity values and CS programs. They stated that they aimed to help pupils "criticise and address mechanisms of power and inequality" and "think critically about electronic platforms" when bringing CSed into their district. A look at the

technological world's disparities, including who makes choices and why, and how to remedy this power imbalance would be part of their curriculum.

Last but not least, Warren CSD decided to integrate keyboarding skills in their CS effort's learning objectives as a reflection of their dedication to equity. It was noted during a July 2018 planning meeting that 40% of their pupils lack access to computers at home, a fact that was brought up during discussion of the development of SPECIAL EDUCATION learning goals for the CSed project.

Cross-level district teams, including teachers, experts, and leadership, view keyboarding in a completely different light than CS advocates, who have had to dispel misconceptions about 'what counts as' CS in the past. As much as the group cared about addressing equality concerns for their pupils, it also valued the creation of a program that emphasized significantly more advanced computer abilities. It was because of their equity-based beliefs that they were able to see keyboarding as a pre-requisite for engaging in more complex computational tasks, and hence as a goal that needed to be included if the district wanted to achieve equity in computer science education.

When it comes to what is included in CSed curricula in districts, commitments to equity present themselves in a wide number of ways. When it comes to curriculum, Starling's focus on equity led them to include learning objectives centered on the social consequences of computers, such as "particularly looking" into technological inequity themselves. As part of the overall CSed project, Warren CSD decided to incorporate keyboarding abilities in the larger scope and sequence of learning outcomes associated with that initiative.

Equity goals differ greatly between the two scenarios, as well. Because of Warren CSD's emphasis on equity, the option to teach keyboarding can be understood as a choice about how and to whom something should be taught. It's possible that WCSD didn't need to incorporate this shift in what's taught as part of this effort if they weren't concerned about making sure that all children had access to computer science learning opportunities. With regard to the equality aims of teaching about social repercussions at Starling CSD, the focus is not on the identity of the school's student body, but rather on teaching students how to criticize and transform the systems of power embedded in technology.

Discussion

Equitable computer science and planning and implementation frameworks were used to guide this study, which attempted to offer light on how concepts of equality play out in practice. In the district's decision-making on who, how, and what is taught in computer science, three separates but interconnected general concepts of equity in CSed are declared and implemented. They were expressed in practical decisions such as curriculum development, professional development, and overall visions that drove the implementation of these goals and objectives.

'Translation' between theoretical notions of justice and the ways in which these commitments are put into reality varied in their complexity, according to the research. For example, Lakewood CSD sent instructors to a professional development opportunity on teaching minority groups while establishing integrated, cross-disciplinary high school courses to attract more underrepresented students.

To achieve specific equity goals in some districts, district leadership must make difficult decisions. It is possible to define CS-related learning goals in such a way that teachers are more likely to accept them. Fearing instructors would lose confidence in their abilities to teach CSed if the district's curriculum focused only on coding, they feared Non-coding learning objectives helped them reach more kids and achieve equity goals.

As a result, it's imperative that all students have equal access to computer science education, regardless of their socioeconomic status or educational background. Even if this wasn't the case in Warren, it's feasible that districts will choose to scale back their learning objectives to the point where the content they teach is unfair.

To provide fair computer science education, we argue that policymakers at all levels should consider many approaches and their intersections. Lesson goals should include both equity needs and consideration of how equity concerns linked with technology are taught within curriculum (equity in 'what's ta'), as well as equity in who is taught and how teaching occurs. Encouraging teachers of underrepresented groups to teach computer science requires state policies that support specific forms of professional development.

As a result of the study's numerous flaws, its conclusions should be treated with extreme skepticism. Data from the first year of planning and activity is a tiny sample for organizational transformation. Less attention was paid to classroom instruction or professional development than to long-term planning and resource allocation in the districts surveyed. Therefore, we are unable to predict how students' learning results will be impacted by various commitments and understandings of equality. To better understand how judgments are made over time, do more thorough longitudinal case studies and data sets.

The research also didn't look at how district players differed in their views on computer science equity. Whether or not faculty members share a common sense of equity is likely to be mediated by elements relating to the organization's overall coherence. Research into the intersection and negotiation of district leadership, principals, and teachers' perspectives on equitable computer science implementation in SPECIAL EDUCATION schools is an essential subject for the future.

This research is a first step toward better understanding the connection between district-level implementation of computer science and various conceptions of equality in society. What we found, we believe, shows unequivocally that participants in SPECIAL EDUCATION education systems' conceptions of equity matter in terms of what really happens on the ground. SPECIAL EDUCATION CS education is still in its infancy, so problems of equity must be at the forefront. We can better allocate resources and attention if we take a closer look at how present efforts are addressing or not addressing various elements of equity.

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