



Building Causal Agency in Autistic Students through Iterative Reflection in Collaborative Transition Planning

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Transition planning is a collaborative process to promote agency in students with disabilities by encouraging them to participate in setting their own goals with team members and learn ways to assess their progress towards the goals. For autistic young adults who experience a lower employment rate, less stability in employment, and lower community connections than those with other disabilities, successful transition planning is an important opportunity to develop agency towards preparing and attaining success in employment and other areas meaningful to them. However, a failure of consistent information sharing among team members and opportunities for agency in students has prevented successful transition planning for autistic students. Therefore, this work brings causal agency theory and the collaborative reflection framework together to uncover ways transition teams can develop students' agency by collaboratively reflecting on students' inputs related to transition goals and progress. By interviewing autistic students, parents of autistic students, and professionals who were involved in transition planning, we uncovered that teams can better support student agency by accommodating their needs and encouraging their input in annual meetings, building relationships through transparent and frequent communication about day-to-day activities, centering goals on student's interests, and supporting student's skill-building in areas related to their transition goals. However, we found that many teams were not enacting these practices, leading to frustration and negative outcomes for young adults. Based on our findings, we propose a role for autistic students in the collaborative reflection framework that encouraged participation and builds causal agency. We also make design recommendations to encourage autistic students' participation in collaborative reflection around long-term and short-term needs in ways that promote their causal agency.

CCS Concepts: • **Human-centered computing** → *Empirical studies in collaborative and social computing*.

Additional Key Words and Phrases: autism, transition planning, collaborative reflection

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1 INTRODUCTION

Transition planning is a collaborative process during which teams made up of students, families, and school staff equip students with the skills necessary to achieve successful post-high school outcomes [42]. This process is designed to promote agency of students by encouraging them to determine their own goals with a team and learn ways to assess their progress towards these goals [75, 76].

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For autistic young adults who experience lower employment rate, less stability in employment, and lower social engagement than those with other disabilities [52, 61, 62, 64], successful transition planning can provide an opportunity to develop agency as they prepare for and attain employment and independent living goals. These plans are critical for autistic students, given the significant decline in support services after they finish high school [30]. However, previous research reporting limited involvement of autistic students in transition planning team meetings underscores the urgency of research exploring ways to increase agency and meaningful participation on these teams [11, 31, 54, 66].

This work investigates technological solutions to increase autistic students' active involvement in transition planning. It has long been an interest of CSCW researchers to support effective team collaboration in delivering health and education services for unique populations, such as autistic individuals [1, 23, 24, 35, 37, 48]. Marcu et al. proposed the collaborative reflection framework (CRF) to describe how providers share information in long- and short-term loops to reflect around goals and progress over time [35]. This framework has been also explored in relation to autistic children receiving educational services [37, 48]. However, research on this model has been focused on the perspectives of providers and caregivers and has not been explored the role of autistic members of these collaborative teams. This is part of a larger pattern of absent neurodiverse voices noted in HCI research, which has led to a call by researchers for studies that incorporate voices of autistic people in technology design [57, 58]. Our research contributes to the existing body of collaboration work by uncovering how technology to support transition planning can hold team members accountable for practices that increase the agency of autistic students during team collaboration.

We use causal agency theory (CAT) and the CRF as theoretical lenses to investigate autistic students' involvement on transition planning teams. CAT describes how people participate in the iterative processes of goal-setting, progress monitoring, and reviewing discrepancies between goals and achievements to build self determination. The transition planning process has a similar series of iterative steps, wherein team members set goals, monitor progress, and change teaching approaches or re-consider goals when progress is not observed. Therefore, the steps of CAT are well-aligned with this process. We adopt the CRF to understand the flow of communication on these teams and to identify how autistic students can participate in collaborative reflection in ways that build causal agency. Using the lenses of CAT and CRF, our goal is to understand ways to improve team collaboration in order to maximize development of autistic students' self-determination throughout their transition planning process and thereby increase successful post-school outcomes.

To investigate design opportunities of technology in supporting the collaborative transition planning process for autistic people, we conducted in-depth semi-structured interviews with 24 participants, including seven autistic young adults, nine parents, and eight professionals who have participated in transition planning. We found that throughout the transition planning process, teams supported student's development of causal agency by including them in the collaborative reflection process during annual meetings and day-to-day communications, by centering their interests and inputs when determining goals, and by identifying opportunities for their growth. Based on our findings, we suggest design implications of technological systems that can promote and increase the student's participation in transition planning to further develop their causal agency during collaborative decision-making processes.

2 BACKGROUND

2.1 Causal Agency Theory: An Extension of the Functional Theory of Self-Determination

Self-determination refers to the ability to guide the direction of one's own life through active participation in goal-setting and pursuit of success [69]. In other words, self-determined people live as "causal agents" who bring about desirable changes by directing their actions toward goals and assessing their progress toward them. Wehmeyer proposed Causal Agency Theory (CAT) to describe the process of becoming a causal agent, emphasizing how a person becomes empowered to act as the primary agent of change to achieve one's goals through an iterative processes of goal-setting, monitoring one's progress toward goals, and reviewing the discrepancies between one's intended goals and one's achievements [70, 77], thereby learning to lead self-determined lives. We use CAT as a theoretical lens to understand how autistic students' involvement in transition team collaboration can promote development of self determination. The development of self-determination is important, as higher self-determination is positively associated with a range of positive transition outcomes, including employment, community inclusion, and life satisfaction [44, 54, 71].

Historical approaches to the education of autistic populations have focused on extinguishing autistic characteristics and enforcing neurotypical standards of achievement through instructional methods that employ external motivation [80]. External motivation runs contrary the development of self-determination [15] thereby creating an educational environment that works against autistic students becoming self-determined. This educational environment can also act as an agent that reinforces the societal construct of disability by separating students with disabilities from their neurotypical peers and upholding ableist attitudes by focusing on students' shortcomings [2]. Technology design has often been complicit with these goals. For instance, a review of wearable technology for autistic users showed a bias toward technology that enforce neuro-normative social patterns on autistic adults rather than supporting inclusion or support of these adults [82]. However, education practices that reject traditional methods can increase self-determination. Wehmeyer et al. have produced a body of work [68, 72–74] showing neurodivergent students, including autistic students, emerge with higher self-determination when teaching practices are built around CAT and provide opportunities to engage in iterative goal-setting. We engage with CAT to consider how technology can support team members who wish to push back against systems and teaching practices that stifle self-determination development and create systems to encourage students' agency, rather than to suggest that there is some innate lack of self-determination in autistic students.

It is important, however, to note that measures of success are not universally agreed upon, and there is some research showing that quality of life ratings are higher amongst autistic self-reporters than their parents [64], suggesting that there may be different values for this group than among the neurotypical population. This difference has been discussed within the field of HCI, where the development of technology targeted at autistic groups tends to focus interventions to decrease autistic traits and alter behavior to become more neurotypical rather than responding to the interests of this group or building up their agency [58, 59, 82]. Previous work in technology design investigating self-determination has considered how to support self-determination in neurotypical adults and teens by integrating users more actively in setting and pursuing their own goals [34, 43, 60]. In contrast, much technology design work targeted toward autistic people has focused on enforcing neurotypical expectations rather than eliciting their goals and encouraging their agency [82]. Our work explores how strategies to support agency in other populations can be extended to the autism community, responding to calls to build technology promoting the agency of autistic

people. We examine how we can support autistic young adults' active collaboration in the transition planning process, recognizing opportunities for schools to follow students' preferences, supporting causal agency and self-determination while empowering students to define their own futures by setting goals that resonate with their interests and values. We employ causal agency theory rather than use the more established self-determination theory because it proposes a framework of actions that people can take to build self-determination, which is useful for considering where tools can be introduced to support actions. We apply causal agency theory to our work to identify ways that technology can support autistic students' actions to overcome interpersonal and systemic barriers that prevent their participation on transition teams.

2.2 Team Collaboration in Transition Planning

In the United States, the Individuals with Disabilities Education Act (IDEA) mandates that transition planning for students with disabilities begin by age 16. Transition planning is a multi-year process designed to support special education students' success in post-high school pursuits [42]. The purpose of transition planning is to determine post-graduation goals for the student, including education, employment, and/or independent living skills, and to document them in the student's annual Individualized Education Plan (IEP). In this paper, we define transition teams as teams of teachers, school administrators, job counselors, students, and caregivers involved in post-high school transition planning.

When identifying goals in transition planning, the Individual with Disabilities Education Acts (IDEA) states that the transition goals must be based on students' strengths, needs, preferences, and interests (34 CFR 300.43(a)(2)). IDEA mandates that students should be invited to the transition meeting but does not otherwise comment on their active participation (34 CFR 300.321(b)). Therefore, the US Department of Education (USDOE) expands on these requirement in a guidebook recommending practices that the transition planning team enact to build students' self-determination by encouraging students to develop their own goals, direct their own learning, and actively participate in meetings [42]. The gap between the legally mandated practices of IDEA and the USDOE recommendations is significant, resulting in a system that prioritizes the creation of a documented plan over the participation and agreement of the student who will be expected to complete that plan. This legal gap builds on a history in which disabled persons have been marginalized in decision-making around their own lives [2], reinforcing paternalistic attitudes by prioritizing educator and parent input over student input. A systematic review of studies on transition planning from 1994-2016 found that autistic students had minimal participation in their transition planning [11], indicating that many schools are following only the legal requirements of IDEA to invite students to meetings rather than adhering to best practices and actively incorporating them into meetings.

Previous work reviewing curricula to build self-determination skills in students with disabilities shows that a number of these curricula are implemented by teaching students to direct their own IEP and/or transition meetings [10, 46], suggesting that the transition planning process is well-suited for building these skills. Several curricula incorporate technology, for example Van Laarhoven et al. used technology such as slide presentations, videos, and text to increase student's voice and participation in meetings which resulted in high ratings of satisfaction amongst parents and students [29]. Wehmeyer et al. provided teachers with technology to support a curriculum teaching self-determination through transition planning [76]. We consider ways that technology can re-frame the actions of the team as a collaborative unit, encouraging practices that prioritize the student's agency and opinions in order to bring more opportunities for students to engage in and influence the planning process by setting goals and monitoring their own progress, thereby building causal agency.

2.3 Collaborative Reflection between Home and School

Interactions between members of large teams that provide long-term and ongoing support for a person, such as transition teams which spend years together directing educational programming to support students' post high-school success, engage in unique communication and planning practices which have been described in the collaborative reflection framework (CRF) [35, 37]. Collaborative reflection occurs when members of a team make sense of information together, using each members' unique viewpoint to build a shared understanding of intervention goals and activities [48]. Marcu et al. proposes two loops of collaborative reflection on these teams; the long-term loop supports ongoing processes related to goal-setting and progress monitoring, while the short-term loop describes practices related to understanding day-to-day performance variations and observations [37]. Amongst pediatric care teams (where children and teens are the focus of intervention) there is a need to facilitate collaboration between professionals (e.g., teachers, clinicians) and caregivers in the home (e.g., parents/grandparents, siblings, nannies, etc.). Researchers have identified ways for technology to address common communication challenges experienced by pediatric teams, such as aligning educational practices and sharing actionable data [37, 48]. Technology to support collaborative reflection between educators and caregivers of autistic children has been explored in various contexts, including ABA intervention for autistic children [26, 26–28, 37, 48] and related clinical service teams (e.g., speech/OT therapy, doctors, etc.) [53]. Technological solutions include automated data capture during intervention sessions to foster parent-professional collaboration [26, 27], an augmentative and alternative communication (AAC) system for children with complex communication needs that shares data and integrates parent and professional communication around a child's communication needs [53], and a data collection interface to facilitate data-driven collaboration for autistic students [36].

Within CSCW, research on the CRF has explored ways that healthcare providers use data to coordinate care [35] and ways to support communication on care teams for autistic children [37, 48]. For care teams of autistic children, researchers have focused on communication between caregivers and providers [37, 48]. However, the role of the autistic person on these teams is rarely considered. Marcu et al. recognized the need for systems to make autistic children aware of their goals and progress, however did not propose solutions to increase their participation in collaboration and communication [37]. Related to increasing the agency of pediatric care-receivers, Zhao et al. proposed technology that hospitalized pediatric patients could use to communicate directly with their professionals about their needs, placing them directly into the role of a collaborator [83]. In the design of this system, researchers emphasized the importance of a technological solution which placed the patient's goals and concerns at the center of care, prioritizing the needs and interests of the patient so they are viewed as equally important as those of caregivers or clinicians. We identify a need for similar research addressing the role of autistic students on their care teams. We contribute to this under-researched design space by considering design opportunities to increase the agency of autistic students on their transition planning teams. We chose to focus on autistic students on transition planning teams in response to calls in the literature to increase the voice of autistic population in technology design related to them [58, 59] and a need to increase the voice of the person at the focus of the intervention on care teams [37, 48].

3 METHODS

To understand existing practices of collaborative transition planning for autistic students, we interviewed 24 participants who were involved in transition planning, including 7 autistic young adults, 9 parents of autistic young adults, and 8 professionals who work with autistic young adults. Three autistic participants preferred a parent to stay with them for some or most of the interview,

which was permitted in order to ensure our participants felt comfortable. As a result, parents sometimes contributed during their child's interviews and provided context, background, and information related to interview questions. In this section, we describe the recruitment process, demographic information of our participants, and data analysis procedure.

3.1 Recruitment

We recruited three groups of participants for this study: autistic young adults, parents, and professionals. We targeted autistic participants who were 16 - 26 years old, able to communicate reliably, and who had participated in transition planning during high school. Regarding communication skills, we included participants if they were able to answer basic comprehension questions about the research study in order to demonstrate their informed consent to participate (e.g., "Please tell me the 3 things we will do today in this study"), and if they were able to participate in a video or phone interview. We did not specify a communication modality in our recruitment material (e.g., verbal, written, AAC). All of our autistic participants communicated verbally. We set a lower bound of age 16, as that is when mandated transition planning begins in schools, and an upper bound of age 26, as these individuals only recently exited the "transition years" as defined by the Institute of Medicine [12] and were likely to recall the process.

For the parent group, we recruited participants who had an autistic child between the ages of 16 and 26, and who had participated in transition planning. For the professional group, we targeted professionals who have worked in the disability field for more than three years and who had participated in transition planning. To recruit participants, we posted flyers on various autism-related Facebook pages as well as on bulletin boards around the local and state agencies. In addition, we contacted regional autism-related mailing lists (e.g., the Autism Society, the Autism Self-Advocacy Network), recruited verbally at autism-related events, and asked members of personal and professional networks to refer interested participants.

3.2 Participants

Participants were from a variety of states in the United States including Georgia, Tennessee, Alabama, North Carolina, Pennsylvania, Texas, and Washington State. Autistic participants were three men and four women, between the ages of 16 and 26. ($M = 18.75$, $SD = 2.9$). We use the designation **Y** for young adults. Their occupations included one high-school student (Y1), two college students (Y2 and Y3), one working at a non-profit company (Y6), two seeking employment (Y4 and Y7), and one currently enrolled in private transition program (Y5). Parent participants were all women, between the ages of 38 to 60 ($M = 50$, $SD = 7.6$). We use the designation **PR** for parents. Professional participants were two men and six women, between the ages of 30 to 71 ($M = 51$, $SD = 14.5$). The occupations of professional participants included vocational rehabilitation counselors, transition coordinators, and special education teachers. We use the designation **PF** for professionals. Participants had no relationship between one another. Young adults sometimes requested that a parent be present for interviews. In these cases, parents occasionally commented to provide context or clarified language but they were not enrolled as participants as their presence was to support their child, not give their perspective. After each interview, participants were compensated with a \$20 Amazon gift card.

3.3 In-Depth Semi-structured Interviews

Semi-structured interviews took between 45 minutes and 1.5 hours and were conducted synchronously. Most occurred through video conferencing calls. All interviews were audio-recorded and transcribed verbatim. We offered accommodations to the interview whenever they were requested. Requested accommodations included conducting interviews via phone instead of video

call and having a parent present. For all three groups of participants, we asked questions about their experiences of participating in transition planning (e.g., what they found most beneficial and challenging in the process, who was present at the meeting, the kinds of technology they used in transition planning) and questions related to self-determination and causal agency (e.g., How did the team decide on goals? How often did the student talk during the meeting?). These questions were slightly modified and tailored for each group of participants—professionals, parents, and autistic young adults.

3.4 Data Analysis

Two researchers (the first and last author) used Nvivo [41] and hand coding to analyze the interview transcripts. The researchers first used thematic analysis related to themes of causal agency to guide coding of the interview transcripts line by line [13, 20]. They then compared each piece of data to the previously coded data to determine whether the data represented a novel idea. After all data were coded, the researchers met and compared codes, then developed a code-book. One researcher returned to the interview transcripts to re-code all the data independently using agreed-upon definitions. Our final code-book contained five themes related to causal agency (Communication, Meeting Format, Goal-Setting Practices, Connecting to resources) which each had 2-3 child codes. For example, "Meeting Format" contained codes of "Student input and self-advocacy, knowledge of rights, and meeting format."

4 RESULTS

In this section, we present three themes critical to students' causal agency development in the team communication process of transition planning. Figure 1 summarizes our findings. In Section 4.1 and 4.2, we first describe ways that teams can develop student's causal agency by *making their interests and inputs central* to the planning process and *maximizing students' opportunities to build skillsets* in the transition period. In Section 4.3, we further discuss team practices that can *support student's active role in team communication* by adopting Marcu et al.'s collaborative reflection framework of long-term and short-term collaborative reflection loops [37].

4.1 Centering Goals around Student's Transition Interests

The importance of soliciting student input was acknowledged by the majority of students, parents, and professionals. Below, we report three common ways that teams reported centering their education goals around students' interests: using toolkits, following student-generated goals, and collaboratively building goals around students' interests. Despite these reported practices, most young adults reported feeling they had little input in their transition.

4.1.1 Using Toolkits to Uncover Students' Interests. In the United States, incorporating student's interests and preferences is legally mandated in transition planning, therefore most participants discussed some attempt at discovering interests. Methods for determining interests varied greatly between transition teams, even those within a family or a school. Where toolkits were in place for this, assessments guided students through pictures of jobs, surveys about preferred work environments, and surveys that paired personality traits and skills to professions (e.g., Myers-Briggs, True Colours). Professionals described how these assessment helped students learn about themselves, "*Sometimes students don't even know what their interests are until that - that assessment will really open their own eyes.*" – PF7. We also uncovered reports of teams selecting classes and internships that catered to student interests, and of students learning about careers related to their interests. Visual supports such as pictures and videos are often used to facilitate instruction for autistic students [47] and particularly those with communication challenges [4]. Professionals

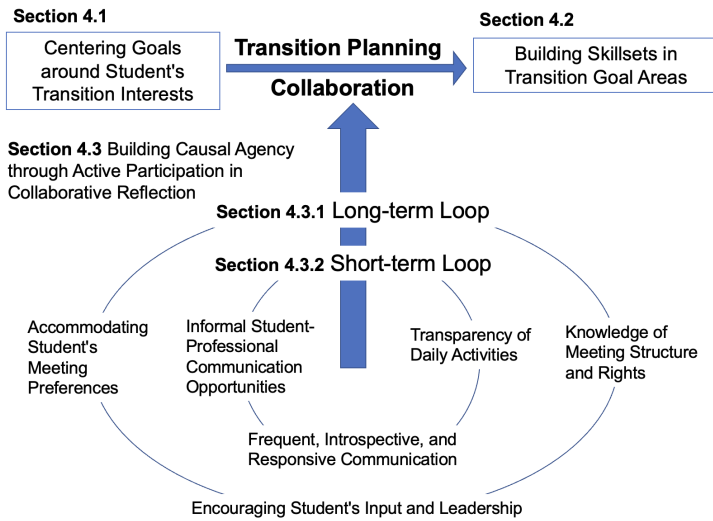


Fig. 1. This diagram summarizes factors that teams should ensure are present to develop students' causal agency in transition planning. We first highlight major themes derived from causal agency theory—setting goals aligned with one's interests and building skills related to those goals. We then extend the iterative process of causal agency development with the long-term and short-term loops of the collaborative reflection framework. In the long-term loop, the team should be responsible for setting goals around student's stated interests and accommodating student's needs and preferences in periodic team communication. In the short-term loop, students should track and share day-to-day progress with team to monitor achievements and/or breakdowns. Once breakdown is noticed, the students should either address the issue with support from team members or, if it may escalate into a larger barrier to education, call for a meeting with members of the transition team to receive flexible support to address their challenges.

in our sample used visual supports like pictures of people at work to help students explore and understand different types of jobs. Additionally, sensory sensitivity is a known issue amongst autistic individuals [49], and was discussed as a barrier to learning by both Y2 and Y3. Professionals considered these factors by including sensory elements of different work environments in surveys to better inform the team of the student's preferences.

The use of toolkits to discover student interests was not reported universally, and some team members even reported no attempt by the school to learn the student's interests, *"They have no assessments, no interest inventories. In order to do his likes and preferences on his IEP, I sit down with him and make a list and send that to the case manager."* – PR7. Where there were no toolkits to discern student interests, teams did not uncover student's authentic interests. One young adult recalled agreeing to teachers' goal proposals because he was not sure what his own interests were, while another reflected, *"I remember them asking me, what do you want to do? And like, I don't have a passion for a career [...] Maybe they could have just told me what options were there."* – Y4. When no tools were used to uncover interests, students missed the opportunity to engage in critical self-reflection of the relationship between their interests and potential goals, which is fundamental to the goal-setting processes that are a part of causal agency.

4.1.2 Following Student-Generated Goals. Where students set their own goals and communicated their interests, we found that they were often paired with vocational and educational programs that supported training and internships related to their goals. Within the pediatric health literature,

Zhao et al. found that even when the goal set by the patient was not achievable in the hospital, the ensuing discussion around the goal created a collaboration opportunity to build a shared understanding with the patient about their care plan [83]. Extending this body of work to transition planning teams, ensuring that students have opportunities to contribute to setting goals related to their interests is important even when the goal may not be within the student's skillset. A critical piece of developing causal agency is engaging in the iterative process of pursuing a goal and examining the discrepancies between one's current skills and their desired outcomes [69, 70]. When students participate in goal-setting for their own educational experience and engage in analysis of the requirements of the actions needed to achieve the goal, they act as causal agents.

On teams where students did not participate in goal-setting, we found instances of young adults not knowing what their goals were, consistent with past research [75]. We also uncovered reports of parents directing students toward goals based their conceptualization of who their child *should* be rather than student's own self-image or presentation. For example, we found instances of parents excluding their child from the goal-setting process by pushing them to attend universities and training programs that were not in alignment with strengths and interests expressed by the student, and of professionals setting goals based on school resources rather than the student's unique profiles. Students expressed frustration and anxiety when professionals and parents determined goals for them, *"We know the best for ourselves too, you know [...] it makes us seem like we're kids and like the parents are in charge of us and like they only know what's best. It's just like, they think, we can't think for that for ourselves. And it just like pisses me off. – Y4"*.

4.1.3 Collaborative Educational Goal-Setting Supporting Transition Goals. The process of goal setting was enacted differently across teams, in some cases the planning and meetings were highly collaborative, while on others teachers worked in isolation. On teams with high levels of collaboration, communication between the transition case manager and teachers led to the student participating in activities that supported the student's transition goals, *"When we're looking at education, we're really looking at, you know, those IEP goals and objectives [...] we need to help, you know, get the student, again, to their end goal and employment" – PF7*. Members of highly collaborative teams reported working with students to locate classes outside of the immediate high school to get job-specific training related to their interests and pairing students with teachers who were responsive to their accommodations. Building collaboration to support students ensured that the team acted on student's wishes, showing the student that their agency drives the process of change.

In teams with low collaboration, we found reports of professionals setting goals without communicating with the students, the parents, or even each other. This often resulted in inappropriate goals that were not challenging, not personalized for students, and had minimal goal alignment between academic and transition goals. Professionals on these teams reported disengagement with the goal-setting process, and parents and young adults reported feeling unsupported, *"I've told my mom what I wanted to do and we discussed how do I get there? [...] It's just me and my mom really." – Y4*.

4.2 Building Skillsets in Transition Goal Areas

Opportunities to pursue interests are critical to the process of developing causal agency capacity [70]. Once interests are determined, students must have the opportunity to pursue specific opportunities in order to enter the iterative loop of reflecting on their performance in pursuit of that goal. We found that teams supported students' growth in areas of their transition by communicating proactively about resources, working with students to pair the student's interests and skills with potential careers.

4.2.1 Pro-Active Connection to Education and Employment Resources. Our participants reported different transition and employment-training resources for special education students graduating from high school that varied based on where the students lived and attended school. Teams that successfully connected students to community resources included professionals that reached out to families pro-actively with relevant resources, "*[Our case manager] always included us, invited him to any of their trainings or opportunities for individuals with disabilities that he could get more training opportunities funding, anything.*" - PR1.

However, most young adults and parents reported that they did not receive information about these types of resources. Parents described learning about programs from parents of other children in special education rather than professionals, and a lack of communication from vocational rehab centers. Even professionals reported that resource availability was often unclear for school district employees. Consistent with previous research [56], we uncovered difficulty connecting with resources post-high school where young adults reported missing out on training altogether because they were not connected to resources within the critical window before services dropped off after high school, "*I even called up a day program and they said like, well, you should have been in the program after high school*" - YA5.

4.2.2 Pairing Skills and Interests with Career Directions. Autistic students often have strong specific interests [79], however they do not always have the skillset to pursue their chosen career. This is a particular difficulty for students with lower intellectual capacity. Therefore, professionals often go through a process of discovering how these goals and careers attracted students to uncover alternative pathways for them to enact those interests. For instance, PF3 discussed how she presented options for a student who wanted to be a nurse but did not have the academic preparation, "*What is it about being a nurse that intrigues you, and then what are some other things that you could be doing or other directions you could take that would achieve that? If it's your vision of helping people – okay well, great! There are lots of ways to help people. So what are some other ways [to achieve that]?*". Teams who engage students in this way create opportunities for students to develop causal agency by guiding them through the process of analyzing the discrepancies between their current skills and desired outcomes.

4.2.3 Supporting Flexible Responses to Challenges. Part of developing causal agency is responding in the face of unsatisfactory outcomes, assessing the discrepancy between the desired outcome and the present situation, and creating a plan to address the discrepancy [69, 70]. Understanding what to do when things do not work as expected is an important skill for growth. Autistic students sometimes experience rigid thought patterns [14]. As such, it is important to have trusted team members support them in changing directions and providing alternative goals that are still related to their stated interests when they do not achieve their initial goals. We uncovered reports of students who were unsuccessful in their initial transition plans and benefited from such support. Y3 shared the successful story of pursuing an alternative goal with support from the counselor after being rejected from her dream school (the only one she applied to), "*At first my plan was to go to [student's dream school]. I was really, really certain about it. [...] I fell into like a deep depression when I wasn't accepted into [the dream school]. But [my counselor] helped me with it. She was trying to give me ideas for like other colleges [...] and she helped me with that process.*" - Y3. Because her counselor understood and supported the student's interest in college, she was able to provide support that was relevant to the student's interests.

However, some young adults reported staff who were not engaged in supporting them following failures. Y6 described being assigned to a training program to work with sick animals (her dream job) that was too difficult for her. When she was unsuccessful, her transition team did not provide support to scaffold her learning and instead assigned her to an internship program that was unrelated to

her goals without even discussing options with her. This student missed out on discovering other options related to her interests and assessing the gap between her desired goal and her current skills. Even during the study interview, years after this event, she continued to describe veterinarian as her dream job without recognizing that that it may not be an ideal career, given "*that I don't like, like, you know, open up wounds and stuff.*" - Y6. Assigning her to a new program without consulting her or helping her understand what kinds of supports she needed to be successful interrupted the self-reflection process needed to develop causal agency, depriving her of the opportunity to analyze what her skills, interests, and needs were, and re-orient herself to a new goal.

Fitting in within workplaces was also challenging for some students. Y3, for example, reported tension with managers who showed hostility toward the autism community by voicing negative comments, and others who did not communicate with her effectively and therefore made her feel that she was not succeeding at work. Difficulty fitting in with and being accepted by neurotypical colleagues is a work barrier for autistic adults that has been previously identified by researchers [50, 50]. Providing support in the form of job coaches and mediators to support the student in responding to discrimination and educating workplaces on how to build more inclusive environments for autistic employees is one key way in which schools can support students' successful transition to employment.

4.3 Building Causal Agency through Active Participation in Collaborative Reflection

Consistent with Marcu et al.'s collaborative reflection framework, we observed long-term and short-term collaborative reflection loops in transition planning team collaboration. However, our student participants were not consistently active in these loops. The student participants who were active in the long-term loop were involved in setting goals and monitoring progress. Those who were active in the short-term loop had opportunities to observe how their day-to-day choices impacted progress toward a desired future and connect with professionals in low-stakes conversations around topics related to their transition and progress.

HCI literature has proposed design recommendations that consider learners' knowledge of goals and feedback around progress [37], however there is a recognized need for considerations of learners' agency on care planning teams [48, 58]. In this section, we fill this knowledge gap by reporting how students in our sample were active transition team members who contributed to goal-setting and progress monitoring, rather than passive recipients of goals and progress reports dictated by others. We first explore findings around the student's role in the long-term collaborative reflection loop, and then in the short-term loop.

4.3.1 Supporting Student's Agency in Long-Term Collaborative Reflection. The long-term collaborative reflection loop of the Collaborative Reflection Framework consists of activities related to planning, executing, and assessing the effects of interventions [37]. We determined that long-term loop transition planning activities included annual transition planning meetings, where teams assess students' interests and skills, set goals, assign intervention schedules, and create periodic progress reports, where professionals send written updates on students' goal performance to parents. By joining in collaboration on this loop, students can have greater opportunities to participate in goal-setting and self-monitoring of progress, actions that contribute to causal agency development [70]. As we detail below, we found that students' development of causal agency in long-term collaborative reflection was most successful when teams accommodated students' meeting preferences, encouraging students to provide meeting input and lead meetings to the best of their ability, and when students and their parents were aware of the student's legal rights and the transition meeting process.

Accommodating Students' Meeting Preferences. Autistic young adults often recalled feeling anxious during large group transition meetings, and several parents and professionals acknowledged that being surrounded by adults discussing one's challenges can be intimidating for students. We uncovered reports of various factors that students preferred for their meetings, such as Y2, who preferred online meetings *"I feel like it kind of leveled the playing field to have it on zoom instead of like a bunch of adults in a room with me,"* or PR2's son, who preferred to attend only part of the meeting *"We actually invited him to the meetings and at 14 he would come and he would, he would talk for a few minutes, but then he wanted to get back to class."*

We also uncovered a number of students who reported disliking their meetings because they did not suit their preferences. Factors included a preference for meetings with fewer people, shorter meetings, and meetings where they could communicate asynchronously or non-verbally (such as by sending emails ahead of time). This finding is consistent with preferences voiced by autistic people for different meeting and communication modalities in various group settings that have been reported in the past literature [14, 21, 40]. We highlight the variety of these preferences to underscore the diverse needs within the autism community. Rather than presuming this is an exhaustive or universal list of needs within the community, a student's actual preferences should be determined, as factors commonly thought of as preferential to autistic people, such as images rather than text, are not always preferred in practice [18].

Encouraging Student's Input and Leadership. Developing causal agency requires both experience setting goals as well as the belief that one's actions will result in change [70]. Therefore, it is important that students see their interests guide transition goals, and that they see that their opinions and inputs result in meaningful changes. On transition teams where student's input was central in meetings, we found reports of teams giving students formal training in leading IEPs, using workbooks to support goal development, and using individualized supports such as PowerPoint presentations for students with difficulties communicating, or practicing with students ahead of time. Prior work on curricula to support self-determination and student leadership during transition planning have used many similar supports to build student participation [38, 73]. One parent reflected on the feeling of agency that stemmed from her daughter's participation in meetings, *"She really likes being in there, it makes her feel like she's a part of things that makes her feel like she's adult and like she has some control over what's happening to her [...] and normally she feels really proud of herself because she's very engaged with it."* - PR8. However, a number of teams did not pursue practices of encouraging student's input. We uncovered several reports where students were rarely encouraged to talk during meetings, were spoken over during meetings, and were even excluded from some or all of the meeting. Students in these cases missed the opportunity to voice opinions and see their input have an effect, thereby missing out on opportunities to develop causal agency.

Knowledge of Meeting Structure and Rights. Adequate knowledge of the transition planning purpose, process, and rights was a significant factor in ensuring that the student understood what was happening during transition planning meetings and was prepared to contribute. Parents and professional expressed the importance of knowing one's rights *"So there's just lots of things that get dropped. And if you don't have a parent who knows their rights in the law, [...] those things get kind of set aside and swept under the rug."* - PF5, with reports of families hiring legal council or massaging personal connections in the school administration to ensure that student's accommodations were observed appropriately. Learning to navigate bureaucratic systems and request accommodations can prepare students to assert their rights under disability law and determine when and how to pursue legal accommodations in employment. One parent described the benefit of this kind of experiences, *"I let him choose [whether to disclose his diagnosis to employers] now because we've had*

negatives on both when we've disclosed and negatives, when we didn't disclose - positives, you know, each way." - PR1. Participants who knew their legal rights around transition planning discussed factors like knowing that they could call a meeting at any time and invite anyone they wished, as well as ensuring that students receive any assessments and supports they needed as important to students' success. One young adult talked about developing the confidence to learn how to advocate for herself and described how after years of learning about the system she will now, *"Go knocking on doors—can you help me with this? Make a lot of phone calls, showing up at offices, asking. It gets me what I want a good amount of the time. Realizing that it's all kind of garbage and that if I'm going to get what I need, I need to step outside the rules and that's okay."* - Y2.

Where students were unaware of the rights and processes, we uncovered reports of schools not following legal procedures by declining to set up timely meetings and assessments, skipping required paperwork, and leaving team members unclear about the purpose of or expectations in meetings. We also uncovered reports of meetings only held at times when the parent or the student had scheduling hardships and students agreeing to what teachers proposed because they did not know what else to do, *"I just didn't know what to say during meeting really, other than just agree to what they were saying."* - Y4. Situations like Y4's meant students missed the opportunity voice opinions and direct their future, resulting in students feeling they had no agency in the process of planning their futures. In a review of studies on involvement of autistic students in meetings, Chandroo et al. reported multiple findings that this feeling of confusion and uncertainty is common amongst students, with authors of several studies calling on teachers to provide students with direct instruction in how to participate in meetings [11]. Several curricula that seek to increase student's participation and agency during the IEP and transition planning process include explicit instruction around the meeting structure to combat confusion and non-participation in meetings [3, 39, 73]. Overall, transition teams not informing students about the meeting process and their rights prevented students from being active in long-term goal planning activities that could contribute to their causal agency.

4.3.2 Supporting Team Relationship-Building in the Short-Term Loop. The short-term collaborative reflection loop defined by Marcu et al. consists of recording behaviors, sharing records, reflecting on behavior, and corroborating interpretations of behaviors [37]. We uncovered that short-term loop transition planning activities were less well-defined than on the long-term loop, as long-term loop communication opportunities were legally mandated. Our interviews further revealed that students reflected positively on situations where they had informal communication opportunities with staff, transparency of daily activities, and frequency of communication. Similar to Marcu's findings, a major source of tension for parents was that professionals did not share detailed data on daily performance, leaving them in the dark about school activities and preventing them from supporting their student's growth at home [37]. Moreover, informal, low-stakes communication activities between students and professionals were not always directly related to the short-term goal tracking as described by Marcu, but which seemed to support students' comfort reaching out to team members when needs related to transitions arose.

Informal Student-Professional Communication Opportunities. Students reported satisfaction when they regarded teachers as friends and mentors they could talk with informally. Where these relationships existed, we found that students felt comfortable approaching team members about accommodations, daily experiences, and for help exploring interests. These activities were not always strictly related to transition planning, however they created a space where students felt comfortable approaching transition team members between formal meetings. Students with well-established lines of communication with school professionals described feeling welcome to check in with teachers about daily needs. They also reflected a desire for teachers to pro-actively check in

with them outside of mandatory formal meetings, even just emailing to ask "Hey, you good?" - Y2. It was important to students not to make extra required meetings to avoid "piling on" to students who were already managing a lot. Informal interactions can build students' confidence that their contributions are valued as they learn to directly communicate their needs, and support causal agency development as they develop a belief that their actions will lead to change [70]. One student reflected on how feeling comfortable interacting with teachers was helpful for her after high school, *"I definitely learned a lot about communicating with teachers because I started early, so I was already developing those skills. Now when I email my professors, like I am already pretty good at it."* - Y3.

Where this type of relationship did not exist, young adults reported difficulty even knowing who to speak to about their needs. One young adult recounted not knowing who to contact when a teacher was denying her accommodations, while another young adult recounted seeing a poster for a program of interest but never applying because he did not know who to talk to about the program. Difficulty connecting with team members meant students were not able contribute to the short-term conversation about their school performance or begin conversations around new interests, and therefore missed out on causal-agency building interactions.

Transparency of Daily Activities. Sharing day-to-day happenings between members who were not co-located created shared context between environments. Professionals described various messaging platforms used to contact parents for messages around daily activities or to find out if something might have happened at home if the student is acting differently than usual, however also reflected that high-tech systems were not always accessible to parents due to poor organization or lack of mobile-readiness. Only one professional described a system for daily communication in which parents were sent a note each day about what their child did, as she worked with students who were not verbal communicators. One parent described a shared whiteboard to track her student's daily activities. Another described a high-tech version of this, *"One of the most effective things that we've come up with is her case manager set up a big Google docs spreadsheet, where everyone can put in what has been going, what they've been working on that specific day, what worked, what didn't work, they're going for that type of thing so that everyone can actually see what's happening as it's happening instead of just a bunch of stuff happening. And then everyone trying to remember and talk about it once every few months."* - PR8.

Where systems did not exist to support transparency, parents were unaware, or only occasionally aware of students' classroom and internship activities. This led to an inability for parents to understand what students' academic and employment goals and activities were, and thus schools ended up targeting goals inappropriately. Parents reported a sense of missed opportunities and lost time on discovering instructional problems months into the school year—or even years after graduation. *"I was floored to see all the information notes that were in my son's portfolio that I had no idea [...] It would have been extremely beneficial and there was no communication about that."* - PR1. Professionals also lamented infrequent communication, one professional described making an effort to send emails to parents around positive events, *"So that not everything we say is bad news"* - PF4. This was similar to findings in the literature, where professionals do not share daily performance even when data is collected and negative events were more likely to be shared with parents than positive ones [37].

Frequent, Introspective, and Responsive Communication. The short-term collaborative reflection loop is built on frequent conversations about data sharing and interpretation [37]. Therefore, it is critical that communication occurs frequently, invites interpretations of daily observations, and that team members are responsive to one another. We uncovered only one report of professionals initiating discussions around progress with students, in which a case manager checked in once every six weeks. While regularly inviting students to reflect on their progress is positive, more

frequent check-ins can create opportunities for students to join the short-term conversation around their needs and reflections about their activities. One student recalled, *"We barely did anything. I remember being bored out of my mind there. So it's like, like I think like the important point is they need to have some like high expectations."* - Y4. Having no place to share the information that the work was not challenging her, Y4 was unable to intercede on her own behalf to make educational activities useful for her. An additional barrier to building ongoing conversations was non-responsive team members, where multiple emails or requests from parents and students would go unanswered, preventing communication altogether.

One available system, Microboards, supports interactions around short-term needs by allowing a small group of people to form an incorporated association to help a person with disability to plan and achieve their goals [5]. This system refers the small group as a 'board' and ensures seamless communication among the board members by explicitly assigning roles and responsibility to each member such as President, Vice President, Secretary, Treasurer, and Public Officer. For example, the President is responsible for efficient communication between the members and Secretary keeps minutes of meetings.

5 DISCUSSION

Existing research investigating the role of technology in supporting team collaboration for autistic students often focuses on experiences of parents and professionals [22, 26, 28, 37, 48, 53], although some do include first-person perspective from autistic individuals [19, 21]. Our work contributes to this body of work by exploring the student's role and collecting first-person experiences of students during their collaboration with the team for transition planning. Specifically, we investigated how the transition planning team collaboration process can contribute to students' sense of causal agency. This process is summarized in Figure 1. Since students should build causal agency through collaborative team work, we extended the process of building causal agency—goal setting, progress monitoring towards goals, and reviewing discrepancies between the intended goals and achievements—with the collaborative reflection process. Therefore, we propose a role for the autistic person who is a target of intervention on collaborative care teams, and consider how team practices can be enacted to support causal agency development through collaborative reflection.

We recognize that a lack of student involvement in transition planning is a larger systemic issue within education that is often not in the control of our stakeholders — professionals, parents, and young autistic adults— and that school districts can be resistant to changing practices. For example, the inadequacies of the special education system that often upholds ableist attitudes [2] and employs teaching methods relying on external motivation, which run contrary to the development of self-determination, thereby withholding the capacities to build self-determined lives from students [80] are unlikely to be solved by the introduction of a technological tool. However, despite these systemic challenges, our data showed successful cases of transition teams where a student's right to lead a self-determined life was acknowledged and development of causal agency was supported. Therefore, in this section, we discuss ways that technology could promote successful practices we uncovered in our data that facilitated students' involvement in the short- and long-term loops of collaborative reflection. We also propose tools to address barriers experienced by team members who wish to support students' agency and work toward constructing educational and transition practices that respect the autonomy of students within the system rather than perpetuating practices that withhold decision-making capacities from them. Moreover, we connect our research findings to the existing line of research investigating collaborative care technology designed to promote agency of pediatric patients and employment support technology. We discuss how existing research can serve as technical solutions to facilitate team collaboration for autistic students and how our findings

can further contribute to developing agency of autistic students in the process of transition team collaboration.

5.1 Student Involvement in the Long-term Collaborative Reflection Loop

The long-term collaborative reflection loop includes activities related to setting goals, planning, and tracking progress toward them [37]. Our findings showed that students were most successful when their meetings were structured according to their preferences, when they had input and took on leadership roles, and when they knew what to expect during the meeting and how to assert their rights in the process. To develop students' causal agency in this long-term reflection process, our findings suggest that team members should explicitly center goals around students' interests and make all the available resources for planning available to allow students choose and build skill sets toward the goals. To ensure this, during the annual meetings that occur to build long-term goals, team members should create a meeting environment that reflects students' meeting preferences (e.g., letting them decide meeting modalities), encourage students' input and leadership, and make them aware of their rights before and during the meeting. In this section, we first discuss opportunities for technology to support identification of students' interests and addressing gaps between their current skills and goals. We then suggest design opportunities to facilitate teams' prioritization of students' preferences in the meetings.

5.1.1 Identifying Interests and Setting Achievable Goals. Identifying interests and preferences is an important step in developing employment goals [55]. However, the existing literature on technology supporting employment primarily focuses on people who already know what they want to become, and thus does not address how to effectively uncover the interests of job seekers [16, 17]. Our results contribute to this line of research by uncovering the need for support tools for autistic young adults to identify their interests and career goals. In our study, we found the toolkits highlighting visuals and experiences (e.g., showing pictures of jobs or videos of employees working at a workplace) helped self-discovery in autistic young adults, as autistic individuals are often reported to show strengths in visual communication. Furthermore, we identified the importance of uncovering unique sensory characteristics of autistic students when identifying career and employment options. Future research should further explore visual and experience-based technologies such as virtual reality (VR) and video modeling as potential solutions for interest-discovering toolkits. For example, VR can simulate different occupations to allow students experience different jobs. Those visual and experience-based technologies have been used previously to support the development of social, vocational, and job-interview skills in autistic young adults [8, 9, 33, 67]. Similar online tools exist for virtual career fair in order to help job seekers learn about employers in online environment [65, 78]. However, future research can further explore the efficacy of including various factors that are critical to autistic people (e.g., environmental and sensory factors of each occupation like noise level, lighting, etc.) to provide more individualized support for autistic students and expose students to occupations that align well with their unique characteristics.

Moreover, we uncovered reports of students being spoken over during meetings and goals being set by team members other than the student. For example, when parents determined that flight school was the best option for their student without speaking with him first. This challenge of competing interests was also identified as a concern for pediatric hospital patients by Zhao et al., who reported that the patients often had different concerns than parents but had to communicate with medical caregivers through parents, meaning that their concerns were not always conveyed [83]. They proposed a collaborative technology which makes the patient's goals and concerns highly visible and displays them with the same prominence of other team member's goals. The increased visibility of goals led to patients becoming more comfortable contributing to their care

discussions and also helped clinicians ground their care in outcomes of importance to patients. A similar interface may help autistic students to make their goals known to team members and build a mechanism for grounding conversations in their preferences. Such a technology could make students' goals highly visible and distinct from parent and teacher goals in the planning documentation. An interface which displays goals from all team members at equal prominence or makes students' goals more prominent can spark a conversation around paths forward and ensure that the student has a space set aside for their own contribution, similar to [83]. Professionals in our sample reported a barrier of parents setting goals for their child, while young adults reported a barrier of being excluded from goal setting. Such an interface can provide a platform to push back against parents or administrators pushing goals which align with measures of success defined by neurotypical norms rather than by the autistic students' measure of success while ensuring that the student has a highly visible role in goal setting.

A technology similar to Microboards [5], which assigns roles to different members of a decision-making team for an individual with intellectual disability, may be adapted to the transition planning settings to address barriers that arise around student's involvement in exploring interests and identifying goals. Such a tool could recognize a role whose explicit job it is to ensure that the student's opinions are actively sought out, that the student can evaluate suggested goals from team members in a low-pressure environment rather than being pushed to accept proposed goals, and who checks in with students regularly to ensure that they are aware of and excited about their transition goals. The existence of an such a role within the team could work to bridge the gap between legally mandated meeting practices of merely inviting the student and best practices of actively including the student in goal-setting. Previous research has revealed that an additional barrier to successful implementation of best practices is teacher's knowledge of the transition procedures and requirements [11]. Therefore, another role that could be assigned in the system like Microboards may be one that ensures educators on the transition team have adequate knowledge to navigate the process skillfully and to support their students in the process. Creating technology that pushes team structures to better reflect best practices by assigning responsibility can be one step toward building more inclusive transition planning environments.

5.1.2 Technology to Address Skill Gaps. A critical part of developing causal agency is understanding not only how to select and work toward a desired outcome, but also to analyze what steps are required to reach this outcome [69, 70]. Parents, professionals, and students in our sample often reported a gap between the student's current abilities and those required to achieve a dream goal. This challenge emerged at two points—when initially setting a goal and when assessing progress toward a goal that was already set.

When determining an initial goal, we found the importance of encouraging the team to develop several realistic goals around student's interests. To do this, team members interviewed students to identify the core elements of interest motivating goals and suggested alternative goals that had similar key elements of importance to the student (e.g., working with animals as a volunteer walker instead of as a veterinarian), but which were achievable given a student's skills. However, this process of guided discovery and alternative goal generation was time and resource intensive. Here, we identify an opportunity for technology to support student's exploration of others with similar interests and abilities to themselves. For example, TeachersPayTeachers is a site which allows educators to share digital educational resources and enables others to download, rate, and review each resources [63]. Similarly, an online employment portfolio repository could allow people to share transition portfolios of autistic adults or students (with their permission), so that students who want to attain specific employment goals can set goals and look for resources or opportunities similar to those in the portfolio. Bills and Ng suggested an algorithm tool that matches autistic

job seekers to positions [7]. Such site design could be tailored to address the needs of autistic individuals. For example, each portfolio can include the person's interests and abilities, special skills and sensory needs, employment goals, steps taken to achieve the goals, and what worked and did not work to achieve those goals.

This tool could also highlight supports to build students' success once a career goal is set. In our sample, some students who secured jobs within the community reported discrimination by neurotypical employees was a barrier success. For students sent to a district-sponsored career training centers and internships, some parents, students, and professionals complained that schools were not always forthcoming about available training options, nor did they consistently support students to progress once they were placed. Students were sometimes sent to settings not aligned with their strengths or interests. Participants also reported students who were not always provided with accommodations such as job coaches who could support student success by building students' workplace skills or developing inclusive practices at work sites. Therefore, students missed out on the opportunity to better understand their skills and needs in way that could increase their ability to learn job skills that support their career interests in the future. This lack of accommodations, including accommodations targeting neurotypical employees' inclusivity skill-sets, contributes to high unemployment rate of autistic adults [50–52].

A network where students and parents could share knowledge and experiences of training opportunities can create a space to hold districts accountable to provide equitable services to students. It can also facilitate communication between autistic young adults about work and education experiences and accommodations at work and school. For example, Y8 emphasized that she wished that someone had told her how she could ask different people on staff to help her secure accommodations and not to take "no" for an answer. Presenting students with specific steps to achieve their goals based on lived experiences can increase self-efficacy by presenting goals that have been achieved by people in similar positions, and showing the types of support that have helped others be successful [17]. For example, students could share strategies for responding to discrimination at work such as sharing one's autism identity, which has been shown to increase acceptance by neurotypical people [51]. Such a platform can provide a place for the autism community to connect directly around ways to circumvent discriminatory and dis-empowering environments and share strategies for success. In designing such a platform, however, special attention should be paid to protecting privacy of those who share their portfolios by controlling information that could possibly reveal their identity.

5.1.3 Prioritizing Student's Preferences and Knowledge in the Meeting Process. Students in our study reflected that the meeting modality, particularly meeting length, place (online vs. in-person), communication options (e.g., talking, email, presentation, etc.), and general meeting knowledge (e.g., meeting purpose and agenda) were important for ensuring that they felt understood what was happening and were comfortable voicing their opinions. This finding is consistent with previous research showing that autistic young adults prefer flexible communication modalities [21, 29, 76]. To provide students with an opportunity to act as causal agents in regards to meeting structure, we recommend designs that provide a platform for making the student's meeting preferences visible to the rest of the team and allow teams to negotiate meeting logistics based on the students' preferences. Using tools to communicate their preferences builds both the skill of communicating desired outcomes and (if the team accommodates their requests) the belief that their efforts have desirable consequences, both foundational elements of causal agency [70]. Therefore, a system that encourages teams to choose meeting modality based on students' preferences can create an environment where students feel more comfortable voicing their opinions and provide an opportunity to see their opinions to results in changes.

Moreover, technological solutions should incorporate practices which encourage neurotypical instructors to intentionally consider and build social inclusion for autistic students, rather than reinforce the view that autistic people should accommodate neurotypical social preferences. Designers should explore the space related to preferred communication modalities of autistic students. Work has been done on creating communication platforms for neurodivergent adults in social and workplace settings [6, 14, 84] and college students in group work classroom settings [85]. However, transition teams embody different power dynamics and structure than these spaces. Transition teams include two sets of adults, school administrators and parents/guardians, who wield significant power over adolescent students in the form of grades and legal custody. Designers should work in partnership with autistic students using participatory and justice-oriented practices to develop ways to disrupt meeting practices developed within ableist educational structures that maintain these power balances [81]. Furthermore, future work should take into account the larger systemic issue within the special education system, where adherence to legal requirements for meetings (e.g., requiring attendance) takes precedence over implementing best practices within these meetings (e.g., participation in goal setting) [11]. Pushing schools to accommodate students' meeting and communication preferences rather than expecting students to accommodate neurotypical interaction norms and preferences is an important step for ensuring that autistic students feel empowered to voice their opinions in the transition planning process.

Additionally, on many transition teams, we found that students were unsure of what to do or expect during the meeting. Previous research on transition-planning curricula has uncovered that telling students what is going to happen in IEP meetings increases meeting participation [3, 39, 73]. Telling students what to expect affords opportunities for them to prepare ahead of time, which in our findings resulted in students self-advocating for their own interests more effectively during meetings. Therefore, designs of collaborative technology that mediate transition team communication and meetings for autistic people should ensure that the student knows what is going to happen in the meeting, provide space for student to prepare, and make the student's intention to give input clear to team members, so that the team can support and encourage the student to participate during meetings. Participants reported teams using presentation software such as PowerPoint to support students with social or general anxiety, using it as a tool for them to arrange their thoughts and practice voicing their opinions outside of the meeting environment. Platforms that support asynchronous communication can make meetings more inclusive for students who do not feel comfortable in synchronous meetings. Aside from supporting those who preferred asynchronous communication, these types of platforms were useful for team members who wanted to ensure students who had limited verbal communication had a way to communicate their needs and interests to the team. Researchers who have investigated similar tools for students with limited verbal communication have reported high satisfaction from parents and students with these tools, indicating that asynchronous presentation tools can be highly effective for building meetings than are inclusive to students with limited verbal communication skills [29].

5.2 Student Involvement in the Short-term Collaborative Reflection Loop: Student-Mediated Information Sharing

The short-term collaborative reflection loop includes activities related to daily observations and performance [37]. Our study uncovered the importance of daily information management and reflection practices to create opportunities to develop causal agency. Students who had frequent, informal communication opportunities with team members and whose team members knew what was happening on a day-to-day basis showed the ability to contribute to conversations in a way that improved their educational experience. For example, by bringing up educational breakdowns with team members as soon as they arise to prevent challenges from escalating into major barriers.

We found that failures of this process made students miss out opportunities to reflect on their everyday progress toward the goals and proactively asking for help when breakdowns occurred. When breakdowns came up, students on teams with poorly established short-term collaborative reflection loops often did not know whom to reach out when they encountered difficulties. In this section, we explore more specific aspects of the short-term collaborative reflection loops to build on causal agency theory and collaborative goal tracking research and discuss how to place the student at the center of facilitating communication on the short-term loop.

5.2.1 Student-Driven Daily Progress Sharing with Team. Many collaborative tracking systems have been proposed to connect parents and professionals more frequently and informally to share progress of autistic children for better care [25, 53]. However, it is unclear how autistic people can intervene in the process, so they can have more agency in daily team communications. In our interviews, we found that transition teams that used individualized supports like student-created PowerPoint presentations about their interests and opinions in front of team members helped students to perceive agency in achieving their transition goals and lead communication with team. However, these primarily occurred during long-term loop collaborative activities. We propose similar technology could facilitate the short-term communication process by scaffolding autistic students to collect photos or reflections daily activities, progress, and events in relation to their goals and interests and share them with team members. Leaving the specifics of the type and content of post up to the user encourages creative expression, which in previous studies of mood tracking was reported as enjoyable by users [32]. Furthermore, a system that supports different types of updates could be accessible to users who have limited verbal skills. Autistic students in our study reported that they enjoyed having informal, frequent interactions with school staff. This student-driven progress sharing with the team could occur in an informal space where team members could check in on the student's performance, while addressing the concerns of parents who often did not know what the student's daily activities are or how they relate to the student's goals.

5.2.2 Capturing Progress Breakdowns for Remediation. Parents and professionals reported on various methods of monitoring and sharing day-to-day events for transition planning which were mediated by parents and professionals only. These included recording daily activities of students on a whiteboard, sending a paper log back and forth, and recording activities on a Google spreadsheet. However, we did not uncover reports of autistic students viewing or contributing to shared communication platforms, and thus they were denied opportunities to build causal agency by tracking their daily progress and reflecting on that progress with team-members. A review of studies from the medical self-tracking community showed that technological solutions such as mobile dashboards that allow participants to view their data facilitated conversations about their care [45, 83], and made them aware of variations in their mood that they did not initially detect [32]. Interfaces that make students' incremental progress visible can similarly make them aware of their progress toward goals at times where their growth is not obvious to themselves. Building communication and drawing attention to changes can create opportunities for students to engage thoughtfully with their current goal progress. Technology for transition-age autistic students could also invite students to reflect on their progress toward goals and determine what direction to take in partnership with other transition team members. This type of reflection is critical to causal agency development since it allows students to capture progress breakdowns toward goals and ask for support, a key component of causal agency. Therefore, when designing collaborative goal tracking technology for autistic individuals, designers should ensure that the system prompts students at intervals to reflect critically on their performance and consider how they are moving closer or farther from their goals. In cases where students are not making desirable progress, technology

should highlight breakdowns and provide explicit ways for students to reach out to their team in order to collaboratively resolve challenges.

6 LIMITATIONS

Our study only included autistic young adults who demonstrate sufficient language skills to converse. However, autism consists of a broad spectrum of abilities. Because of the language demands of our interview protocol, students with severe receptive or expressive language disorder could not participate, and our findings may not be applicable to this group. Our findings indicate that there is an urgent need to expand services for this population, therefore future work should consider ways for students with more varied verbal skills to participate in the collaborative reflection process. Furthermore, we collected data through semi-structured interviews. This allowed researchers to ask contextualized follow-up questions. This was important for researchers to develop a rich understanding of participant experiences. However, this may have created a self-selection bias for participants who were comfortable with synchronous conversation. As such, our sample may under-represent those less comfortable with synchronous dialogue, such as alternative and augmentative communication (AAC) users or those with more significant social anxiety. Despite our recruitment bias toward participants willing to engage in synchronous, verbal interviews, we still uncovered a preference reported by some autistic participants for asynchronous and alternative communication options. Therefore, our study may under-report the urgency of this need. In future studies, we recommend that researchers actively advertise more communication options and a willingness to accommodate autistic participants' communication preferences.

Our sample included participants from across several different states. Therefore, we uncovered substantial variability in how transitions are planned and executed across the United States. However, it is probable that there are transition collaboration models we did not uncover. We may have overlooked an experience that is common in one area of the country, or failed to uncover a system which works well for teams that include autistic students.

Finally, our work was informed by only a limited number of parents, professionals, and students. The nature of special education and autism is such that each student's profile is too unique to be served by a general curriculum. We recognize that because every student who participates in transition planning is in special education, each student is likely to reflect an entirely unique circumstance. Future work on this topic is needed to expand understanding of how teams collaborate, and particularly further work eliciting experiences directly from students.

7 CONCLUSION

Building technology to increase self-determination in autistic users is an area of need in HCI [58, 59]. In order to build self-determination, students must act as causal agents, iteratively directing their actions toward goals and reflecting on their progress towards goals. However, much of the literature in the area of transition planning and autism considers the viewpoints of parents and professionals rather than students [56]. We contribute a description of the collaborative transition planning process that considers the role of the student. We examined the process of collaborative reflection on transition planning teams for autistic students and uncovered ways that teams support students' agency on these teams. We also uncovered ways that teams centered their planning processes on students' transition interests and created opportunities for students to build their knowledge and skills in areas related to their transition goals. However, we found that many teams were not conducting transition planning in a way that built agency for autistic students during meetings, a common finding in the transition planning literature [11]. We examined ways to increase student's agency by defining their role in collaborative reflection, and proposed design considerations to encourage teams to adopt practices that support autistic students' development of causal agency.

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