Empathic Education: Perceptions of Self-Determination by Rightful Presence

by

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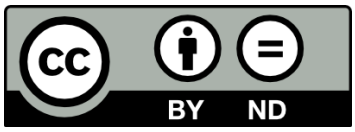

DISSERTATION ABSTRACT

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Doctor of Philosophy in Special Education

Title: Empathic Education: Perceptions of Self-Determination by Rightful Presence

Grounded in empathic education and the concept of rightful presence, this study moved beyond dominant inclusion paradigms, such as the inequitable host-guest 'hospitality' relationship; crucially, the study design prioritized equitable communication access, ensuring that all participants' stories were treated with equal reverence.

This qualitative study investigated the impact of an expansively designed Unified Robotics program on perceptions of three self-determination needs – competence (effective performance), relatedness (belonging and social engagement), and autonomy (equitable decision-making access) – among Autistic students, students with intellectual dis/abilities, and general education students. The study was enriched by an examination of parent perceptions of those same values in their children. Pre- and post-season interviews probed students' perceptions, while field observations provided additional data on students' self-determination expressions. The study also appraised perceptions of benefits and costs associated with participation in the intervention across all participants.

Qualitative analysis involved interpretive examination of extracts from interview responses to closed questions, where the interviews had been coded for the three self-determination needs. The Unified Robotics intervention yielded substantial perceived benefits for students' self-determination at negligible cost. Findings consistently demonstrated improved student perceptions of self-determination after program participation, as corroborated by parent and teacher reports. Students described enhanced perceptions across all three self-determination

needs, which was further supported by parent data and field reports. The program's expansive design also promoted reflection, attitude changes, and rightful presence.

This research highlights the transformative potential of empathic, expansively designed programs in fostering self-determination and rightful presence for all learners. It challenges traditional, dominant inclusion paradigms and emphasizes the importance of equitable, supportive educational environments for all students.

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DEDICATION

To Johnny Valentine, Callaway Joe, and Samurai Henry

"…you must learn the rules before you break them.
Of course there are always the great exceptions…"

– J. P. Collins (1921)

TERM USE STATEMENT

A sizable portion of this audience will already be familiar with the following concepts, so we provide this explanation not to inform so much as to describe the context of solidarity within which this work is written. At a metalevel, respectful naming is a critical component of a focus on empathic education (including such related research as this); consequently, our intent is to use referential vocabulary with appropriate respect (and even reverence). We resist unexamined capitulation to the expectations of the dominant paradigm.

Paradigms beyond the dominant one run a polymorphous, intricate gamut (e.g., one's gender, ability, resource access, and similar), as do the naming preferences of the people who reside in those spaces; for example, one person might consider a variation in their hearing ability to be ancillary to their core sense of Self, while another might identify as Deaf, and yet another might choose to reside in a less polarized range within that domain. This residence comes to be treated as less definitional as social justice movements prevail; for example, attributes such as sex, skin color, and ability are now less potent in acting as authoritarian determiners of dis/enfranchisement, albeit they linger systemically.

In addition to this dimension, there are people who identify less directly through family, friends, and other alliances/allegiances, such as children whose parents identify as Deaf. As capitalization of membership terms has come to reflect a self-determined pursuit of equity and social justice for marginalized paradigms (e.g., Autistic, Deaf), we shall favor that pattern.

Among an increasing number of other sources, Price (2022) is a contemporary proponent for self-identifying as Autistic, in part to eradicate involuntary, dominant paradigm-driven masking by countering with radical visibility. With all due respect accorded to those people who make other personal choices, we are also reflecting that pattern to favor that choice among the

Autistics with whom we personally share lives. For people who are not Autistic, we shall follow Price's lead and use the term Allistic.

The phrase "students with disabilities" does not represent such a consensus (or such radical visibility) and finding an alternative that remains viable across that vast expanse is much more difficult, although at the very least the spelling "dis/abilities" represents some dismantling of the pejorative value of the term. Across that range, the intensity of enculturation and the degree and kind of influence on one's sense of Self varies broadly, including the effect of some profound dis/abilities on a person's expression of preference for self-identification. While identifying someone else as Autistic or Deaf might be a sign of respect associated with positive pride, calling someone else Dis/abled would be a much more ambiguous prospect, as that term has not been liberated by people with dis/abilities from dominant paradigm stigmatization. So, until we discover a positive alternative, we shall continue to use 'students with dis/abilities' as a neutral option whose intent is respectful; similarly, we shall use the term 'general education students and teachers' (and similar) to refer in a neutral manner to those people who are not currently so identified. We shall not be using any shorthand acronym for 'student with dis/abilities' as those have an increasingly dehumanizing effect the more often that they appear.

When it comes to intellectual dis/abilities in specific, we are standing on uncomfortably unstable ground. The current guideline suggests 'person with intellectual disabilities'; however, while this approach has made its way into federal law and is supported by such agencies as the Special Olympics, we cannot determine with confidence how much influence any people with intellectual dis/abilities had on the creation of this characterization. All that said, to the degree that it is necessary to make this distinction for the purposes of this study, and only until a better

idea comes along, we shall use a form that is consistent with the above pattern, namely, ‘students with intellectual dis/abilities’, and likewise we shall avoid any acronyms.

Note that there is also a need to refer to students who have been identified through the IEP process as being eligible for services associated with the distinct disability categories defined in the likes of the Oregon Administrative Rules, such as “Autism Spectrum Disorder” (ASD or 82) and “Intellectual Disability” (ID or 10). When referring to material from studies that involve students and the eligibility process, we shall use the pattern ‘students eligible under ASD’ and similar.

When it comes to this study in specific, and the students who are participating through their membership in Unified Robotics, we shall use those terms that have been identified by Unified Sports (within Special Olympics), where participants who have special education eligibilities will be referred to as ‘Athletes’, and those who do not will be called ‘Partners’. Again, we note that we are unable to determine with confidence the degree to which such Athletes or Partners were actively involved in this choice made by Unified Sports; in addition to which, this sort of *other*-identification process tells us nothing about any given person’s *self*-identification(s).

Finally, we shall use they/them/their/theirs as generic, non-genderic third-person pronouns, and we promote valuing nonhuman animal lives by referring to them as ‘who’.

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1. Introduction

> As a classroom community, our capacity to generate excitement is deeply affected by our interest in one another, in hearing one another's voices, in recognizing one another's presence.
>
> – bell hooks (Teaching to Transgress, 2014)

The Chronic Abuse of the Hospitality Paradigm in Education

Scientific research cannot prove that something absolutely does not exist; it can only note that an entity has yet to manifest under observation. Accordingly, we discern here with conviction that *so far*, no human culture has ever been identified that entirely lacks some account of its hospitality dynamics in its associated body of literature. This fundamental principle emerges not just because *synchronic* ethnologists (as categorical out-group members) have traditionally functioned as guests within their observed cultures, but because a rich *diachronic* narrative is also readily available for study as deeply as *Gilgameš*, the oldest known written story. Šamḫat brings Enkidu to the hut of the shepherds (Tablet II, ll. 36-37), who place bread and ale before him (ll. 44-45), whereupon she must teach the recently 'civilized' Enkidu what to do with them (ll. 50-51; George, p. 561). While these traditions vary broadly in their depictions of privileges and obligations, a host-guest imbalance nonetheless always exists, and it meaningfully contributes to the culture's definition of *who someone is* when occupying those roles. Understand that schools establish inequitable cultures whose imbalanced hospitality dynamics damage students with dis/abilities.

The more that this constraint upon guests is controlled by a host class that constitutes a dominant paradigm (dominant paradigm), the greater the likelihood of systemic injustice being inflicted upon the guests; for example, endemic *noblesse oblige* (NO) in educational institutions continues to brand students with dis/abilities as ancillary guests in programs that are hosted by

such dominant paradigm members as general education teachers and students. As a type of NO, such 'inclusion' is an inherently biased approach to mutually shared education access that insidiously undermines any scaffolding of a student's self-determination, denying the *rightful presence* of students with dis/abilities. It is incumbent upon us to effect a comprehensive change for the better.

Although many studies of 'inclusion' programs have examined associations between educational setting changes and differences in achievement, further research is required due to the complex nature of the relationship holding between the determination factors that originate in one's Self (i.e., self-determination) versus those that are externally imposed on others by privileged people (i.e., collateral subjugation). That contrast represents a contemporary struggle to actualize the fundamental right of 'included' students to be accorded a just and equitable value as a person in *any and all* educational experiences, rather than their being subordinated in the role of a guest.

The Unified Robotics program represents an opportunity designed to support equitable access to participation for *all* students; further, it is expansive in that it educates the educators in the methods used to radically uproot the entrenched hospitality template to alleviate the worst of the host/guest imbalance. Two effective design criteria are incorporated that verifiably change the perceptions of participants: namely, equal status and pursuit of a common goal (Sullivan & Masters Glidden, 2014). Furthermore, three needs intrinsic to the health of self-determination are made accessible: competence, relatedness, and autonomy (Deci & Ryan, 1990, 1995). Finally, while Unified Robotics is not (yet) an evidence-based curriculum, it aligns with Universal Design for Learning principles.

In accord with that foundation, the Unified Robotics program is deliberately, expansively designed to profile the students' independent competence, equitable relatedness or legitimate belonging, and emerging autonomy. It is an experience where each student's rightful presence is revered. This consequent set of pursued criteria defines the immediate context within which we examine the effect of committed involvement in such an egalitarian program on these students' perceptions related to their self-determination factors before and after participation, and the perceptions of their parents and teachers regarding the benefits of the students' participation.

Specifically, for Autistics and Allistics, as well as students with intellectual dis/abilities and their general education peers, the consequent hypothesis is that a student will report an improved perception of inherent, personal control over their determination of Self after their participation in Unified Robotics, and that their parents and teachers will similarly report tangible benefits that result from the students' participation.

The methods used by Unified Robotics should prove to be a much more effective approach than the systemic, chanted admiration of the problem of inclusion, particularly as it deforms access to participation in such contiguous environments as afterschool programs. The privilege that derives from the misapplication of 'inclusion' still skews access to these activities, no matter that they convene after the ringing of the three o'clock bell or are held beyond the strict boundaries of the main campus. Furthermore, the effect of equitable participation in afterschool activities should improve access to engagement in interactions during the canonical school day, so consideration of inclusion is germane.

Inclusion

In recent decades, the most controversial issue regarding the education of children with special education needs is that of so-called 'inclusion' (Farrell, 2010; Kauffman & Badar, 2014;

Slee, 2011). Salend and Duhaney (2011) distilled four key principles from the literature on inclusive education, according to which this philosophy engenders the idealized version of this practice, namely:

- providing all learners with challenging, engaging, and flexible general education curricula;
- embracing diversity and responsiveness to individual strengths and challenges;
- using reflective practices and differentiated instruction; and
- establishing a community based on collaboration among students, teachers, families, other professionals, and community agencies.

Inclusive education, therefore, aims to provide a facilitative and constructive focus for improving the education of students with dis/abilities; however, that aim has missed its mark.

True Inclusion is a Right

The Civil Rights movement of the 1950s and 1960s was a precursor to legislation protecting the rights of children with dis/abilities to access a public education. In delivering the opinion of the Supreme Court in the case of Brown v. Board of Education of Topeka, Chief Justice Earl Warren, referring to the segregation of children by race, stated:

> Today, education is perhaps the most important function of state and local government, as it is a principal instrument in awakening students to cultural values, in preparing them for later career opportunities, and in helping them to interact meaningfully in their environment. The right to learn and belong must be made available on equal terms. In the field of education, the doctrine "separate and equal" has no place. (1954, p. 493)

These same arguments that originally applied to race have been repeated on behalf of students with dis/abilities, many of whom continue to be educated separately from their general education peers despite legislation mandating otherwise (NIDRR, 2003; Marisco, 2021).

To be clear, in its section on "Nonacademic services," the Individuals with Disabilities Education Improvement Act (IDEIA) declares:

> The State must ensure the following: Each public agency must take steps, including the provision of supplementary aids and services determined appropriate and necessary by the child's IEP Team, to provide nonacademic and extracurricular services and activities in the manner necessary to afford children with disabilities an equal opportunity for participation in those services and activities. (2004, Part B, Subpart B, §300.107a)

Up to this point in the declaration, the phrase "equal opportunity for participation" shares only a partial synonymy with 'inclusion'. Although the context *is* engagement in activities that are designed for the benefit of children who are not on an IEP, we still need two more components. The first one is a thorough specification of the nonacademic and extracurricular activity types:

> Nonacademic and extracurricular services and activities may include counseling services, athletics, transportation, health services, recreational activities, special interest groups or clubs sponsored by the public agency, referrals to agencies that provide assistance to individuals with disabilities, and employment of students, including both employment by the public agency and assistance in making outside employment available. (2004, Part B, Subpart B, §300.107b)

Unified Robotics falls well within these parameters. The second component is the further specification of maximal support for the child's needs in their pursuit of these opportunities:

> In providing or arranging for the provision of nonacademic and extracurricular services and activities, including meals, recess periods, and the services and activities set forth in §300.107, each public agency must ensure that each child with a disability participates with nondisabled children in the extracurricular services and activities to the maximum extent appropriate to the needs of that child. The public agency must ensure that each child with a disability has the supplementary aids and services determined by the child's IEP Team to be appropriate and necessary for the child to participate in nonacademic settings. (2004, Part B, Subpart B, §300.117)

Although these sorts of IDEIA policies reflect movement toward inclusive education, in practice many schools are reluctant to include students with extensive support needs in general education classrooms (McLeskey et al., 2012; O'Rourke, 2015; Ryndak et al., 2013). In 2020, 66% of

students with dis/abilities spent 80% or more of their time in general classes, and 30% spent core content instructional time in segregated classrooms (i.e., language arts, reading, math, and science). Inclusion rates plummet for students with intellectual dis/abilities, just 19% of whom spent 80% or more of their day in general classes.

All students have a right to feel valued and accepted in their learning environment, regardless of their physical, intellectual, social, emotional, cultural, or other conditions (Heyder et al., 2020); hence, students' social-emotional school experiences play a pivotal role in the debate on inclusive education (Schwab et al., 2018). Positive social-emotional school experiences, such as experiencing social integration and well-being in school, are important educational goals. Their relevance has been underscored by influential motivational frameworks such as Self-Determination Theory (Deci & Ryan, 2012) or social-psychological interventions enhancing students' sense of belonging (e.g. Walton, et al., 2012).

Inclusion is Problematic

In stark contrast to its guiding principles, and despite the value inherent in its ideal form, some writers note that when education is inclusive in name only, the result is the sacrifice of children for the sake of misplaced ideology (Kauffman & Hallahan, 2005). Others state that "Ironically, the promotion of the delusion that being present in a school equates with being socially and educationally included, is one of the most dishonest and insidious forms of exclusion" (Cooper & Jacobs, 2011, p. 6). Yet others (e.g., Armstrong, 2010) have suggested that inclusion has become no more than a fashionable buzzword where the genuine article is often considered impractical for most people.

Kelly and Norwich (2013) speak to the complexity of the term 'inclusion', as there is such a broad variety in what structure and supports are provided to students moving between

segregated settings and mainstream settings. Kelly and Norwich assert that to be mainstreamed requires providing individualized support by adapting the mainstream environment to meet the needs of all students. Armstrong (2010) asserts that the term 'inclusion' is used in so many ways that it can mean different things to different people, or all things to all people, so unless it is clearly defined it becomes effectively meaningless. It is important, therefore, to clarify the meaning and implications of inclusion regarding the education of children with dis/abilities – or to advance a new model altogether.

Programming rarely occurs to increase communication and social interaction among general education students and their Autistic peers and students with intellectual dis/abilities. Intervention efforts to improve this situation are scarce (Carter et al. 2005; Carter et al. 2008). These studies also found that the designers of existing practices engaged in insufficient effort to increase quality of social and academic participation for Autistics and students with intellectual dis/abilities, and consequently interactions with general education peers are limited (Mu et al., 2000).

Negative biases can deter efforts to include Autistics and students with intellectual dis/abilities in the general education setting. That said, the research demonstrates that for general education students, *simple exposure* from inclusion rarely leads to positive attitude or behavior change, and in fact sometimes has the opposite effect (Manetti et al., 2001; Siperstein et al., 2007). Rather, quality and type of interaction, operationalized as the positivity or negativity of the experience that one has with members of an outgroup, predicts the attitude of general education students toward collaborating with peers with dis/abilities (McManus et al., 2011). In addition, knowledge about social groups of interest is also a predictor of attitudes:

> …an individual who knows several individuals with intellectual disabilities (i.e., quantity of contact) may also have positive experiences with the individuals (i.e., quality of

> contact), and from these relationships gain more knowledge about intellectual disabilities, which should then increase the likelihood that he or she has positive attitudes toward individuals with intellectual disabilities. (p. 581)

Mansfield proposes a narrative genre of *reflection* (2014, last paragraphs), emphasizing sensitivity while conceptualizing a spin in someone else's life. To improve the chances that interactions will result in positive attitudes, it is important to design programs that scaffold skills in empathy and reflection (i.e., intellectually and emotionally imagining oneself in the life of another person).

The Compound Issue of STEM Inclusion

STEM started out as a simple acronym that represented not just the set of relationships that exist between the technical *fields* of science, technology, engineering, and math, but also the program and policy *designs* that have focused on those domains. The term 'STEM' will be used hereafter to refer both to the fields and the approach to education, not to the literal acronym. STEM has many cousins, such as STREAM and MINT, where their components vary in much the same manner as those attributed to 'science'. Over the course of more than 20 years, STEM has conventionalized into a linguistic unit with a homogenized meaning, such as in the phrase, 'STEM is important'; for example, STEM is important because it equips young people with the skills and knowledge that they will need to succeed in technology fields. According to the U.S. Department of Education (2022):

> In an ever-changing, increasingly complex world, it's more important than ever that our nation's youth are prepared to bring knowledge and skills to solve problems, make sense of information, and know how to gather and evaluate evidence to make decisions.

And yet, STEM has a long history of exclusion, where our cultural canon is replete with narratives about school counselors advising young women to avoid the sciences and portrayals of young women who have been brainwashed to declare that they are 'bad at math'. That injustice

is still being fought, along with the umbrella issue of female sex being treated as a disability. Currently, students with dis/abilities also have limited access to positive, engaging empathic STEM education. To understand this complex issue, an examination of the implementation of inclusive practices and access to STEM is needed.

Opportunities to learn are shaped by the historical injustices that students encounter. This is especially true in STEM and schooling (Calabrese Barton & Tan, 2019). There is limited research on the inclusion of students with dis/abilities in STEM classes. As will be detailed in the literature review, however, there is a robust body of literature about inclusion of other marginalized populations for example, studies have repeatedly documented the challenges that marginalized populations encounter in STEM, starting with a bias about what a scientist looks like. Zurn et al. (2022) go so far as to assert that scientific advancement pays the price for this lack of inclusivity, with a weaker consequent future occurring without the contributions of diverse scientists. The focus of previous research has addressed disparities across gender and race, and the effects have been limited. While women now experience some reduced barriers, this same truth does not hold true for racial minorities (DSBES, 2017; UNESCO, 2017). Very few STEM diversification efforts have included disparities in dis/ability (Klimaitis et al., 2021).

With its focus on robotics and coding, Unified Robotics provides a *manageable microcosm* of STEM-writ-large within which this study was conducted, as this setting is deliberately and carefully designed to incorporate inclusion in a more nearly optimal, balanced form. It is time to help education recapture the ideals that inclusion was originally intended to represent. It is time to equitably rebalance the hospitality paradigm through an appeal to *empathic education* as founded upon such principles as rightful presence.

Empathic Education

Although the term ‘inclusion’ was introduced as a slogan to combat isolative practices, its actual implementation has come to represent an imbalanced dynamic in which general education students are cast in the privileged role of abled dominant paradigm hosts. Approaches in equity are moving forward from such conceptions as ‘tolerance’ (which accord paternalistic control to the dominant paradigm) to ‘admiration’ (which still objectifies those who are admired ‘from above’) and onward to a more mutual ‘appreciation’. Admittedly, while the term ‘appreciation’ can – for some people – connote a certain (almost backhanded) *mildness* in the expression of mutual regard, it also extends a respectful sincerity. In a consistent manner, we shall take yet another step forward and refer to ‘empathic education’, emphasizing sensitivity and reflection (as in the narrative genre). Please note as well the burgeoning body of research that busts the pervasive myth that autism and empathy are anathema, when in fact a considerable number of Autistics are highly sensitive Empaths (Haghighi, 2023). We differentiate this from the term ‘empathetic’, as the meaning of empathic (despite its earlier recorded coinage) has come to profile the involvement of the Empath as a person rather than the empathetic experience on its own.

Empathic education draws from the best that is intended by inclusion, namely a mindful and respectful scaffolding of rightful presence (below) that celebrates and values difference and diversity and that considers human rights, social justice, and equity issues, as well as a social model of dis/ability and a sociopolitical model of education. It also encompasses the process of school transformation and a focus on children’s entitlement and access to education (Kozleski et al., 2011; Loreman et al., 2014; Mitchell, 2005; Slee, 2011). Expansive learning (also below)

would encourage designers to incorporate such principles as rightful presence into their programs as a matter of best practice.

Rightful Presence

The initial framework for rightful presence emerged as the hospitality paradigm failed to capture the social and political struggles for belonging waged by borderland and refugee communities (i.e., as guests) in the countries that received them (i.e., their hosts), even when that reception was relatively welcoming (Barnett, 2005; Squire & Darling, 2013). Legitimate belonging means more than expanding who has a right to participate in a community; rather, it requires excavation of current structures and systems that were designed to perpetuate otherness. To profoundly change belonging in this way, hosting must shift from wielding the privilege to dictate norms, to sharing the obligation for making sense of and valuing the cultural knowledge and experiences of newcomers as powerful contributors to their society (Calabrese Barton & Tan, 2019).

Addressing the ways in which systemic injustices manifest in classroom practice remains an important challenge in the study of teaching and learning (Artiles, 2011). Equity-driven reform efforts in teaching and learning have been grounded in the idea of inclusion (Martin, 2019), which asserts that *all* students should have access and opportunities to participate in practices central to academic and social disciplines, in ways that are tailored and meaningful to them; however, de Royston et al. (2017), point out that actual inclusion programs fail when it comes to *meaningfulness*, in that they are not in fact inclusive. The call for inclusion, therefore, does not embrace the struggle of the oppressed in the classroom and does not center justice. Given the moral imperative to disrupt this inequity in teaching and learning, the demand of *rightful presence* must be at the center of the conversation.

Calabrese Barton and Tan (2019) provide the definition of rightful presence that guides this study, namely:

> …legitimate and legitimized membership in a classroom community because of who one is (not who one should be) in which the practices of that community support restructuring power dynamics toward more just ends through making both injustice and social change visible. (p. 3)

Rightful presence draws attention to the importance of engagement across settings, time, and activity, and maintains their relationship to social change efforts and social justice (Jurow & Shea, 2015). This approach requires a shift away from the inequities of mere inclusion, where the impetus is on an individual to assimilate into the culture of power or remain marginal to the learning community.

Calabrese Barton and Tan (2020) further assert that rightfulness is claimed through presence and that justice and injustice must be made visible. Rightful presence is indicated by the extent to which injustices are made visible and present in teaching and learning alongside amplifications of youths' lives and wisdom, such that new possibilities for social change arise. It should also disrupt the normative knowledge and power relation through discourse between the historically more and less powerful members of society. Engaging in this type of discourse may lead to a reconstitution of rights and shifting of hierarchies of classrooms (Calabrese Barton & Tan, 2020).

Consequential Learning

Calabrese Barton and Tan (2019) also state that the results of given learning experiences are shaped by historical injustices, and that to consider rightful presence, it is essential to actively incorporate change through the design of a program's consequential learning (Shelton, 2014), thus "changing participation in changing communities of practice" (Lave, 1996, p. 150). Learning is only consequential in relation to the networks of activities and values that make it

matter (Tschannen-Moran & Nestor-Baker, 2004); furthermore, Jurow and Shea (2015) state, "The consequentiality of learning is not located either in individuals' changing forms of participation or in changing community practices alone; it is found in their mutual relations" (p. 287). The intentional consequence of learning in the Unified Robotics program will primarily be the compelling improvement of a participant's perception of their self-determination factors; however, we also note that the educators will engage in expansive learning regarding designing such programs.

Consequential learning is presented in this project as a triangle of educators, students, and outsiders who have been linked together to complete an appropriate public task. The function of these roles requires clarification. Educators are the teachers, organizers, and parents. The adults, the parents, and the teachers are the connectors to the community. Students are community members and contributors. They are producers and critical thinkers, decision makers, owners of knowledge, evaluators, and managers of time and space. In this project, they are consequential learners in that they will be either seen as a valuable contributor to community when they may have been previously overlooked, or they will be the Unified Robotics entrepreneurs creating expansive career opportunities in their communities. Outsiders are the bringers of skill, energy, interest, and resources. They are the robotics mentors, the ESD STEM department team, and the special education administrators. They are also the authors of the Unified Robotics curriculum.

Expansive Learning

'Expansion' is a term frequently used in research in Diversity, Equity, and Inclusion (DEI) initiatives. It refers to actions or processes that expand a scope, arena, and impact in exponential ways. It means learning environments should be expanded so that people are engaged in equitable, diverse systems. The theory of expansive learning focuses on learning

processes in which the very subject of learning is transformed from isolated individuals to collectives and networks. Making learning environments welcoming is not only about changing practices, policies, and procedures; it is about changing people. Expansive practices (e.g., Miller, 2020) recognize that while changing the former does not necessarily lead to change in the latter, it *should*.

No one should have to wait on the periphery to be included; as such, we must expand – ideas, approaches, frameworks, and people – and look toward expansive frameworks for transformation of learning environments. Expansion is building community across the landscape of our differences. Expansion requires us to explore beyond the comfortable social networks in which we typically reside, where we not only *tolerate* but *seek out* divergent voices and perspectives, and constantly challenge our own ideologies. Expansion is an idea for transformative ecology in education, where voices are valued and where learning is more equitable, where people's repertoires are extended and power relations are transformed (Gutiérrez & Larson, 2007). Above all, expansion incorporates the education of the educators in the design principles involved, such as Universal Design for Learning, social connection, and a shift in perceptions of meaningful data.

Unified Robotics

Unified Robotics is a contemporary expansive learning program. The goal of participation in Unified Robotics is to create meaningful relationships among students as they work to create a robot and to redefine success. Unified Robotics partners students with dis/abilities to those students who might not otherwise have any substantial exposure to people with dis/abilities. Unified Robotics is a way for students to teach each other what they are capable of, based on the values of respect, empathy, willingness, and community, which will

affect their perceptions of their needs. Through the collaborative process, both groups of students develop skills in several areas. The program is based around students learning from direct experience about the way peers with and without Autism and intellectual dis/abilities think and perceive the world, and the way the world perceives them.

As demands for a workforce in STEM increase, it is going to be essential to create leaders who adopt the perspective that wisdom and success are unique to individual people, and that people with dis/abilities provide that very perspective and knowledge that might otherwise be absent. Through their participation in Unified Robotics, students learn to communicate effectively to a broad audience who have a wide range of literacy skills that are represented in the STEM vocabulary and skill set. They gain leadership skills and learn to extract talent where others find nothing, uniquely positioning them to disrupt inequities in the STEM world. These students feel a unique sense of accomplishment that is fostered in an equally rare environment, create meaningful relationships, and redefine success, because success looks different for everyone. Ryan and Deci (2000a) note, “Students who are overly controlled not only lose initiative but learn less well, especially when learning is complex or requires conceptual, creative processing” (p. 59). This project, in which peers with and without Autism and intellectual dis/abilities collaborate, creates a space where students process new iterations of success.

Effective Design Criteria

The design of Unified Robotics also draws upon two demonstrably effective design criteria (Sullivan & Masters Glidden, 2014): namely, equal status and pursuit of a common goal. In addition, the interview protocols and analyses from this same study have closely informed the content and structure of those that are being designed for this research.

Self-Determination Theory's Intrinsic Needs

In their involved body of work on Self-Determination Theory (SDT), Ryan and Deci (2017) state:

> SDT is a construct which is centrally concerned with the social conditions that facilitate or hinder human flourishing by examining how biological, social, and cultural conditions either enhance or undermine the inherent human capacities for growth, engagement, and wellness, both in general and in specific domains and endeavors. (p. 3)

That construct is *vast*, and a full SDT analysis of self-determination in our one specific program lies well beyond the capacity of this study; however, formative SDT materials (Deci & Ryan, 1990, 1995) contain a vital, manageable nucleus in the proposal of three primary, intrinsic needs for the health of one's sense of self-determination, where those needs can be digested as follows (and expanded upon later): namely, *competence* (effective performance), *relatedness* (social interconnection), and *autonomy* (freedom to make decisions).

This circumscribed application of SDT is practical and critical. It is practical in that it points to how features of contexts facilitate or undermine the motivations and satisfactions underlying self-regulation and wellness. It is critical as far as it examines and compares social contexts in terms of their adequacy in supporting versus impairing human thriving. This ability to examine proximal contexts is essential to this project; furthermore, any program that intends to improve the participants' perception should optimize the three proposed needs and make their growth available to *all* participants. The Unified Robotics program incorporates all of them.

Universal Design for Learning

The Universal Design for Learning (UDL) framework helps to improve and optimize teaching and learning for all people, differentiating instruction by providing multiple means of accessing information. As such, this research project is centered around the UDL guidelines. As mentioned earlier, the design of Unified Robotics aligns with UDL principles.

UDL considers that learners need multiple means of engagement, representation, action, and expression. The goal of UDL is to reduce barriers and serve the full range of variability in how humans learn in different contexts. Variability can be overwhelming for educators who are planning for dozens of learners each day (Tomlinson, 2014); however, learner variability is predictable and can be organized across three brain networks targeted by the UDL framework (CAST, 2018):

- *affective* (the 'why' of learning found in interest, effort and persistence, and self-regulation);
- *recognition* (the 'what' of learning exercised through perception, language and symbols, and comprehension); and
- *strategic* (the 'how' of learning seen in physical action, expression and communication, and executive function).

Thus, UDL guides educators in advance preparation of curricular and instructional resources that allow for this variability among learners, offering opportunities for shared learning.

A system of learning for students with dis/abilities must be created where diversity of ability is embodied, instituted, and consistently ensured. UDL creates environments where all students engage in relevant activities, which can synthesize the cultural value of their learning communities. This system, according to Deci and Ryan (2000), is essential for fulfillment of basic psychological needs.

Style Resolutions in this Work

The following information is *not trivial quibbling* in this presentation of research into equitability of access for a diverse population. Due to the symbolic nature of language, where form-meaning pairings establish grammatical entities (Langacker, 2008), those elements of form that determine the visuospatial organizational design of each page's display will affect the

perceptual and cognitive accessibility of their conveyed meanings for the readers of those pages (Carter-Thomas & Landragin, 2012). These cited references can no more than introduce a domain that is beyond our immediate scope to pursue; however, when style choices obscure symbolization's ability to convey meaning, they need to be *descriptive* in their classification within style conformity, and adaptive to functional purpose, rather than *prescriptive*, and beholden to arbitrary tradition.

The style manual published by the University of Oregon Division of Graduate Studies [UO] issues the following direction, "In addition to adhering to the guidelines included in this UO *Manual*, each student should select a general style manual to follow for making consistent decisions about specific points of style not covered here" (2023, p. 16, emphasis in the original). For certain restricted meanings of the word 'select', we have selected the style guide published by the American Psychological Association ([APA], 2020). UO also states, "Should the manuals conflict, the UO *Manual* takes precedence" (p. 16). Clarifying the hierarchy of authority in this way profiles the two *very* different purposes served by these two sets of rules. Whereas the purpose of the APA framework is to format a *copy manuscript* in a way that best facilitates subsequent adaptation by journal editors and the like, the UO *Manual* is designed for the preparation of a dissertation's *final form* for physical publication; crucially, *this is why the APA guide does not follow its own rules* − their guide is a book, not a copy manuscript. Therefore, where the UO Manual remains agnostic, we follow APA, except in those cases where the guidelines apply to copy manuscripts of journal articles and not the final forms of entire books. All that said, there is one further type of constraint to which we are beholden.

This establishment of relative authority is superseded by an additional UO provision, as follows, "Matters regarding the intellectual content and some aspects of style (e.g., footnote

format and placement and formatting of in-text citations, the References Cited section, tables, and figures) are discipline-specific and should be determined in consultation with the advisor and committee" (p. 5); in other words, UO indicates that those particular guidelines are not fixed in a publication for reference. That would work well enough except that UO *also* says, "Footnotes, endnotes, and References Cited/Bibliography entries **must** be single spaced, but there must be one blank line between footnote, endnote, or References Cited/Bibliography entries" (p. 15, bold emphasis in the original). So despite the identification of the format specifications as discipline specific, they "**must**" be single spaced according to the *Manual*, where to make matters worse, some discipline-specific consultation requires that the APA *copy manuscript* rules be applied to a *dissertation*, such as the *double* spacing of those same items (2020, p. 303), or an adherence to header styles that are only designed for the navigation of journal length articles (2020, Table 2.3) and not book-length documents.

We respectfully submit that a *university* should endeavor to determine *evidence-based, universally designed* 'guide spectra' that would account for the functions necessary to the purposes of a dissertation. The printed form should be optimally accessible to ranges of perceptual *and* cognitive parsing, particularly when the domain within which the work is being conducted is *special education*; nevertheless, with the *existing* academic labyrinth held firmly in mind, there are other consistent patterns which we have found it necessary to follow, in addition to the other types of latitude that we have been allowed in support of diverse processing.

Paragraph Length

The APA guide simply states, "Single-sentence paragraphs are abrupt and should be used infrequently" (p. 114), which allows for author judgment. A local constraint states that every paragraph must contain at least two instances of terminal punctuation (i.e., a formal plurality of

question marks, exclamation points, interrobangs, and/or non-abbreviating periods). While we would otherwise tend to conform to the more rigid rule, it is unmotivated in the face of the research about choosing styles based upon the need to depict symbolization in a way that accurately conveys intended meaning (Carter-Thomas & Landragin, 2012). When they are relatively short, then, we use single-sentence paragraphs sparingly, such as when their very abruptness is ideal in an iconic portrayal of summary emphasis. When they are long, we do not introduce arbitrary punctuation breaks when it would change the meaning.

Denotation of Terms

Scare quotes are conventionally created with “double quotation marks”; however, because this work contains so much material that is quoted directly from interview transcripts, including some very short sequences of words, ‘single quotes’ will be used to set off material that is not a direct quotation from the corpus or a referenced publication. That will include the likes of ‘yes’ and ‘no’ questions, which we mention in specific just to make this paragraph contain two terminal periods.

Register

Generally speaking, figurative language is discouraged in academic works, and yet the alleged dryness of the traditional register renders it no less dense and complex. We shall not resort to the likes of poetry or florid prose (notwithstanding the use of such words as “shall” and “notwithstanding”); however, we *are* educators, and learning/teaching something strange is often aided by associating it with something more familiar. The concepts for ‘learning’ and ‘teaching’ strongly tend to be interwoven in the world’s languages; for example, in Swahili, ‘learning’ is the reflexive form of ‘teaching’, and in ASL a core component (i.e., phonemic or cheremic) handshape is linked to the conceptual image of [GRASP], integrated with a ‘from-to’ motion

symbolizing [TRANSFER]. We shall, therefore, occasionally resort to such figurative language tools as metaphor to illustrate at the very least those materials that we found to be otherwise challenging for *us* to access; in other words, as we learned, so shall we teach.

Summary

The implementation of inclusion has fallen far short of the ideal, with its foundation in a hospitality paradigm lending itself too readily to abuses in the form of an imbalance of power in favor of the dominant paradigm hosts, where students with dis/abilities are forced to approach their educators in a subservient pose, begging for scraps, tugging a forelock while cap-in-hand. Grounded in the milieu of empathic education, the Unified Robotics program profiles the rightful presence of all participants with the intent of scaffolding growth in their self-determination needs, namely: competence, relatedness, and autonomy; furthermore, the program expansively educates the involved educators so that these changes might scale forward into the future.

To help provide such programs with an evidence-based footing, this study will analyze changes in the perceptions of self-determination that are held by all participants both before and after their engagement in the Unified Robotics events, whether they are students with or without intellectual dis/abilities, Autistic, or Allistic. We are further interested in the reports of their parents and teachers regarding the perceived benefits of such a program. This is the inquiry's aim that is distilled into the two primary research questions.

2. Literature Review

> For a long time, Henry Bemis had had an ambition. To read a book.
>
> – Lynn Venable, "Time Enough at Last" (1953)

This literature review will begin with the theoretical context encompassing inclusion and self-determination, shift to the design components required for an equitably inclusive program, and wrap up with an examination of programs that purport to already embody the principles of empathic education.

Inclusion and Self-Determination

This study asks how the perception of SD needs change for students and their parents after involvement in the expansive learning experience represented by the Unified Robotics program. This section aims to examine the current limitations of inclusion, how those limits affect students, and how inclusion might be reframed to expand opportunities for all students.

The Limits of Inclusion

Inclusion, in an idealistic sense, refers to intentionally engaging with difference. Inclusion initiatives aim to foster norms and cultures that ensure a sense of belonging among all people in a particular system or community. At the intended core, inclusion revolves around value, respect, and empowerment. Inclusive efforts generally include an invitation of presence to marginalized communities.

Unfortunately, the term 'inclusion' is rife with embedded privilege (Geiger & Jordan, 2014), referring to the action or state of including or of being included within a group or structure (Gartner & Lipsky, 1987; Sailor, 1991; Stainback & Stainback, 1990). This definition begs the question: *who gets to decide* who and/or what is included, and for what purposes? Inclusionary aims, in theory, strive for broader policies, practices, and procedures to foster

welcoming environments. Policies drive inclusion, and in education it is held to be the gold standard for students with dis/abilities inherently, the process is enacted by people, leaving the concept vulnerable to impact by privileged perspectives. Someone sends the invitation, and in this process, is given the power to decide the 'worthiness' of those invited.

A fundamentally flawed assumption related to inclusion initiatives must be critiqued, namely that *they work to change environments*. Despite years of inclusion efforts and dedicated resources, financial and otherwise, many special education environments are more segregated now than they have been since the implementation of the IDEIA, with local districts separating students with dis/abilities from general education students for specially designed instruction that is often provided in a segregated setting (Wehmeyer, 2022). The prevailing practice for supporting students with dis/abilities in general education classrooms is with the support of adult paraprofessionals, which research shows tends to further socially isolate students, especially at the high school level (Carter & Kennedy, 2006). Instruction specially designed to meet a student's Individualized Educational Plan (IEP) is often provided in an exclusionary model, which does not generalize for Autistics and students with intellectual dis/abilities (Gresham et al., 2001). In distinct contrast, peer involvement in classroom support removes the stigma of adult paraprofessional assistance, and the authentic experience of learning together can help to generalize social communication skills, furthering students' perceptions of belonging and community relatedness.

Being a welcomed guest in a new place implies access and opportunity, but it also sets up power dynamics. The inviter may be benevolent and welcoming; however, by merely extending an invitation to participate in institutional systems there is an expectation of assimilation,

consigning those without the ability to mask themselves (however involuntarily) as permanent guests with attenuated agency (Barnett, 2005).

In relation to inclusion of Autistics and students with intellectual dis/abilities, the current social climate (i.e., simply including the mere presence of diverse populations or practices) cannot be assumed to create *meaningfully* diverse and inclusive communities. Teachers without the experience, training, and student engagement practices to meaningfully include students with dis/abilities in their classrooms can further marginalize the student and contribute to social rifts by having an environment that does not support communities of belonging for all students, and they can rescind the invitation of inclusion at any time (Calabrese Barton & Tan, 2020). Agran et al. (1999) demonstrates that although teachers promote the value of self-determination for students, few include such needs in IEPs. At best, students with dis/abilities are incidentally exposed to peer interaction; at worst, these types of efforts to be inclusive can sow broad resentment against inclusion efforts or serve as a diversion for the education and relatedness for the students involved.

Inclusion requires conformity and the ability of the individual to adapt to the system in which they are invited to participate. The actual system does not change. Martin (2019) states that "inclusion rests on the implied promise of not radically altering the status quo" (p. 469). Regarding students with dis/abilities, often the perception is that they can be included if they are not too disruptive and are provided with adequate outside support. This type of inclusion runs the risk of tokenization of already marginalized populations and is simply insufficient.

Inclusion in STEM

Student engagement in academic and social situations is essential for achievement. Students who believe that they can do the work, who find the content meaningful, and who feel

supported by their teachers and peers, experience a greater sense of competence and belonging, and thereby report more positive outcomes (Thomas & Allen et al., 2021). Educational opportunities related to STEM have accelerated for high school students in recent years (Li et al., 2020). There is empirical research on the opportunities present for students to participate in STEM when they are minoritized by race, gender, and language (Estrada et al., 2016; Griffith, 2010; Museus et al., 2011); however, research is needed on the effects of participation in expansive engagement opportunities with Autistics, students with intellectual dis/abilities, and their general education peers when given a high-interest career-connected STEM learning opportunity.

Students who engage in STEM programs in high school have increased access to future career opportunities, yet these opportunities for STEM learning remain elusive for students with dis/abilities (Greene & Lawler, 2016). Despite the demands of IDEIA, namely that students with dis/abilities be given access to the general education curriculum within their IEPs, participation of students with dis/abilities in STEM remains limited (Klimaitis & Mullen, 2021). While locally, statewide, and nationally, inclusion of students with dis/abilities is a common topic of research, meaningful participation is difficult to achieve, and student isolation is well documented (Buck et al., 2020; Jong et al., 2020; Mohr-Schroeder et al., 2020; Suh et al., 2020). Students with dis/abilities face academic and social barriers that make engagement in STEM inaccessible, often to the point of exclusion (Moon et al., 2012); furthermore, students with dis/abilities can have difficulty with executive function skills and may struggle to understand abstract concepts, which impedes their success in STEM courses (Basham et al., 2010; James et al., 2020).

Research has shown the positive impact of extracurricular activities on student development (Berger et al., 2020; Ricci et al., 2020) along with positive gains during and after participation in inquiry-based afterschool STEM programs (Dymond et al., 2020; Mäkitalo-Siegl et al., 2011). Despite these outcomes, it is repeatedly seen that fewer students with dis/abilities participate in extracurricular STEM activities than their peers without dis/abilities (Dymond et al., 2020; U.S. Government Accountability Office, 2010). Lipscomb et al. (2017) reported that 57% of students with intellectual dis/abilities were significantly less likely than general education peers or other students with dis/abilities to participate in clubs, even though the IDEIA (2004) mandates consideration in non-academic activities, as detailed above.

The Impact of Inclusion

In the past 40 years, segregation and institutionalization have given way to more productive engagement for people with dis/abilities in community, education, work, housing, and leisure (Bramston et al., 2002; Keith & Schalock, 2000). Despite these advances, social acceptance of people with intellectual dis/abilities remains problematic (Freeman, 2000; Piercy et al., 2002). Research shows that meaningful community participation for students with and without dis/abilities is possible and beneficial (Amado et al., 2013; Özer et al., 2012), and that attitude change is a necessary component of meaningful participation, leading to increased competence, relatedness, and autonomy; moreover, research on the effect of inclusive education has shown that participation in inclusive environments can lead to academic, behavioral and social, and postsecondary and employment benefits (Haber et al., 2016).

Academic Benefits

Studies conducted specifically on the impact of including students with dis/abilities on the academic achievement of their peers without dis/ability are scarce (Sermier Dessemontet &

Bless, 2013), though the few studies available show promise. The inclusion of students with dis/abilities in general education produced either positive or neutral effects on outcomes for general education classmates (Kalambouka et al., 2007; Ruijs & Peetsma, 2009; Ruijs et al., 2010; Sermier Dessemontet & Bless, 2013). Schools implementing equity-based inclusive education demonstrated larger student growth on annual state reading and math assessments compared to students attending comparable schools (Sailor et al., 2018). Students without dis/abilities made significantly greater progress in reading and math when educated in inclusive classrooms (Cole et al., 2004).

There is currently no clear pattern to identify the elements of inclusion that have the greatest impact on student achievement, and most studies focus on students who are eligible under Specific Learning Disability, not ASD and ID. Two studies reported positive academic outcomes for students with learning dis/abilities at the elementary level (Cole et al., 2004; Demeris et al., 2007) or secondary level (Rouse & Florian, 2006). Engagement in the general education curriculum strongly and positively correlated with math and reading achievement for students with dis/abilities (Cole et al., 2004; Cosier et al., 2013; Kurth & Mastergeorge, 2010; Sermier Dessemontet & Bless, 2012). Researchers speculate that this may be due to the implementation of instructional strategies and teaching techniques to meet diverse students' needs. One study (Farrell et al., 2007) reported a slightly negative outcome. McDonnel et al. (2003), evaluated the difference in rate of academic achievement for two groups of students, one which included students with dis/abilities, and one that did not. They found no significant difference in rate of achievement related to reading, mathematics, or language arts skills between the groups.

Social Behavior Benefits. In education, increased social acceptance has been viewed as a positive outcome of engagement with students with dis/abilities and their general education peers. Dovidio et al. (2003) emphasized the importance of contact through cooperative activities to address acceptance; however, there is limited research in the literature about the social effects of inclusion for students with dis/abilities.

Autistics who were academically and socially included at school experienced more positive developmental trajectories that extended into adulthood, engaging in fewer antisocial behaviors, while demonstrating improved independent daily living skills (Woodman et al., 2016). Students with extensive support needs who spent more time integrated among general education peers demonstrated improved metacognitive and interpersonal abilities and established more substantive networks of relationships (Copeland & Cosbey, 2008; Jackson et al., 2012; Wehmeyer, 2006).

Postsecondary and Employment Benefits. Although there are only a few, studies examining the benefits of inclusion for students with dis/abilities once they leave school show several benefits. Students with dis/abilities, including Autistics and students with intellectual dis/abilities who were educated in inclusive settings, experience greater post-school success than do their segregated peers, attaining meaningful social outcomes within core life domains of education, employment, and independent living (Haber et al., 2016; Ryndak et al., 2010; Test et al., 2009; White & Weiner, 2004). Students with dis/abilities who were included in general education classrooms were twice as likely to enroll and persist in postsecondary education relative to their segregated peers (Rojewski et al., 2015).

Opportunities for Career-Centered Learning. Postsecondary education is associated with positive long-term outcomes of students whose IEP eligibility is ID, including increased

competitive employment and self-determination (Chan et al., 2018; Moore & Schelling, 2015). Research shows that students with dis/abilities with an interest in STEM faced systemic barriers in the sciences and often choose not to pursue careers in STEM fields (Thurston et al., 2017). Deci and Ryan (1985) stated, "people will not generally engage in a behavior they expect to yield desired reinforcement if they do not expect that there is a good chance of their succeeding at the behavior (i.e., of their being efficacious)" (pp. 223-224). This tendency may be a contributor to individuals with ID having the lowest rates of post-high school education and employment of all dis/ability groups (Migliore et al., 2009); however, if students with dis/abilities have positive opportunities to explore work options in high school, they might be more likely to continue their education.

Another factor that contributes to inequity in educational and employment opportunities is the scarce availability of post-secondary options for students with ID (Grigal & Papay, 2018). Opportunities for students with dis/abilities to attend postsecondary education programs at colleges around the United States have gradually increased since the amendment and extension of the Higher Education Opportunity Act in 2008 (Grigal et al., 2018). This change, coupled with greater opportunities to engage in STEM activities in high school, may induce students to opt to participate in postsecondary programs.

Perceptions

Self-determination refers to a person's ability to make choices that influence their own life. It is important because of the crucial role that it plays in people's health and well-being. Research across special education categories has established that self-determination is lower in students with dis/abilities compared to their general education peers (Shogren et al., 2008; Ward & Meyer, 1999; Wehmeyer et al., 2007). Wiener et al. (2012) state, "Stigmatizing beliefs often

result from false assumptions that people in the stigmatized group are incapable, may cause harm, and therefore should be excluded" (p. 221). Recent studies have demonstrated that the attitudes of typically developing students toward students with dis/abilities have become more positive because of the inclusion of students with dis/abilities (Siperstein et al., 2007). Positive attitudes toward people with dis/ability are considered to play an important role in their social acceptance and social participation (Ouellette-Kuntz et al., 2010; Scior, 2011; Siperstein et al., 2007).

The perceptions of general education teachers of students with dis/abilities normally consist of types of dis/abilities, their prevalence, and the educational needs they exhibit (Clough & Lindsay, 1991) and are generally differentiated along three dimensions: physical and sensory, cognitive, and behavioral-emotional. Forlin (1995) found that educators were reluctant to include a student with intellectual dis/abilities and were more accepting of students with physical dis/abilities. Forlin's study identified 95% of educators as believing that students with *mild* physical dis/abilities should be included part-time into the mainstream setting, and only 6% as believing that full-time mainstreaming of students with *severe* physical dis/abilities was acceptable. Eighty-six percent of educators believed that only children with mild intellectual dis/abilities should be included part-time in the mainstream setting. Only 1% of teachers in the study believed that students with intellectual dis/abilities should be placed in the mainstream, as it would be a burden on the teacher. In general, Forlin found that the degree of acceptance by educators for placements declined rapidly with the severity of dis/ability across physical and intellectual categories.

Experience with students with dis/abilities is an important contributing factor to positive perceptions by teachers. Nilsen (2020) found that teachers built up hesitation and resistance as

they tried to balance their general education workload with the time that it takes to become skilled teachers for students with dis/abilities; however, following supported inclusion experiences, these teachers re-evaluated the balance between the cost of their time and effort against the benefit to students and judged the effort to be a success (Leyser et al., 1994). As teachers implement inclusive programs and have authentic experiences with students with significant dis/abilities, their perceptions of these students' abilities might improve.

Shogren and Broussard (2011) conducted a qualitative study of self-perceptions of self-determination in adults with intellectual dis/abilities. Participants identified (a) the role of learning skills with personalized support provided and (b) the attitudes of the people providing support as factors that had large impacts on their self-determination. They wrote,

> …just as self-determination originally achieved recognition in the dis/ability field both as a personal characteristic to be promoted through education and as systems change initiative to reform how supports/services are organized and delivered, the participants highlighted the critical need to continue (and perhaps further) integrate research, policy, and practice initiatives to promote personal self-determination and to reform the dis/ability service system. (p. 99)

In other words, they found that an environment that facilitates self-determination is essential to positive self-perception.

Program Design Components

In this section, we examine the literature related to those components deemed important to the design of a truly inclusive program. Those components are: expansive opportunities, consequential learning, universal design for learning, and the three SD needs.

Expansive Opportunities

Expansive education is not merely a call for civility or a desire for the false narrative of everyone getting along. Expansion calls for understanding of histories and divergent perspectives.

Gutiérrez and Rogoff (2003) define expansive education as changing participation in culturally valued activities using complex repertoires of practice where formal and informal boundaries make no sense. Gutiérrez and Larson (2007) promote expansion, thus placing a greater emphasis on expansive learning and the need to *transform* spaces, rather than on the goal to simply expand spaces for learning; furthermore, issues of power, inequity, and historical practices such as who benefits from learning and how, are essential to the issue of expansion. The boundary of who is included, when, and how can be addressed by centering the concept of rightful presence in the conversation. This centering challenges the binary of in- and out-grouping and formal and informal learning.

According to Ryan and Deci (2000a), the degree to which people can synthesize cultural values and regulations and incorporate them into the Self depends on the degree to which fulfillment of their basic psychological needs is supported as they engage in relevant activities. A system of learning for students with dis/abilities must be created where diversity of ability is embodied, instituted, and consistently ensured. Expansive learning opportunities provide transformative landscapes where embracing difference is normative.

Morukian (2022) offers three practices to encourage expansion. First, there is the need to embrace multiple realities by recognizing that one's perception of "truth" is just that: a perception based on one's lived experiences. By embracing multiple realities, we recognize that the 'whole' truth is a summation of our stories where we look at an issue through the lens of our

own lived experiences. Second is the need to adopt the perspective of others. Morukian (p. 90) references a line from *The War for Kindness* in which Jamil Zaki describes empathy, where a longer version of that quote is as follows:

> When a friend cries in front of you or tells you a hilarious story, their voice and expressions leap through the air between you and into your brain, changing you in the process. You take on their emotions, decode their thoughts, and worry about their welfare. In other words, you empathize. (p. 2)

That level of empathy takes immense courage because we must care deeply about the well-being of the people we see as 'other'. We all have facets of our identity that automatically afford us advantages and disadvantages. Our stories of pain do not preclude any of us from having privilege in certain situations. Third, there is the need to take emotional ownership. Our identity conflicts carry powerful emotions: pride, anger, fear, and grief. By verbalizing the emotions that drive our stories, others can connect with us. Emotional ownership requires us to articulate, but also to manage those emotions so they do not cloud our ability to take on the perspective of others.

Consequential Learning

Opportunities for career-connected learning perpetuate the concept of inclusion as adequate. In contrast, consequential learning research examines what matters to people and how the associated values and practices, when coordinated through social activity, can allow for imagining new social features (Gutiérrez et al., 2016). Consequential learning allows for new authorship of community knowledge, practices, and wisdom, and deepens disciplinary engagement (Birmingham et al., 2017), calling attention to new forms of knowledge and practice that emerge when people have an opportunity to experience expanded engagement and widen what counts as expertise (Gutiérrez, 2012).

Gutiérrez (2012) and Jurow and Shea (2015) examined knowledge and practices that emerged in participatory engagement practices. They illustrate how consequential learning, while occurring within local practice, addresses broader systemic structures, disrupting those that sustain inequality. Understanding consequentiality in learning requires one to pay attention to power dynamics – how people are positioned, why, and by whom, situationally. Rightful presence asserts that to be truly welcomed into a community in a meaningful way, the guest-host power dynamic must change.

Consequential learning recognizes that students' learning takes place in the classroom and in the community, and therefore suggests the development of pedagogies with ties to both students' educations and the formation of their personal characters. In consequential learning, schools and communities are linked in a way that expects students to "use tools, and concepts of academic, technical, artistic, and business disciplines and are challenged to produce consequential public outcomes… to make a difference in the well-being of communities" (Sheldon et al., 2004, p. 39). By encouraging students to use classroom lessons to the benefit of their communities, students learn critical thinking and judgment and bolster community involvement in school systems (Sheldon et al., 2004).

Universal Design for Learning

UDL connects to a school's equity aims by offering ways that educators improve access, representation, or other features of teaching and learning that have not been available to some student groups in traditional education systems. With UDL-based curriculum and instructional resources, educators have available the pieces they are likely to need to support learners' different interests, languages, ways of engaging with and expressing knowledge that are prevalent among non-dominant cultures with which many students identify (Evmenova, 2018).

UDL is about reducing barriers and serving the full range of variability in how human brains learn in different contexts (Chita-Tegmark et al., 2012; Kieran & Anderson, 2019).

Competence, Relatedness, and Autonomy in Self-Determination Theory

In 1988, Michael Ward was the Chief of the Secondary Education and Transition Services Branch at the Office of Special Education Programs. He is known for his distinguished history of self-determination activism for people with dis/abilities. He defined two components of self-determination, and then profiled the additional context within which its pursuit is a more complex challenge for people with dis/abilities:

> Self-determination refers both to the attitudes which lead people to define goals for themselves and to their ability to take the initiative to achieve those goals. Acquiring the personal characteristics which lead to self-determination is a developmental process that begins in early childhood and continues throughout adult life. While it is important for all people to acquire these traits, it is a critical – and often more difficult – goal for people with disabilities. They must first shatter the pervasive stereotypes which imply that they cannot, or perhaps should not, practice self-determination. (Ward, 1988, p. 2)

Ward (1996) focuses on young adults in their quest for self-determination, detailing his own struggle. Wehmeyer and Shogren, who misattribute the 1988 quote to the 1996 article (2016, p. 561), describe the slow improvements in that difficulty that parallel the development of civil rights legislation. Ward and Kohler (1996) detail OSERS initiatives that not only rendered inventories of necessary program practices (e.g., skill content, instruction methods, community bases, generalization, future planning) but service delivery models and implications. The point is that self-determined students are more likely to feel motivated to achieve, and they also tend to feel greater levels of competence and satisfaction (Brophy, 2004; Vasconcellos et al., 2020).

This study would lose itself were it to attempt to embody the entirety of the construct which is Self-Determination Theory (SDT); however, within that body of work there is a

particularly germane description of three basic needs that should be met to optimize the healthy growth of one's self-determination (Deci & Ryan, 2002; Ryan & Deci, 2000b):

- *Competence* (effective performance capability): People need to gain mastery of tasks and learn different skills. When people feel that they have the skills needed for success, they are more likely to take actions that will help them achieve their goals.
- *Relatedness* or connection (social interrelationship): People need to experience a sense of legitimate belonging and attachment to other people.
- *Autonomy* (freedom to make decisions): People need to feel in control of their own behaviors and goals. This is the sense of being able to take direct action that will result in real change.

Self-determination is "a dispositional characteristic manifested as acting as the causal agent in one's life. Self-determined people (i.e., causal agents) act in service to freely chosen goals. Self-determined actions function to enable a person to be the causal agent in his or her life" (Shogren et al., 2015, p. 258). Naturally, these three needs blend; for just one plain example, people vary in their competence with social interrelationship skills, which can affect their freedom to make decisions within that domain.

Higher levels of self-determination among people with intellectual dis/abilities are associated with better adaptive behavior, reduced self-harm, increased community participation, and an enhanced motivation for learning (Beadle-Brown et al., 2021; Elliott & Dillenburger, 2016; Sullivan & Roane, 2018). Elevated levels of self-determination are related to increased quality of life and well-being for people with various levels of intellectual dis/abilities (Frielink et al., 2018; Nota et al., 2007; Vaucher et al., 2020; Wehmeyer & Schwartz, 1998). Promoting the self-determination of Autistic adolescents and those with intellectual dis/abilities is essential to increased quality of life and life outcomes (Nota et al., 2007; Shogren et al., 2015).

'Competence' is a broad term that refers to a person's capacity to interact effectively with the environment, which is not attained by effort, but is developed as a sense of confidence and effectiveness (Deci & Ryan, 2002; Grolnick & Ryan, 1989). Grolnick and Ryan (1989) note that in an academic setting, "The sense of competence in school is reflected in the child's knowledge concerning control over academic outcomes and in the internalized belief that one is able to effect such outcomes" (p.143). In the SDT framework, competence can be viewed within an academic setting as students' perceptions of their ability to master the course material and the level of challenge they find in tasks (Froiland et al., 2019). Bandura (2000) states, "A strong sense of efficacy fosters a high level of motivation, academic accomplishments, and development of intrinsic interest in academic subject matter" (p. 174). This statement alludes to the needs of competence and relatedness in SDT. Ryan and Deci (2000a) tied these two concepts together by explaining, "Thus, people must not only experience perceived competence (or self-efficacy), they must also experience their behavior to be self-determined if intrinsic motivation is to be maintained or enhanced" (p. 58).

'Relatedness' is a need associated with intrinsic motivation (Deci & Ryan, 2002), where connecting with others directly satisfies basic psychological needs (Ryan & Hawley, 2016). This study examines whether the participants experienced changes in perceptions of belonging. Within an academic setting, relatedness may be described as a student's feeling of belongingness with their classroom peers and/or the level of perceived care by their teacher. Deci and Ryan (2002) explain that relatedness "concerns the psychological sense of being with others in secure communion or unity" (p. 7). They theorize that students must possess a feeling of relatedness to others to cultivate intrinsic motivation for learning. This social interaction with others is a necessary component to learning. Ryan and Deci (2000b) also state that, "a similar dynamic

occurs in interpersonal settings over the life span, with intrinsic motivation more likely to flourish in contexts characterized by a sense of security and relatedness" (p. 71). Associated with motivation, competence also has a social component. A student's feelings of competence can come from feedback from others, both academically and socially (Grolnick & Ryan, 1989). Regarding input students receive in a school setting, Bandura (2000) notes:

> Many social factors apart from the formal instruction – such as peer modeling of cognitive skills, social comparison with the performance of other students, and instructors' interpretations of children's successes and failures in ways that reflect favorably or unfavorably on their ability – also affect children's judgments of their intellectual efficacy (competence). (p. 174)

Interpersonal events and structures such as communication and feedback are needed to foster intrinsic motivation in learning. This key component of self-determination adds to feelings of competence and increases intrinsic motivation to perform with the content matter (Ryan & Deci, 2000a).

In SDT, 'autonomy' is theorized as essential for the development of intrinsic motivation. Deci and Ryan (1987) define autonomous action as an action that is chosen by the individual and an "action for which one is responsible" and can be expanded to include how much ownership in the educational process a student feels they have (p. 1025). Deci and Ryan (2002) further explain, "When autonomous, individuals experience their behavior as an expression of the self, such that, even when actions are influenced by outside sources, the actors concur with those influences, feeling both initiative and value with regard to them" (p. 8). Some research points to autonomy as the most important of the three needs in the SDT framework to promote self-determined motivations (Young-Jones et al., 2014). Autonomy has also been found to promote more persistence on tasks and increase self-regulation for learning (Stefanou et al., 2004). Giving autonomy support to others who are close is also satisfying the giver's basic needs, enhancing

the giver's well-being over and above the enhancement that comes from receiving support. The mutuality of autonomy support facilitates satisfaction of basic psychological needs in both partners and encourages more positive dynamics over time (Ryan & Deci, 2017).

Existing Expansive Programs

The program developed by Sullivan and Masters Glidden (2014) acts as a beautiful template, of which this research is in some sense an extension. Their mixed-method study examined changes in attitudes of college students toward individuals with dis/abilities in the context of intramural Special Olympics swimming. They demonstrated the effectiveness of cognitive/affective/behavioral intervention, finding positive effects on the attitudes of individuals without dis/abilities toward their teammates. Sullivan and Masters Glidden found that their participants experienced increased comfort in social interactions with reduced worry about making mistakes, and they propose that cooperative interdependence allowed participants to appreciate the strengths of each team member.

The results of Sullivan and Masters Glidden's work embody the principles that we want to see emulated in truly inclusive educational programs: rightful presence as demonstrated by equal status and sharing of a common goal. This dovetails with scaffolding and improvements in self-determination's basic needs of autonomy, competence, and relatedness, and the selection of Unified Robotics as the platform for the current study.

Summary

The term 'aspect' is used in architectural design (now adopted into common parlance) to refer to the views available from a given room; for example, 'dual aspect' would tend to mean that a room has two sets of windows giving onto two (usually orthogonal) perspectives. Figuratively, this literature review is also at least dual aspect, in that we can not only look out

upon a landscape littered with informative instances of limited inclusion, but also peer forward into those programs that more closely resemble our intended destination of wholly respected rightful presence. Although Sullivan and Masters Glidden (2014) is truly admirable, and its results are notably encouraging, a dissertation needs to be more than a journal article; that is to say, it must make a unique contribution to its field, which in this case is Special Education and Clinical Studies. That is how we imagine the application of empathic education principles, starting with the Unified Robotics endeavor.

3. Methodology

> There is a difference between looking at the other and being in a relation to the other. What is absolutely primary for understanding the locus of our ethical responsibility is not something we see or know from the standpoint of isolated ego. It is only from inside the relation to the other, the relation face to face, that one is in a position to hear the other's demand as an ethical demand.
>
> – Perpich (2019)

In addition to the traditional outline of a methodology section, this chapter must address some of the inequitable assumptions inherent in qualitative research; therefore, the chosen constructivist epistemology is situated at the beginning as a phenomenological inquiry. Once having established that context, the description of the settings and participants is followed by an explication of distinct types of procedures to cover data collection, analysis, and protection. That body of instruction provides a segue into the roles of the principal investigator in all these proceedings, as well as the ethical considerations that must be observed in their pursuit. The chapter will round out the research questions on whose consideration these components converge.

Conceptual Framework

As detailed in the literature review, this research interprets participants' lived experience in Unified Robotics, where that interpretative derivation of meaning is realistically substantiated by remaining faithful to a social constructivist epistemology that relies on personal interaction, winnowing justified belief from opinion; ultimately, the intent is to make sense of the meaning that others have about the world. Interpretivism relies as much as possible on the participants' experiences and views, actively accounting for the influence that the interpreter's experience and background might have on shaping the inquiry. In exploring the experience of those living a particular phenomenon first-hand, phenomenology is an ideal approach to this qualitative

research. A complex system of multiple interpretations may be revealed, then, as this meeting of the minds is established through interactions with others. Critical Phenomenology (Weiss et al., 2019), in specific, is crucial to this research, as it profiles those experiences in which privilege and diversity are defining factors.

Conceptual Framework Components

In distinguishing justified belief from opinion, a social constructivist epistemology relies on personal interaction to realistically substantiate an interpretation of experience, the intent of which is to come to a *meeting of the minds* between participants and interpreters, where in this research it is the participation in Unified Robotics that is the lived experience to be interpreted. Phenomenology then treats the meaning residing in those interpretations as accessible objects for qualitative study.

Constructivist Epistemology

This research project elucidates the nature of improving environments within which to foster the three SD needs of competence, relatedness, and autonomy, with expansive opportunities to engage with robotics in a high school setting. Social constructivism, also called interpretivism, recognizes that precise, systematic, and rigorously formulated answers to complex human problems do not exist. Creswell and Poth (2018) explain the tenets of social constructivism as a method in which individuals seek to understand the world in which they live and work and develop subjective meanings of their experiences. The goal of interpretivism is to rely as much as possible on the participants' experiences and views of the situation. These views are constructed through interaction with others and often lead to unearthing multiple interpretations.

Phenomenology allows us to investigate student perceptions of a phenomenon or holistic account of a real-life situation and the possible relationships between their experience and changes in self-determination factors (Griffin, 2006) that we identify as self-determination needs ('SD needs'). Using the phenomenological method, *researcher* experience will be used to clearly understand *participant* experiences (Creswell, 2009). Using qualitative phenomenological methodology to analyze students' perceptions of their own SD needs will help to meet the research goals.

Critical Phenomenology

This project considered SD needs in settings where rightful presence was at the center of structure. Phenomenology is a qualitative research approach which explores the experience of those living a particular phenomenon, leading the researcher to gain a saturated understanding of the lived experience as conveyed by the person who lived the experience first-hand.

The concepts of phenomenology and hermeneutics have evolved since the 1800s. Creswell (2013) expresses the concept of "lived experiences" to describe how research participants experience the phenomenon being studied (p. 76). Phenomenology can be used to describe the lived experience of several people (Creswell, 2007), assuming that "we make sense of lived experience according to its personal significance for us, and implies that experiential, practical and instinctive understanding is more meaningful than abstract, theoretical knowledge" (Standing, 2009, p. 20). Lewis and Staehler (2010) also state that "phenomenology focuses not on what appears, but on how it appears" (p. 1). Phenomenological research differs from other modes of qualitative inquiry in that it attempts to understand the essence of a phenomenon from the perspective of participants who have experienced it (Christensen et al., 2017), making it the most practical mode of inquiry for this project.

Six methodological themes in phenomenological research appear in van Manen (1990, pp. 31-33):

1. turning to a phenomenon which seriously interests us and commits us to the world,
2. investigating experience as we live it rather than as we conceptualize it,
3. reflecting on the essential themes which characterize the phenomenon,
4. describing the phenomenon through the art of writing and rewriting,
5. maintaining a strong and oriented pedagogical relation to the phenomenon, and
6. balancing the research concepts by considering parts and whole.

For van Manen, phenomenological studies are (crucially) always based on previously lived experiences, not current events, as once one reflects on something currently happening, it may have changed (or ceased altogether). In specific, "Lived experience is the breathing of meaning" (p. 36), where lived experience is then both the beginning and the end of phenomenological research.

Drawing upon a recent anthology addressing Critical Phenomenology (Weiss et al., 2019), this study challenges the institutional and structural inequities that are habitual in special education. Born from the need to address the intersectionality of race, gender, class, ability, and the modern experience, Critical Phenomenology attempts to suspend innate understanding of reality to describe structures, and instead offers a lens to open new possibilities for reimagining and reclaiming meaning. It is a struggle for liberation from structures that privilege, naturalize, and normalize certain experiences of the world while marginalizing, pathologizing, and discrediting others (Guenther, 2019). Critical Phenomenology is an avenue to bring to the foreground the experiences of marginalization, oppression, and power in order to identify and transform common experiences of injustice that render 'the familiar' a site of oppression. The

aim is not only to expose the extension of privilege to ideas, groups, and systems, but to "repair the world, encouraging generosity, respect, and compassion for the diversity of our lived experiences" (Weiss, 2019, p. *xiv*).

Solidarity across difference is a cornerstone of Critical Phenomenology, and that is precisely what this study investigated. With this work, we present a disruption and interrogation of current systems that permit inclusion by creating the conditions for a new possibility for all students in the pursuit of solidarity; therefore, the phenomenological method was best suited to accomplish the goal of the study, providing an in-depth understanding of participant experiences (Creswell, 2009).

Affective Methods and the Coding of Values and Needs

A philosophical discussion of the interaction between feelings, thoughts, and beliefs is beyond the scope of this work, particularly given that these functions are now approached as indistinct (Ball, 2022). However, to establish a historical footing for affective methods, we note that Anderson (1981) respectively associated thought, action, and feeling with cognitive, behavioral, and affective human characteristics, where the latter involved "typical ways of feeling or expressing [human] emotions" (p. 3). Gable and Wolf (1993) provide a historical survey dredging into the mid-1950s, building up to an analysis of "affective characteristics" to support systematically coding the likes of 'values' and 'attitudes' (p. 5). While *they* do not try to define 'belief', the constructs can be listed here as follows:

- *Belief*: (a system or instance of) understanding so fundamental that underlying support for its truth, while it might exist, is not necessary… it simply *is*.
- *Value*: a tight, abiding, belief in positive worth (and opposed anti-worth) from which preferences emerge that then influence attitudes; values identify importance

- *Attitude*: a looser, more malleable system of beliefs (that are influenced by values) from which judgments emerge (about what something is) that then affect actions

Beliefs include values and attitudes. Gable and Wolf note that such constructs "are clearly not independent," which gives rise to a lack of consensus among their collected sources, where the "discussion could go on further and become more confusing" beyond the provision of anything more than this sort of cursory pass at definitions (p. 25).

In 2009, Saldaña ontologized the Values Coding Scheme into the larger world of qualitative coding systems, where it has retained its position through the most recent revision of that work (2021). Saldaña lists Gable and Wolf as one of two primary sources. LeCompte and Preissle (1993) is listed as the second definitive source, and that volume does thoroughly detail the process of qualitative analysis for ethnography; however, there is no substantive mention of values coding in that book. Their example codes are derived instead from observable entities, namely when a teacher expresses any of the following items: "the teacher's authority or establishes rules (R), organizes a time schedule (T), or focuses on tasks or work (W)" (p. 261). There is a bare hint of values being coded, albeit not with explicit intent, in a section on software reviews where one product displays tags of individual words in a transcript, specifically 'like' (p. 300), as opposed to the only other example, namely 'know' (p. 301). We treat Saldaña's derivation, then, as our unified source.

As a *working definition* in the context of these terms, this study treats 'need' as an individual's belief that the sanctity of their essential well-being relies on *access* to certain values, although they will not likely conceptualize it in that way in so many words. In that sense, the terms 'values' and 'needs' are not strictly synonymous. Values are more broadly cultural, akin to the environment within which an individual develops their attitudes regarding their needs.

Setting

There are three settings for the lived experiences addressed in this study; namely, the district and the two specific schools within which the Unified Robotics events occurred. All setting names have been anonymized and thoroughly 'dis-Oregonized'.

The District

The school district in which this study took place is in an urban area with a population of 175,000 (United States Census, 2021), where over 1,500 students in grades 9-12 attend each of the participating schools (as reported by the district). School district personnel are embarking on a journey to implement full inclusion for students with dis/abilities in their Least Restrictive Environment after decades of reliance on pull-out special education services or self-contained classrooms that offer limited opportunities for inclusion (along with its known flaws). That said, despite repeated inquiry, the district consistently reported that they have no record of any student attending who is identified with an eligibility of intellectual disability.

The Schools

The Unified Robotics program is an afterschool activity. The following material, therefore, separately describes the schools that the students attend, as these educational environments differ in nontrivial ways.

Mountain Lake High School. Mountain Lake High School hosts a self-contained classroom (managed by the Education Service District) for 13 students with moderate-to-profound intellectual dis/abilities, where they are provided with an elevated level of support and services to engage in academics and Life Skills. Given expansive learning opportunities provided to teachers, namely training in UDL, this school can serve these students in an increasingly inclusive delivery model. That said, the STEM teachers who participated in this study's program

planning reported that they are left to differentiate instruction without access to sufficient UDL training.

On the advice of the ESD's program administrator for the Life Skills classroom, the teacher and staff members decided that they would *not* participate in Unified Robotics so as not to have to reschedule seven of their weekly hour-long planning meetings. Unified Robotics organizers were directed not to discuss this decision with classroom staff for fear that it might make them feel pressured to participate; however, students were able to participate after the teacher and staff dropped them off at the sessions.

Mountain Lake also has a program for general education students to engage in credit-earning opportunities as 'peer tutors' to students with intellectual dis/abilities. Such activities are sometimes referred to as 'reverse inclusion', which profiles the imbalance. In the 2022-2023 school year, the school had five peer tutors who engaged as classroom assistants and models for one class period per day. The training these peer tutors received occurs in an 'on the ground' model, where expectations are explained as they work. This peer tutoring occurs in self-contained and community settings supervised by the special education teacher and paid instructional assistants. This school has an active and acclaimed afterschool Robotics Club with approximately 40 students on the participant roster, many of whom were on Unified Robotics teams.

Spring Meadow High School. Spring Meadow High School's STEM program is like that at Mountain Lake regarding the support for UDL training; however, the engineering teacher at Spring Meadow explicitly seeks out opportunities to partner with the Life Skills teacher. In this school, several students with ID and ASD eligibilities were engaged in STEM classes in the 2022-2023 year in association with the school's comprehensive learning center program.

Spring Meadow hosts a self-contained classroom (managed by the ESD) for 13 students with moderate-to-profound intellectual dis/abilities, where they are provided with an elevated level of support and services to engage in academics and Life Skills. This school's culture is reported to seek expansive learning (i.e., training in UDL), with staff bridging gaps in student access to STEM opportunities.

The Life Skills teacher and many staff members participated in the Unified Robotics sessions, along with the Occupational Therapist assigned to the classroom, plus the ESD specialists listed below.

The school has an active peer-tutoring program, with general education students often participating in the credit-earning opportunity for multiple academic trimesters during their academic careers at Spring Meadow. The training and guidance for these peer tutors is identical to that of the Mountain Lake program, but the number of students engaging at this school is greater.

For several years, this school has participated in Unified Basketball. This program occurred during lunch, with one showcase game per year against another high school's Unified Basketball team. Many of the peer tutors from this school also participate in Unified Basketball, as do most of the students in the Life Skills class, as well as from the comprehensive learning center.

Spring Meadow does not have a robotics club but does have an engineering club that meets weekly in the engineering teacher's classroom after school to experiment with engineering design and electronics. Some of those students were on Unified Robotics teams.

Recruitment

This section describes the recruitment process used to inform participants about the program and early study. All participant names have been anonymized.

Students

At both schools, the engineering, special education, and Life Skills teachers distributed flyers informing students and their families about Unified Robotics, which was accompanied by a registration form to return to the teacher. The students who were on the Unified Robotics roster for the 2023-2024 school year were candidates for recruitment into this study; however, not every student on the roster was a study participant. Each student participant received a team uniform shirt designed by a student volunteer, plus unique awards for specific achievements during the Build season as incentives for participation.

The child of one staff member who was providing support to the team at Spring Meadow heard about the program, and in the second week asked to be involved even though they attended a third high school altogether. The student was encouraged to participate and was an enthusiastic Partner.

Parents

The parents of the students who were on the Unified Robotics roster were sent a flyer via standard mail and email explaining the opportunity to participate in this study. That document included an invitation to attend a parent-only virtual question-and-answer (Q&A) session that occurred early in the fall of 2023 that was conducted by the PI one week after the invitation would have been received. A second flyer was then sent home via the classroom teachers for final recruitment information for Athletes, Partners, and their parents.

Information about consent and assent was included in the recruitment flyers. During the Q&A sessions, this topic was discussed with potential participants both as study subjects, and on behalf of the Athletes and Partners for whom they were guardians. Consent and assent forms for both parents and students were either signed at that time or returned to the PI via the robotics teachers and mentors.

Teachers

Teachers who had students in the robotics program or who were robotics team instructors were approached individually to solicit their participation in the study. Copies of a flyer were posted at the ESD asking for participation in the Unified Robotics season, and specialists who responded were asked to participate in the study. Interest in the season spread through word-of-mouth, and specialists who volunteered to attend were asked to be in the study. They were all given informed consent documentation, as well as details about the season length at the schools, which was six sessions of approximately 60 minutes each. They were all told they could attend as many or as few of the sessions as they were able.

Participants

Students

Study participants were students from each school between the ages of 14 and 18 (inclusive). Some students had special education eligibilities under the category of ID or ASD, as primary, secondary, or co-existing, and others did not have any special education eligibilities. All were members of the school's Unified Robotics teams. At Mountain Lake, there were 12 Unified Robotics participants, of whom four were Athletes and eight were Partners. Interviews with Partners and their parents revealed that four Partners had a medical diagnosis of ASD, albeit without special education eligibility. Spring Meadow's Unified Robotics team consisted of eight

Athletes and ten Partners. Students were randomly assigned partners, as this was a novel season. The Athletes and Partners at Spring Meadow were already acquainted, but those at Mountain Lake were not.

Parents

One parent per student agreed to participate at the beginning of the study, as student participation in the study was not allowed otherwise. Student participation in Unified Robotics itself was not affected by parent decisions about participating in the study. Divulging private information such as gender and age was not required for participation in the study. The only demographic information collected was that the participant was the parent or guardian of a high school aged participant.

Teachers

Eight teachers agreed to participate: one from Instructional Technology, one General Education Science Teacher, two Speech Language Pathologists with expertise in Augmentative and Alternative Communication, one Occupational Therapist, one Special Education Teacher, and two Special Education Instructional Assistants. The only demographic information collected was that the participant was a teacher, specialist, or paraprofessional for a high school program.

Measures

The first research question, What are the perceptions of Autistics and Allistics, and students with intellectual dis/abilities and their general education peers, in terms of the three self-determination needs of competence, relatedness, and autonomy, after their participation in the expansively designed Unified Robotics program?, motivated the measurement of students' perceptions of their three SD needs before and after participation in the Unified Robotics program.

The second research question, What are the perceptions of parents and teachers of the benefits and costs to Autistics and Allistics, and students with intellectual dis/abilities and their general education peers, after the students' participation in the expansively designed Unified Robotics program?, drove the elicitation of costs and benefits to students, both individually and collectively, from the perspective of parents and teachers.

Data were collected through self-reports; therefore, corroboration between reporters involved triangulation of three measures: (a) *parent* perception of SD needs in their child, (b) *student* assessments of costs and benefits, and (c) field data collected by *researchers* while observing students during program sessions. As an ancillary element, we also measured teacher familiarity with such program design components as support for rightful presence and the scaffolding of SD needs.

Prior to any interaction with participants, all research tools (e.g., interview protocols, permission slips, field note sheets, and the like) were reviewed and approved by the Institutional Review Board of the University of Oregon, Eugene and the Review Board of the host school district.

Interviews

There were interview protocols for each of the three participant groups: students, parents, and teachers. Unlike the student and parent protocols that focused on the student, the teacher interview was about the teacher.

Before and after the Unified Robotics season, study participants engaged in semi-structured interviews to collect self-reports of data specific to their domain, such as their perceptions of their SD needs. Depending upon 'yes/no' branching (e.g., if 'yes', then ask the listed follow-up), and to which group the interviewee belonged (i.e., student, parent, or teacher),

the survey consisted of 15-26 short, semi-structured interview questions, some of which were adapted as closed questions designed to probe SD needs, and others of which were left more open ended (cf., Appendices S1-3, P1-3, and T1-3). If the response format had been mechanical (e.g., an online form with no method provided for elaboration), we could have represented the meanings intended by the participants as if they were only binary values; however, an interview format was necessary to support equitability of access (i.e., an adaptive in-person interface), and because some of the questions among the closed set had been deliberately paired with further prompts to elicit narrative details. Even without further prompting, many participants independently chose to elaborate upon otherwise closed responses at widely varying lengths.

We had considered mechanically locking down the protocol response system. That stark filter would have disguised the fuzziness for the sake of *apparent* conformity; however, that exclusionary gatekeeping would also disrespect the principles on which this research is founded. Similarly, we selected the interview format to maintain our appeal to the personal interactions that would support communication adaptability. Unfortunately, a prompt-dependent interview environment is *not* a creature of universal design, being rooted in a rarely examined history of reliance on the likes of:

- unaided voice,
- focused attention,
- inhibited physical presence,
- conventional cognition,
- ordered sensory processing, and
- a standard command of the language in which the interview is conducted.

While we knew that the basic form of the protocol was not readily accessible for some of our participants, we were also aware of the side effect that an inclusion of accessibility strategies risks “deviations” that would introduce extraneous variables. The numbers prompted by an interview protocol are only as meaningful as the degree to which a participant fits the engineered mold without need for modifications.

The point is that the closed question results were only those derived from strict conformance to the protocols, which means not only that some of the data required some transparently identified special treatment to compare it with the rest of the quantification set, but some of it would only be made present in the more qualitative sections of the analysis as everyone’s story was told. Crucially, no one’s story was left out due to this inequity. The simple, descriptive statistics derived from the dynamic, *extended* interview formats came to color the conforming tables displayed in the results, as dismissing such excursions outright as ‘bad data’ would be a form of cherry picking that would also deny some people their right to participate and be imaged.

Student Interview Protocol. Depending on branching, the first part of the interview for both the preseason and postseason contained seven-to-nine yes/no (closed) questions, plus two-to-three yes/no questions to elicit (open) elaboration about types of choices that the student makes (Appendix S2). In the second half of the interview (Appendix S3), the preseason interview protocol included two exclusively narrative responses. The second half of the postseason interview contained five yes/no questions that led to narrative elaboration. The question topics included: (dis)liking the Unified Robotics program; building robots by themselves or with others; being on teams; having friends on teams; decisions that they were able to make at home, school, and on teams, including what those choices were; Unified

Robotics being good for them; their attitudes changing towards people; and participation in the following year. To help ensure that the interview would be accessible to all students (without having to use separate protocols), the prompts and questions were developed in consultation with an Autistic Ph.D. in Cognitive Science and Linguistics who is a Speech-Language Pathologist with expertise in the Life Skills venue and AAC.

Parent Interview Protocol. The parent protocols (Appendices P2-P3) were very similar to those used with the students. The questions naturally varied to the extent of asking about their student rather than themselves, such as whether the student had ever built a robot on a team. The postseason interview included an additional 'yes/no' question among the type that led to narrative elaboration, where parents were asked not only whether their child's attitudes had changed, but also their own.

Teacher Interview Protocol. The first part of the interview (Appendix T1-T2) sought to determine what teachers (already) knew or did not know about: (a) the two main inclusion design components of Unified Robotics (i.e., the existence of equal status as rightful presence and shared goals, and then how they were implemented); and (b) the three SD needs (i.e., competence, relatedness, and autonomy). The questions about how those three items would be included and/or scaffolded were more involved; therefore, they were needs coded and analyzed both quantitatively and qualitatively. The questions in the second part of the teacher interview (Appendix T3) were treated as short-answer versions and were also analyzed qualitatively.

Field Observation Protocol

As the interviews were self-reports, a measure of corroboration was added in the form of field observations completed by two observers who were not participants. This protocol (Appendix F1) was used to record student engagement behaviors related to the SD needs.

The protocol had two columns, one for Athletes and one for Partners, and separate sections for each of the three SD needs, where each such section had two rows, one for each binary pole of the three values, as follows:

- Autonomy. Free Choice vs No Free Choice
- Competence. Effective Performance vs No Effective Performance
- Relatedness. Social Connection vs Social Isolation

Within any given cell, there were checkboxes for observable indicators; for example, within the section for the Competence value, along its Effective Performance row, the Athletes section listed these items:

- Explaining
- Using materials
- Taking turns

An additional area of the protocol was devoted to capturing displays of emotions (also divided into sections for Athletes and Partners) designed to reflect on a participant's sense of enjoyable benefit from the activity (e.g., smiling, laughing, relaxed), or indicators of their distress (e.g., frustration, sadness, dysregulation).

The number of such indicators in each section of the protocol was necessarily limited by the sheer volume of indicators that could be observed across this combinatorial propagation:

- all students
- during each session
- served by only two recorders
- whose physical access to observed students was pragmatically limited
- by the capacity and furniture layout of
- the number of teams distributed across the room.

That is why each cell only has a few checkboxes.

Procedures

Prior to initiating the intervention program, Unified Robotics, all Partners were trained. Communication support materials were engaged early on, such as updates to student AAC systems and the production of laminated communication boards for each team. In addition, preseason interviews with students, parents, and teachers were conducted at the start of the Build season. Field observations were conducted during Build sessions. The data collection process wrapped up with the postseason interviews.

Intervention Program - Unified Robotics

The Unified Robotics™ program represents both the setting and intervention within which the students' perceptions of self-determination were affected. It is important, therefore, to understand the structure and content of those influences on the measures.

For Inspiration and Recognition in Science and Technology (FIRST) is a non-profit public charity corporation that functions as an international youth organization. It maintains a research facility in which it conducts educational programs, and it licenses teams to participate in specific STE competitions among schools and other youth groups. FIRST Robotics Competition (FRC), specifically, is just that: an international competition in robotics at the high school level.

Unified Sports is an endeavor within Special Olympics to create a program in which Athletes (i.e., people with dis/abilities) and Partners (i.e., those who are not so *identified*) participate equitably in mutually shared events (cf., this study's Term Use Statement). Unified Robotics exists as the intersection of FIRST Robotics and Unified Sports.

Preseason Partner Training

The purpose of the preseason partner training was to socialize and instruct students in ways that encourage self-determined learning initiatives that result in intrinsically motivated

learning (Deci & Ryan, 2004). The three components are: (a) provide students with meaningful rationales that will enable them to understand the purpose and personal importance of each learning activity; (b) acknowledge students' feelings when it is necessary to require them to do something they might not want to do; and (c) manage the instruction of a group that emphasizes choice rather than control. Those principles are reflected in the Partner training that occurred before the season started.

A special education administrator from the local Education Service District provided Partners a two-hour training. This introduction to partnering with Athletes was encouraged but not required for all participants and mentors. The training consisted of five video modules that included small-group discussions. The module themes were created for Special Olympics Oregon in collaboration with an Oregon metropolitan school district. These video modules had previously been used in training Partners in Unified Sports.

The first module began the discussion on inclusive versus non-inclusive thinking. The module aimed to reflect from a first-person perspective on the Partners' attitudes, beliefs, and experiences about inclusion. This module activity used Inclusion Tiles as discussion prompts for small group discussions.

The second module addressed inclusive language. Those without dis/abilities can feel discomfort when referring to persons with dis/abilities if this person cannot articulate their own preferences. This module addressed where identity-first and person-first language came from, what purposes they serve, and how to ensure that we speak inclusively. This is a sensitive topic. We may not always say the right thing, but the fear of saying the wrong thing can be a barrier to creating spaces where all community members feel valued.

The third module was a communication challenge. It was a relay game with the variables of building a six-piece LEGO® model with a team, using limited communication in specific roles. The connection was that Unified Athletes experience a variety of communication challenges, and it is part of the role of Unified Partners to push through these barriers with Athletes. The goal was to allow for building friendships, community, and competence in communication.

The fourth module covered the role of the Partner and the meaning of inclusive play. The Partners observed ten vignettes in which inclusion (not necessarily rightful presence) and exclusion were the themes. Discussion prompts after each vignette allowed for the Partners to identify which method of participation was in play.

The fifth module was titled "I Choose to Include." Partners established their personal motivation for participation in this project by answering the question, "I choose to include because…." Partners were asked to keep this commitment visible in their workspace as a reminder of their 'why'.

Preseason Interviews

Before the Unified Robotics season (or in a few cases shortly after it had started), the research participants engaged in semi-structured interviews to collect data on their self-reported perceptions of their SD needs. The interviews were conducted by the PI or the IRB approved research associate and lasted between three and 30 minutes per interview. The interviews were audio recorded.

Student Interviews. Of the 19 Unified Robotics students, 16 participated in preseason interviews, six of whom could not access the activity in a manner that strictly adhered to the protocol. In those cases where a student was not fluent with the conventional format of the

interview, the interviewer would honor their communication style, engaging in such scaffolded facilitation as repeating a question (that might be reworded or embellished), prompting to use an AAC system, relying on interactions with a familiar communication partner, waiting for longer processing times, and otherwise meeting the student where they were.

Parent Interviews. For the 19 participating students, ten parent interviews were conducted prior to the intervention. They were set up through contact by phone, email, and/or text. Meetings were conducted over 10-30 minutes, either in person or over the phone, as most convenient for the parent. These took two weeks to collect, overlapping with the beginning of the Build season. Parents who did not respond in that period did not participate in Pre interviews. The interview process was not disturbed by mismatches between the language with which any given parent was most fluent and the language of the protocol.

Teacher Interviews. No teacher responded to the request for a preseason interview. The teachers were only interviewed in the postseason interval.

Field Observation

Prior to observing in the field, interrater reliability was established using the following process:

- The two raters (i.e., the PI and the IRB approved research associate) discussed the protocol checkboxes to promote mutual agreement about their meaning.
- They simultaneously completed independent observations of the same student.
- They reviewed their notes together, discussed any discrepancies to promote a shared understanding of the representation, and resolved any mismatches. This step was repeated twice, albeit with different students.
    - There were minimal cases of one rater marking an additional box compared to the other; crucially, there were no cases of diametric opposition, such as one rater marking “communicating” while the other checked “not communicating.”

- Comments were never in polar opposition (i.e., they were all complementary).

Given the intended purpose of the field notes, no modification of the protocol was needed.

Build Season

Please refer to Appendix G1 for mechanical details: Guidelines for Program and Session Schedules.

The Build Season lasted for six weeks. To facilitate equitable access to communication among all participants, the Unified Robotics sessions at both schools were attended by the following ESD specialists: 1) the Augmentative and Alternative Communication (AAC) specialist, who is also an Assistive Technology professional; 2) the Assistive Technology specialist, who is also a Speech-Language Pathologist with AAC experience; 3) the Speech-Language Pathologist assigned to the Spring Meadow classroom; 4) a Speech-Language Pathologist who was not specifically assigned to either classroom; and 5) a bilingual Desktop Technician.

During the first session, this group of communication specialists fanned out among the teams to demonstrate the use of the laminated communication pages at the tables, encourage students to use their AAC systems, and provide coaching around communication supports, such as demonstrating examples of inquiring into people's preferences during decision making. This support provision occurred as an integral part of the session's activities. The participants adapted quickly, and the need for direct communication support from the specialists dropped away. The specialist most familiar with the students' AAC systems took pictures of participants – with their permission – so that the device matrices could be updated.

As a result, communication was very well supported (as well as neurodiversity, as it happens); however, it should be noted that the presence of the Life Skills staff members was

particularly helpful at Mountain Lake, given the depth of their familiarity with the students and their communication in the absence of participation by classroom staff members. As mentioned, an AAC specialist added pertinent information to student communication devices and created auxiliary communication boards specific to involvement on the robotics team. This group was joined by an informal rotation of ESD program supervisors who were not assigned to the classroom but actively supported the endeavor.

Session Content. From the first meeting, teammates worked together to build and program a SPIKE® robot using the provided instruction manual in their kit and embellishments that the team developed. After their robot had been built, teams programmed their robot with software provided by the LEGO® Group and continuously tested and refined their designs and program, until they had developed a well-tested and structurally sound robot that met the objectives of the defined game. During the last two weeks of Build meetings, students also practiced presenting their robot, which included the following: (a) an introduction of the team, along with an explanation of how their robot worked; (b) the design, build, and programming process; (c) the season's game, with main objective and basic rules; and (d) practiced responses to sample questions that judges might ask during the Championship Tournament. During this time, the teams also refined their robots on a practice game field.

Session Focus. The presumption of rightful presence, this radical alteration of the status quo (Martin, 2019), is the key that renders the beneficial effect resulting from participation. Note that its implementation is just as much a matter of not appealing to a traditional 'inclusion' paradigm. It is apparent across all session components, where we can appeal to just one such factor as an illustrative example, namely the following of one step in the robot-building instructions:

> *Competence*: Equitable and authentic participation distributes learning opportunities across all of the participants. Extending into their proximal zones, they all learn how to associate diagrammatic representations with the stepwise assembly of components into increasingly complex functional units. They get practice with distinguishing targeted parts from the inventory mass, counting features and then matching combinations of size and shape. They get practice with distributing such tasks as: identifying the pieces that need to be found, retrieving them, putting them together, testing them, determining that they are ready for the next step, and turning the page. Each step builds upon the previous one towards a larger goal, so the increase in competence is similarly componential. And then there is the experience-based increase in competence with relatedness and autonomy.
>
> *Relatedness*: In communication, turn taking, social negotiation and navigation, team members are mutually, equally responsible for learning (competence) to communicate together (relatedness). Their sense of challenge (and possible frustration) and success is shared as part of a bonding process, engaging reflection and empathy. Otherness fades, and people's qualms about the unknown are assuaged. This grows with every step of the construction.
>
> *Autonomy*: Everyone has an opportunity to express individual preferences in a safe environment where their contribution is valued, and each team develops its style of aggregate decision making. While the instructions are necessarily directive, there are choices of which person will actually handle the physical parts for any given step, whether enough progress has been made to engage a testing stage, and so on. Then there are some discretionary steps outside of the sequence of instructions, such as how to customize the appearance of the model to represent the team. There are also decisions to be made relative to the process of following the steps, such as when to take breaks.

These sorts of benefits of rightful presence apply equally well to the other session components detailed in Appendix G1, but the point remains that the miracle growth formula was the adults judiciously getting out of the way.

Debugging

One of the mentors built a kit per the manufacturer's instructions, programmed to engage in the game rules (e.g., launching a ball when motion was detected in a sensor's field), and created a default set of code that could be used as a reset value. In the case of this study, the need

for this trial did not become apparent until the first session was underway, and would have been better implemented prior to the Build season.

Tournament

The season culminated in a Championship Tournament hosted at Spring Meadow and staffed by volunteers from Mountain Lake's Robotics Team. The Tournament began with an Opening Ceremony highlighting the program's participants and supporters. One Unified Robotics participant turned up with team name buttons that they had autonomously decided to make for each team's respective members. Due to staffing constraints, presentations to the audience with the points described above were not included in the tournament. All teams competed in double-elimination rounds. During this time, judges determined which teams would receive which achievement award based on their conversations with and observations of each team and the criteria required to qualify, such as Most Cannonball Hits, Most Leagues Traveled, and Best Dance Party (where the latter referred to an extemporaneous Build season component that reflected all three SD needs).

Field Observations

During the build season, the PI and the IRB approved research associate observed each student on either four or five separate sessions except for two students whose early availability was affected by illness and one student who was observed in six sessions. Before each session, the two members of the research team randomly and evenly divided the teams between themselves. Each researcher went through their team list in nonspecific order. For each team in that sequence, they focused their observation on each of the students in turn for about three minutes apiece, although some overlap was unavoidable as teammates were working together or were moving between and around other teams. If a given researcher's attention was not required

for other session tasks, then the observation of a given student might on occasion be as long as five minutes. These field notes were discussed for clarity at the end of each session.

In stepwise terms, this part of the procedure can be described as follows:

- At the beginning of each session, the PI and Research Associate take Field Observation Notes. These are the materials for each session: one clipboard per team, and enough FON sheets per clipboard to cover all team members.
- Before each session, the researchers randomly and evenly divide the FON clipboards into two piles.
- Each observer works through their FON pile in a nonspecific sequence.
- For each team in that sequence, observe each of the students in turn for about three-to-five minutes. Some overlap will be unavoidable as teammates work together or move around.
- At the end of each session, the observers discuss the collected FONs for clarity.

This sequence should be held in mind when referring to the guidelines in Appendix G1.

Postseason Interviews

After the Unified Robotics season, the research participants engaged in postseason semi-structured interviews to collect data on their self-reported perceptions of their SD needs. Only one student declined, and more parents and teachers participated than in the preseason.

Student Interviews. Eighteen students participated in postseason interviews, of whom five manifested responses that did not match the protocol's constraints. As with the preseason interviews, the interviewer engaged in any modifications necessary to facilitate communication with students who were not fluent with the conventional format. They used the same strategies as in the preseason.

Parent Interviews. In the postseason, five parents were added to the existing interview cohort, not all of whom were preseason participants, including separate interviews with the same parent for two students. As in the preseason, interviews were set up through contact by phone, email, and/or text. Meetings were conducted over 10-30 minutes, either in person or over the phone, as most convenient to the parent. These were collected within two weeks of the tournament, and outliers beyond that boundary did not participate in the postseason.

Teacher Interviews. Teachers were only interviewed in the postseason. Depending upon branching, the survey consisted of 17 to 26 short-answer questions. The interviews were set up by phone, email, and/or text. They were conducted either in-person or by phone, within two weeks of the end of the tournament.

Data Analysis

There are so many different degrees and kinds of bias that ontologies compete to organize them, and mild-to-wild strategies abound to mitigate the effects. Of greatest import in our research into *rightful presence*, we must account for the fact that the nature of the people collecting the data fundamentally affects their design of the collection environment, specifically the exchange of information to be analyzed. As increasingly self-aware as it might claim to be, scientific research nonetheless represents an intellectual elitism; in fact, dissertations are openly a membership challenge. We can strive to approach comfortable, meaningful communication for all participants, but researchers who have been admitted to this level of intensity will never be able to *truly* meet all participants where they are. We can be staunch allies, but we simply do not live where they spend their lives. That is to say, while *Flowers for Algernon* (1958) is problematic fiction, it is nonetheless grounded in Keyes' concerns over equity issues that arose while working as a special education teacher (Keyes, 1999). So, we approximate. We *adapt*.

Creators and readers of dissertations tend to belong to a class of people for whom this research environment is navigable in its familiarity, and even its challenges feel familiar. We were able to *learn* our way at least this far. Neither irony nor paradox, we must equitably adapt historically inequitable tools *while studying* the inequitable system that teaches people to perpetuate the system of research.

Values Coding Scheme and Transcript Codes (TC)

This research selected a Values Coding scheme (Saldaña, 2009) to reflect the participants' values, attitudes, and beliefs toward changes in their SD *needs* (i.e., not their self-determination *values*, as such), as well as their perceptions of costs and benefits associated with participation. Coding for qualitative analysis can go through cycles, generally as deduction and induction are balanced (Gable & Wolf, 1993; LeCompte & Preissle, 1993), and Values Coding is 'first cycle', where a set of deductive codes are applied at the outset, prior to any iterations. Scollon and Scollon (2004) state that, "all speech and all discourse, but also all action is inherently a system of attitudes. Any action implies value, attitude, affect, emotion" (p. 144). As this study evaluated the complex interplay between thought, feeling, and actions influencing motivation factors, this is an appropriate method. Values coding aligned with understanding the lived experience of each group of students as related to SD needs. This provided the basis for the selection of the specific codes that were applied to the transcripts.

This is the code scheme, guidelines for tagging, and some coding examples:

- *Competence* (effective performance): participant's action couched in an assessment of successful capability (e.g., "I can build a robot," "I was able to say [*x*].")
- *Relatedness* (social interconnection): interactions with other people, a sense of belonging ("listening to each other's words," "Feel. Together" on an AAC system.)

- *Autonomy* (freedom to make decisions): independent, volitional decisions, including aspirations ("I can choose," "What I really want to do is help people.")

We have described these already in some detail (cf. Competence, Relatedness, and Autonomy in Self-Determination Theory). There is necessary interplay; for example, a single statement might express effectively engaging in a social interaction (e.g., 'I made new friends'), successfully making a decision on their own ('I figured out the best way'); being free to make a decision about a social interaction ('I went and built it with them'); or all three ('I decided to work with them').

Processing of Interviews

Interview processing consisted of four major steps. Transcription occurred first. A session to establish interrater reliability preceded actual coding. The analyses followed thereafter.

Transcription of Interviews. To ensure familiarity with all data, two researchers (i.e., the PI and one associate) independently listened to the interview recordings all the way through first without coding. Audio recordings of all interviews were then transcribed by the research team using verbatim intelligent transcription design. The PI and a research associate each transcribed a set of interviews, and then edited each other's sets for accuracy, voice, and verbatim intelligent transcription choices. All names were anonymized. This method was used for all transcription**.**

Interrater Reliability of Transcript Codes. To ensure confirmability in the coding process, interrater reliability was established using the following process:

- The research team met and reviewed the codebook and participated in a clarifying discussion to ensure that all members were familiar with the coding scheme and process.

- The team reviewed two sample transcripts together and discussed how the coding tags would be applied to the transcripts. During this process, the research team discussed the areas of potential discrepancies and came to a resolution.
- The research team independently coded sample transcripts where they compared and discussed discrepancies to gain an in-depth understanding of the coding scheme as it was being applied.
- The codebook was updated to include clarifying definitions and instructions as needed.
- The process of coding, comparing, and discussing was repeated until 98% agreement was achieved between all team members on all excerpts.
- Two team members coded each transcript, and reliability checks were conducted throughout the coding process.

The qualitative analysis is interpretative of lived experience, relying upon a rater's association of the meanings of interview passages with expressions of SD needs; therefore, establishing this very close degree of agreement was crucial.

Coding of Interviews. Using the Dedoose coding platform, researchers coded the transcripts of all narrative data to apply the deductive codes of Competence, Relatedness, and Autonomy. The material was combed for the following themes: (a) comments that reveal stative and changed attitudes about participants; (b) expressions regarding the three SD needs; and (c) descriptions of emotional states that might reflect on a person's perception of the program's potential benefits. Independent clauses were calved at their conjunctions into separate pieces of evidence for categorization according to the SD needs that they expressed, unless that initial clause incorporated those subsequent needs more closely, such as by omitting the following subject (so that it was dependent) or having a pronoun representing the previous clause.

Analysis of Interviews. Each transcript was manually dissected into spreadsheets defined by participant rows and question columns (Appendix X1). Each such table collected one 'participant season' type; for example, the table pictured in the appendix shows a row with Student X's answers dissected from the preseason interviews. (The full sheet contained rows for all students.) At need, these sheets spawned subordinate versions, such as a table containing only those postseason parent interviews in which the parent had also participated in the preseason. Just for ease of visual processing, green highlighting marked the columns with the 'yes/no' questions (that could be associated with elaboration, which was stored after '||' in the same cell), and yellow profiled those for short answer question.

This arrangement supported the sorting of passages into narrative response groups, such as every student response to the prompt about the decisions that they were able to make at home, where that set could then be more easily subdivided by hand into their associated 'coding of needs' groups (e.g., all of them that had been coded as containing an expression of autonomy, or all of them that explicitly used the word "breakfast"). These sheets made it easier to distribute examples into the display of the qualitative results, such as a given student's section on competence. Even with the names being obscured, the transcripts contain private, potentially identifying information. Once the study is complete, the transcripts will be destroyed to further protect confidentiality.

Processing of Field Observation Notes

The processing of field observation notes consisted of three steps. The individual notes were collapsed into charts and transferred from handwritten to digital storage.

Transfer of Field Observation Notes. When the season ended, all field note checkbox data was manually tallied onto a separate sheet of paper, and comments were copied verbatim.

That transfer was repeated, and the results were compared. No errors were detected. Those values were then transferred to a digital spreadsheet structured as follows: rows by anonymized student name (ordered by the date that the note was taken), and columns by observation (i.e., explaining, using materials, and so on). Two additional columns were added for the emotion comments, namely negative (e.g., “frowned’) and positive (e.g., “laughing”).

Analysis of Field Notes. Basic statistics were then run on those sheets (e.g., totals, percentages, mean averages, and standard deviations). This information was intended as an adjunct to the personal interviews; for example, a self-report of a sense of improved competence might be supported by diachronic observations of the participant’s increased use of materials. The comments, therefore, were compared with and appended to the individual qualitative analyses for each student, following any parent contribution.

Closed Questions. Closed questions were marked as ‘yes’ (Y), ‘no’ (N), ‘do not know’ (X), or ‘not asked’ (-). The ‘X’ code includes ‘maybe’ and ‘not sure’.

Student data were diverted into two streams. Notably, as stated in our methods, it is not Athlete and Partner membership that defines these two groups, but rather:

- *Students with Access*: Some students displayed fluency with the interview format, answering all questions that were asked, providing independent definitions of “team” and “choice,” and elaborating freely. That fluency did vary within that specific range of general access, and some students derived communicative benefit from their direct interactions with the interviewer.

- *Students without Access*: Some students did not enjoy that ease of access, even with the determined and creative support of the interviewer. Questions went unanswered, independent definitions were not forthcoming, and elaboration was sparse when it was not more often absent; that said, the student could relate at least some of their

> story by traveling well off the beaten protocol path with the interviewer, and – unlike Frost (1915) – taking that road truly *did* make all the difference.

The methods for extending the interviews beyond conventional access were described in the section on preseason data collection for students. Each of the idiosyncratic, individualized renditions expressed that person's perceptions of their lived experience in a manner than was just as personal, and therefore just as meaningful, as everyone else's stories. The upshot is that each of these two sets of data broadcast *signals* that were obscured by the *noise* that they would each introduce to the other; therefore, they were analyzed separately.

Transcript Codes. Transcript codes were applied to responses to open-ended questions and volunteered elaborations of closed questions. Once again, student data were divided into two groups based on interview fluency, with no such modification being needed for either parents or teachers. More questions were asked in the postseason. Therefore, to make a straightforward comparison with the preseason interviews, we included a step where we tallied code figures only from those questions in the postseason that had preseason counterparts.

Qualitative Analysis

The next stage bore some similarity to a collection of case studies that were developed from the data; that is, the coded data were extracted from each student's transcript, sorted together according to their code, and then those sets of expressed perceptions of lived experience were socially interpreted as critical phenomenological objects. As the lived experiences were most closely shared among team members, where they often mentioned each other, the individual student studies were grouped by teams for further examination and then presentation. The quantitative complements were brought to bear as each student's analysis progressed, such as complementary checking for alignment between the self-reports and the field notes.

Parent data were similarly analyzed. Items that expressed sentiments about the Unified Robotics program were categorized according to similarity in meaning, and when a parent made a statement that reflected directly on their child, that element was absorbed into that student's section as a parent contribution. Teacher data were aggregated according to similarity in the meaning of the commentary about the program, with comments about themselves being treated as evaluations of costs and benefits.

Procedure for Data Protection

Protections were put in place to support the well-being and data security of every person who was interviewed and to help ensure the study's trustworthiness. Merriam and Tisdell's (2016) work on qualitative analysis cautions that critical researchers must build relationships with their participants and be aware of power dynamics. Through various networks, the PI has previously established relationships with some participants to varying degrees. To mitigate potential power dynamics between the PI and the participants, the PI did not personally interview staff in their agency's employment.

The PI's employment as a special education administrator allowed for the implementation of novel projects in the interest of creating expansive learning environments for students with dis/abilities. As such, the PI made no attempts to remove their preconceptions about advancing learning opportunities for all students and the positive impact collaborative discovery has for all student growth. The PI is also the parent of two student owners of the robotics team at one research site. Critical Phenomenology allows for the PI's past and current experiences in the field of special education to assist in their interpretation of the lived experiences of students and adults engaged in this project.

Instead of attempting to erase the PI from this project (aside from the traditional demands of third-person language used in academic writing, such as referring to myself as "the PI" or "we"), the PI embraced their multiple perspectives and their own lived experience as a special educator and parent to engage in training conversations with students, parents, teachers, and mentors. The PI's experience helped guide interviews with participants. Due to the PI's position, they relied on their research team and their advisor during the analysis and drafting process to check that all information presented and conclusions reached in the findings for this paper are backed by data rather than their previous knowledge. The PI's positions as researcher, student, administrator, and parent were considered by all secondary coders and editors.

Ethical Considerations

Merriam (2009) stated that ethical considerations must protect all participants. This research was approved by the Institutional Review Board through the University of Oregon before conducting interviews. Working with their advisor, the PI evaluated methods to mitigate potential risks to participants, including ensuring confidentiality, gaining informed consent, and protecting participants' privacy in all aspects of data collection, storage, and anonymization.

Research Questions

The preceding material distills into the following two research questions:

> R. 1. What are the perceptions of Autistics and Allistics, and students with intellectual dis/abilities and their general education peers, in terms of the three self-determination needs of competence, relatedness, and autonomy, after their participation in the expansively designed Unified Robotics program?
>
> R. 2. What are the perceptions of parents and teachers of the benefits and costs to Autistics and Allistics, and students with intellectual dis/abilities and their general education peers, after the students' participation in the expansively designed Unified Robotics program?

The rest of this dissertation explains, in essence, what this research illuminated.

4. Results

Most of the things I do at school are choice. Choicey.

– Jason

It was toast. Strawberry jelly toast.

– Christopher

Epigraphs encapsulate themes, not always in their specific sentiment alone, but often in the person of their author. In this case we honor our students, whose words could elicit welcome feelings of joy and inspiration, such as Christopher portraying the recovery from a stumble. In a manner akin to Jason aptly coining the term "choicey," we optimistically pursued creative approaches whenever this research became too 'toasty'. Thus, per, Christopher, you are invited to partake of the resulting "Strawberry jelly toast." Even with our artfully sensitive engineering, it was expected that pouring analog sauce into a digital engine might crash the system on occasion, necessitating iterative redesigns and reboots. This, our counterculture revolution, has learned at least *that* much from the fraught history of youth movements.

In this case, research into rightful presence fundamentally challenges dominant design paradigms that grossly favor the elicitation of information from people whose way of being in the world aligns with that of a statistically typical research designer. When it came to the interview format, we did not shoehorn everyone into dominant paradigm work pumps or plain-toe Oxfords; but rather, we took inspiration from the W.J. Brooks Shoe Company (McAvoy, 1999); in other words, the results presented here are derived from empathically cobbled methods.

For the sake of brevity and scansion, the preseason and postseason interviews will be referred to hereafter as 'Pre' and 'Post', respectively. Results of student and parent interviews reveal vastly consistent increases in their perceptions − across all three SD needs − of student

self-determination, irrespective of any given student's dis/ability identifications after Unified Robotics.

These qualitative results are divided into the three main sections defined by the highest-order category of participants, namely: students, parents, and then teachers. The analysis of the content of the student narratives is contained entirely within the Students section and is similar in form to a collection of case studies. When the material from a given parent's interview bore directly on their child, *and* it added to the meaningful interpretation of SD needs, then it was included in that student's individual section, whereas parent comments about other topics, such as liking the Unified Robotics program or appreciating that their child seemed happy to participate, were approached in the separate Parents section. Interview material from the teachers was not student specific, so it was all reported in the Teachers section.

Students

The student interviews are grouped by teams, within which each team member's section is organized as follows: material is extracted from Pre and Post based on its (reliably coded) expression of SD needs, grouped first by competence, followed by autonomy, and then relatedness. The needs appear in that order not just to match the interview protocol's sequence, but because an initial description of competence factors led to the specific subset in which competence grew in relatedness skills, which transitioned well into a discussion of relatedness, and then the lesser number of examples of autonomy, which emerged from the other two SD needs. The interview excerpts are used here for illustration without changing their fundamental meaning, so we have removed distracting filler words, repetitions, and false starts.

The narrative (analysis) of each member's section is interjected with germane parental commentary that was derived from their interviews, plus field note comparisons. If a parent's

response to a closed question is not explicitly mentioned, then it can be assumed to match that of the student (or they interpreted the question differently), and to have matched without the parent having elaborated any further (e.g., just "Yes" with "Yes"). The Pre protocol presented 11 opportunities per parent for spontaneous (not prompted) elaboration on closed questions, compared to 16 in Post. Elaboration occurred at a rate of 3% for Pre and 5% for Post, largely because parents had more to say in Post that was specifically related to perceived changes in SD needs, such as details about their child having made more friends, having learned to build robots, and so on. In other words, "No" and "Yes" in Pre turned into 'no, but' and 'yes, and' in Post. If a parent's response to an open question is not specifically mentioned, then it was consistent with that of the student without having added further detail.

Table 1 displays team membership (with all names anonymized), which establishes the order in which the students appear. Jasper and Nick were not able to participate in Pre due to illness, and Melissa was recruited from a third school and started too late for a Pre interview to be based on comparable experience with Unified Robotics. We honored Kathy's decision to decline the opportunity to participate in Post.

Table 1

Order of Progression

Team	Members (Students)		
A	Evelyn	Lauren	Kathy
B	Jasper	Nick	
C	Jason	Christopher	
D	Hank	Kim	Simon
E	Michael	Loren	Cameron
F	Catherine	Nelly	
G	Jasmine	Claire	
H	Melissa	Joe	

Evelyn (Team A)

During the Build Season, Evelyn seemed to enjoy the experience. Across four observations, she was noted to be laughing, hugging, smiling, and happy. During one session, Evelyn resisted the instructor's attempts to intervene with her team to set physical boundaries for one student who uses physical touch for comfort. Field observations consistently indicate that Evelyn honored her team's communication by speaking gently, modifying phrase length, and maintaining close physical proximity with her team. In all interviews, parent responses to closed questions matched Evelyn's.

Competence. Evelyn is expected to make decisions at home. Her parent describes her as being on the verge of adulthood, preparing detailed plans for college and moving out, and making other important decisions on her own, albeit in consultation with her parents, which indicates that they see her as competent. Although Evelyn is competent in some areas of her life, such as participating in her coursework, cooking, dressing, and taking care of her own basic personal care needs, she had lower levels of competence in new areas such as building a robot or interacting with people with disabilities. In both Pre and Post, Evelyn said that she could not build a robot alone. Whereas in Pre, Evelyn said that she could make a robot with a team if it were working right, after her experience in Unified Robotics, she said, "I assisted in it." In context, that statement was not intended to express ambivalence around competence, but rather reflects her choice (described below under autonomy) to direct her efforts more towards her strengths in "marketing and design."

Evelyn anticipated that Unified Robotics would promote competence inclusively, saying,

> I assume and hope it will be a great learning experience and will also help other people regardless of intellectual property, or intellectual ability. I hope it is a wonderful opportunity to help people learn about STEM and also learn about self-growth so they can do what they want to do as well.

This quote has a flavor of relatedness to it as well, with Evelyn expressing her hopes for others. There are many places where Evelyn's other-centeredness is equally well evident. Autonomy is also evident in the expression of people doing what they want to do.

Evelyn offered up a particularly good suggestion (associated with competence and relatedness) regarding the setup meeting:

> I wish that they also included how to talk to people who are nonverbal, like basic stuff, because I feel like that was something I had to figure out. It would have been nice to have some basics on how to talk to somebody who doesn't express that they hear you or agree with you. And so, you don't know if you're talking to them or not, or if they're listening to you, or if they need space or not.

Evelyn is not the only team member who expressed feeling overwhelmed at first when figuring out how diverse communication was going to work. While there were multiple mentors present who had a depth of expertise in this area and they did provide guidance, certainly there were fewer than one per team. At one of the two sites, the classroom teacher and staff members decided that they would participate and their immediacy (i.e., their familiar daily experience) with the individual students informed their support for the teams, going a long way to mitigating that sense of uneasiness (as is evidenced by the fact that it was expressed far less by the students at that site).

Relatedness. Evelyn's responses should all be understood in the context of her long-standing commitment to helping other people. In fact, Evelyn skewed the quantitative results by talking at length about making decisions to help other people:

> *Pre*: I just want to help people. I don't care much how I am doing it.

> *Post*: I really enjoy helping, or at least perceiving that I'm helping, other people and helping people, giving people access to opportunities that they usually would not have access to, and I hope that I was able to do that. I perceived that I was able to do that, but I'm not on the receiving end of that help so I'm not 100% confident that it was helpful. But I hope it was and I feel like it was.

> ...
> But what I really want to do is help people, and that's what I've wanted to do since I was conscious, so probably four years old. [Unified Robotics] made me feel like a better human being. A lot of the time, I lose sight of what I want to do with my life because I focus more on success, rather being well off monetarily, and so, considering jobs and career paths that excel in that or accentuate that. Sometimes I lose track of that, and [participating in Unified Robotics] helped me reestablish what I want to do with my life.

Evelyn's description displays autonomy (i.e., how she directs her life to approach her choice to help people), competence (i.e., the perception of helping others in fact, reestablishing her focus), and of course relatedness (i.e., helping others). Her parent mentioned that she liked getting reports about Evelyn interacting with the students and having a good time and identified her as having good attitudes toward others even before the intervention, with a perception of increased self-confidence around working with different people.

Autonomy. As for choices at home, Evelyn said in Pre that she chooses her interests and how she spends her time, which expanded in Post to incorporate, "How I express myself." School choices in Pre are "mostly just" which classes, dropping a class, and choosing to show up at school, while in Post the ability to choose classes is modified by a more explicit mention of being controlled, as in, "I do have stricter requirements [than at home] because I need to take a certain amount of credits to graduate, and I'd like to do that. They require that of me." The notion is that the choice to pursue graduation is hers, but the school defines the parameters within which that can happen (i.e., "It's less choice [than at home]"). Team choices in Pre are another "mostly," elaborated upon as, "I get to choose how I spend my time. I get to choose what problems I would like to tackle or help tackle." In Post, Evelyn describes what problems she did choose to tackle, namely:

> I've chosen to not particularly build a robot and more help with other aspects of the team like marketing and design. I chose to do that instead of building a robot because I saw that we were lacking in those areas."

The field notes show that this was not an absolute matter of "instead of" so much as 'in addition to', albeit with some shift in balance over time. Unified Robotics was a viable venue within which that autonomy and competence could be scaffolded, and Evelyn chose to avail herself of that entirely supported option.

Evelyn is one of the students whose attitudes "stayed the same" because they were already high.

Lauren (Team A)

Although field notes indicate that she was on occasion laughing, smiling, hugging, and happy, Lauren was also observed to be very quiet and reserved during interactions with her team. Her parent notes, "I think she was a different person in that program. She understands it there now." Lauren is a recent immigrant and is developing language competence and was observed to have a previous friendship with Evelyn. Parent responses to closed questions aligned with Lauren's.

Competence. Lauren turned to her parent for advice about how to communicate with the Athlete on her team, and field notes indicate an improvement over the course of the season. In Pre, Lauren definitively stated that she could not make a robot on her own, but by Post she was expressing not just a clear increase in her sense of confidence but a realistic awareness of the remaining constraints:

> It depends on what type of robots and if there are instructions or not, because I could build a robot with instructions and easy-to-find materials; for instance, if it's a robot that's built with Legos then I think I might. But if it's robots like the one in [robotics team], then I cannot build it by myself.

When it came to building robots with a team, Lauren said that in the past she tried but gave up, which stands in contrast with her Post assessment in which she said that with "more people with different strengths, abilities, and ideas, building a robot together would be possible." Lauren

attributed some of this change directly to her Unified Robotics experience, saying that while she had previously been scared to talk to other people at times, Unified Robotics allowed her to communicate with her team members without being hindered by worries about saying something wrong.

Relatedness. Before Unified Robotics, Lauren already had friends on her school robotics team, but she had not met and talked with students with disabilities. In Post, after having made such friends, she said:

> At first, I really didn't have a lot of information about the people in special education, partly because I never had the chance to meet and talk with them. But after Unified, I really feel they are very kind, very nice people that won't lie to you. If they like you then they really want to be friends with you. I just feel it's very rare for this to happen for the people in school.

Lauren described the Unified Robotics experience as authentic in a way that she does not see in other facets of high school, expressing a sense of belonging on the Unified Robotics team and emphasizing the uniqueness of working on this type of team with students in special education.

Autonomy. Initially, Lauren identified a choice rather simply as a selection between two provided options, only to expand in Post with a much more active definition, namely, "when you face a question or a thing that you have multiple options to choose, and the one you choose is the choice you made based on the thoughts and feelings in that moment." This is a shift from an agentless conceptualization to one which spotlights the agent much more distinctly on stage.

Ancillary. Lauren said she liked the preseason training for partners, and spontaneously asked if there would be Unified Robotics next year so she could participate again.

Kathy (Team A)

Kathy only participated in a Pre interview. Her field notes indicate laughing, smiling, happy, high fives, and dancing. Kathy was observed to prefer sharing close physical proximity

with her team, and often was observed with her head on a teammate's shoulder or holding their hands. Her interview responses were expressed with her voice and her AAC system (or both), either one or two words, and occasionally a sequence of two such phrases. While she repeated "together" after hearing the interviewer define a team, her response to the definition of "choice" was "like," which was not a keyword from the interviewer. Her responses were not imitative.

Competence. Kathy answered "Yes" to all questions about making robots. Her sense of competence is strong.

Relatedness. There was no material in Kathy's responses that associated with relatedness.

Autonomy. Kathy reports being able to choose "kitchen" at home, and when in the kitchen, "straw," volunteering also "ball." At school, she gets to choose, "Class. Yes, PE," which is a response akin to those of other participants.

Jasper (Team B)

Jasper was ill during the first week of Unified Robotics, so he could not participate in Pre. Jasper explicitly asked to still be included in the study. Jasper was observed to be engaged, happy, and committed. He was eager to socially engage with his teammate and share typical age-appropriate topics. For example, one observation notes a discussion about mustache length and how hard it is to grow a goatee.

Competence. Jasper said that to build a robot he would need help. He drew upon his Unified Robotics participation to define a team, saying, "My experiences are like to build robots... and a ball will run just to the other robot," and then added, "A team is unified." In that context, Jasper said that he could make a robot with a team, providing expressions of competence (and autonomy) that backed up his claim, such as, "So, when I did my robot team, it

launched a ball into the other robots," and "I could build the robot and a cannonball went to hit the other robot." His parent said that Jasper could build a Lego robot with instructions, but not an "actual robot on his own." Without Pre we cannot show a change, but in Post his competence is clear.

Relatedness. Jasper made multiple positive comments about friendship, and how much he liked being on teams, saying that he has friends that make robots "All the time," smiling broadly about being on any teams, and saying, "I do have friends on teams." He talked about "the choice to make friends," and, "Well, I choose... I like being on a team." His parent said in Post that Jasper now had more friends. As mentioned above, he said, "I like to be on a team." Making friends was one of the specific things that Jasper said he liked about Unified Robotics, saying that "[Nick] is my favorite friend," whom he met in Unified Robotics. Regarding the attitude prompt (phrased as whether he thinks differently about other people after being in Unified Robotics), Jasper said, "We can be happy." Indeed, we can.

Autonomy. Similar to his method for defining a team, Jasper gave specific examples to define a choice, "The choice is to make friends... and build robots." Asked if he got to make choices at home, he said, "I don't know," and the subsequent examples that he gave were prompt dependent, such as saying, "I like to eat a burrito," when he was asked if he decided what to eat. His response about school choices was not dependent in that way, and he offered, "I do schoolwork and make friends." His first response to the team choice question was, "My team likes it, and I like to be on a team. Robots," then after a repeated prompt, "When I did my robot team, it launched a ball into the other robots." Following a more specific prompt about being able to choose how to build, Jasper replied, "Well, it kinda feels like you get a Lego kit." He did not elaborate further, so this might be a familiar case where a participant answers with an

example of something that happened during Unified Robotics rather than it being a commentary on how much control Jasper felt he had.

Nick (Team B)

Nick was ill during the first week of Unified Robotics, so he could not participate in Pre. Nick was interviewed in Post as a matter of course, but his parent was unavailable for interviews. Nick was identified as calm, reassuring, patient, cooperative, and engaged. He offered to help other teams when they were struggling with coding or engineering challenges. It was observed that during the first instance of providing assistance, he was quietly reminded to include Jasper, and that he and Jasper provided assistance together in subsequent instances.

Competence. Nick said that while he could build a robot by himself, "I find it significantly easier to work together for such a project than alone." Again, without Pre, we cannot propose change, but his competence in Post is plain.

Relatedness. Nick said that Unified Robotics was good for him, "I found it helpful for working with all kinds of people, it was a good social practice for me that I would not have had," which is also tied to competence. Couched in his response about changed attitudes, he said, "I feel like I understand more people now and can better work and communicate with them even if it is uncomfortable at first." And finally, "I liked setting up the challenge, and the idea of building, programming the robot with my teammate. I really liked the final event and working collaboratively. It was also fun competing against classmates." A lot of Nick's perspectives on his Unified Robotics participation associated with relatedness.

Autonomy. Nick described his home choices as follows, "I don't have full control over most things, but I have a say in when I go to bed, what I eat, and what activities I do." This is different from other participants listing 'eat', 'sleep', and 'activities', because for Nick the

context is such that he only has "a say." School is constrained as well, where he has some choice but, "Not all of the time, with the schedule and classes. I can choose what I do during lunch, and during classes, though some choices can be penalized." Few students mentioned the penalty phase. His portrayal of teams poses an ideal, "In a good team, yes, if my partners agree with my choices, to stay in the team or leave, and I should have a say in choices, though my teammates should also." Once again, we see the notion of having a say, also enjoyed by other members, with greater autonomy around the binary theme of staying or leaving. The focus on the constraints is evident, with teams displaying the greater latitude.

Jason (Team C)

In field notes, Jason is often observed to be smiling, engaged, sharing proximity, and focused on the task at hand. In all observations, he was found to be sharing space, materials, and ideas with his partner. Jason was also observed to encourage his teammate to take the lead on asking questions of the facilitators, such as using the phrase, "What do you think we should do?" Jason's parents note that participation made such an impression on Jason that he wrote about it in one of his college application essays.

Competence. Regarding building a robot by himself, Jason expressed a clear increase in confidence between Pre (where he simply said, "No") and Post, where he concluded, "Yeah, I think with a partner or maybe by myself." Of note, he kindly included the modifier, "I think I'll need Christopher's help," which also displays relatedness between himself and his partner. Jason has been on teams before, including Unified Basketball and Track, but neither STEM nor Robotics. He brought up an interesting difference in the Pre-to-Post skill development between the two types of teams, saying that robotics required "a more fine set of communication skills" for working with other people that would generalize to all interactions, elaborating that robotics

involved a “finer detail since there’s more variables with robotics than basketball.” Initially, Jason said that he was not sure whether any of his friends had ever “physically constructed a robot,” but that they could figure it out as a group. In contrast, his confidence in Post about building with a team shifted to a definite, “Yes. Yes I can.” In addition to the overall increase in the confidence with which Jason expressed his change in competence, his insightful comparison displays some higher-order self-awareness of the intricacies inherent in the character of the skill improvement. Jason’s parent described him as being “ready for adulthood,” which is a vote of confidence.

Relatedness. Jason indicated that before Unified Robotics, “the special education part of our school was pretty foreign to me,” but that afterwards, “I’m really glad that I initially joined a Unified team to create those connections.” He also observed that when it came to the association between friends and team activities, “most of these sports and activities, we create pretty strong bonds throughout it.” As will be mentioned in his expressions of autonomy, when it comes to teams, he emphasized that choices were a matter of ‘we’, not ‘I’. Specifically, when asked what he liked about Unified Robotics, he identified:

> The teamwork, the teamwork, how relaxed I feel in that environment. I come from a hard day’s schoolwork, and every Monday I was just wanting to go back to Unified Robotics, and that’s basically what got me through the day.

Add in Jason’s observations about the need for a finer degree of communication skill in robotics, and we get a picture of a participant who came to carefully nurture interpersonal relationships with other people in Unified Robotics, including partners who had previously been reconciled to a domain that had been “pretty foreign” to Jason. While Jason said that his attitudes toward others had changed, his parent said that he had inherently good attitudes already.

In a presentation to the school board about the Unified Robotics experience, Jason displayed autonomy and relatedness both in (a) his description of making the choice to leave the Varsity basketball team because it conflicted with Unified Robotics, and (b) saying that he looked forward to Unified Robotics, where in contrast he felt stress over basketball.

Autonomy. Jason's parent identifies him as a natural leader with a magnetic personality who makes all his own decisions, "He could live on his own, as an adult." In fact, when it came to the decision to participate in Unified Robotics, Jason approached his parents and said, "I'm going to do this, Dad and Mom. Sign these forms." Jason's parent says that school administrators and staff identify him as making, "Great decisions." In Pre, when asked about what he gets to choose, Jason consistently described those choices in terms of narrow individual selections that are governed by broad, hierarchic constraints, such as, "my parents are paying for my house, so I'm going to do what they ask," and, "There are some requirements with school, like courses I have to take and other things." In Post, Jason demonstrated greater control over his choices by categorizing them with four highly schematic verbs (i.e., 'eat', 'go', 'do', and 'see'), albeit hedged with limiting qualifiers (i.e., 'for the most part', 'mostly', and 'maybe'): "I get to choose what food I eat, for the most part where I want to go, what I mostly want to do, and maybe who I want to see." His focus has shifted from (a) how he was constrained from on high to (b) the categorical breadth of matters where he had a great deal of choice. He similarly captured the dynamic of choice at school by encapsulating it with a neologism: "Choicey," which was epigraphically apt.

Jason held up an interesting comparison between the different types of teams that are instantiated in track and basketball, as characterized by the effect that such differences have on the allowed range of choices, namely: (a) track is a conglomeration of individualized

components ("you get to choose what you want to do, whether it's running short distances, long distances, jumping, or throwing"); versus (b) basketball is more a matter of cog-in-the-machine ("it's more like your talents and where you play best so there's a lot less choice in basketball"). Crucially, Jason observed that basketball involves a stark binary, namely, "usually you grow to enjoy those spots and if you don't, you don't play basketball." His response in Post is worthy of highlighting, namely that he changed his portrayal of teams from that of a hierarchy to a considerably flatter structure, "I don't think it's more of I get to choose, but we choose. When presented with multiple different options as a team we narrow it down." As reinforced by the analysis of his relatedness, he has adopted a gestalt perspective by shifting from a description of teams as (a) a set of parts to (b) a holistic set (emergent from parts), where he was coming together with other students to decide what was best for the team, demonstrating both relatedness and autonomy. Compare this to his depiction of his choice in basketball: either fit in or leave.

Christopher (Team C)

Christopher was happy, and his parent notes that he would identify the sessions as "fun" when he came home, and there were big smiles in the team photo. Christopher's parent said in Post that he was excited, and talked about how much he enjoyed the program. The field observations denote smiling, encouraged, confident, and high fives. Christopher's field notes indicate a high level of social engagement with his teammate, and many instances of loud laughter. There was no misalignment between Christopher's responses to closed questions and those of his parent.

Competence. In Pre, Christopher accurately anticipated that the project would make "tiny, tiny robot squares," and his parent notes that he builds 3D models at home with instructions. In general, his parent identifies Christopher as self-motivated in completing chores

at home. In Post, this understanding had expanded to include germane comments about the goals of robotics and his team's successes, namely when he talked about (a) building a tower, (b) charging the robots, and (c) the use of "tiny computers" (i.e., the robot drive motors). Christopher further explained that their robot used "the entire boat track. It used power on. It walked around." The robots did indeed follow a track, were powered on and off by students, and moved around under their own power. Christopher adopted project vocabulary in referring to a "cannonball," specifically in terms of the boat's failure to hit any targets with its launched balls, identifying that result as a functional failure with the colorful phrase, "It was toast. Strawberry jelly toast." For Christopher, a Pre-to-Post increase in competence is evident. His parent also noted in Post that at the tournament, Christopher felt free to mingle with people and give them compliments, which is tied to relatedness, and that he activated the robot accurately without his anyone directing him, all associated with autonomy.

Relatedness. In Pre, Christopher's definition of a team did not include a clear, overt concept of relatedness. However, he did appear excited to participate when he answered with the animated phrase, "They make robots," which does express at least a schematic notion of people pursuing a goal in common. In Pre, Christopher also said that he had no friends on teams, nor did he name any other students or staff members with whom he works. In Post, the story was quite different. His team definition had expanded to become, "A team is to make a pirate boat. They use wheels." He also identified his partner by first name and said, "He's silly. I like Jason. He builds robots." He said his team was called "Pirate Ship, the [Team C Name]." Christopher not only said that he has friends on his robotics team but also alluded to a shared game with Jason. His connection with Jason continued in the tournament when he reported that they both watched the robots together. He also said that he liked robotics when talking about the tournament, further

naming other people who were also involved in the project. Christopher's growth in his experience of relatedness seems clear in the noticeably increased degree to which he included the identification of several partners by name (including Jason five times and his team three times), and his descriptions of the activities in which they were mutually involved.

In Pre, Christopher demonstrated relational skills by complimenting the interviewer's choice of clothing, concluding with the inclusive exclamation, "We're awesome!" He displayed some nervousness when asked to predict what he thinks the project will be like by mentioning "clammy hands;" however, Christopher did not have clammy hands in Post, and instead gave the interviewer several fist bumps and (dry) high fives.

Autonomy. In Pre, when asked about the choices that he makes at home, Christopher only spoke of specific choices made within the domain of meals, namely beef tacos and a specific type of soda (i.e., "Zero calorie Coca-Cola"). In Post, that shifted to the higher-order domains within which specific choices are made, saying, "I get to choose computers, to watch YouTube," whereupon he then said "Domo" to identify the robot-related music video for Domo Arigato, Mr. Roboto. In Pre, for school choices, Christopher said, "I choose deliveries" and "I use sign language." In Post, this changed to "reading survival science [worksheets]" and "I get to choose at school, Unified Basketball practice. Ball jump. I like ball jump in Unified Basketball." In Post, for team choices, Christopher said (referring to the project bin and the robot wheels), "I like Unified Robotics. I choose yellow box, this blue wheel. I like games." He also said he and his partner chose the team's name together, and when discussing this they both laughed. In Post, in addition to his responses being longer, Christopher's description of choices shifted from (a) a simple, brief list of specific items chosen to incorporate (b) the concept of choices made within a domain.

Hank (Team D)

While Hank is vocal, he does not use his voice verbally, and is observed in the field to be smiling, happy, and encouraging. He also communicates with facial expression, consistent head motion for 'yes' and 'no', bodily gestures, and his high-tech eye-gaze AAC system. His parent said that Hank enjoyed the program. With his communication partners in general, Hank often demonstrates his (competent and autonomous) ability to lead the topic of conversation in his preferred direction, as was the case in his interviews, which were directed well off the protocol path. Caution was necessary to ensure that Hank's redirections were understood in accord with his intent; that is, we did not want to miss a request to stop the interview. He made that request part of the way through Pre, which was honored, and engaged in a modified Post before electing to go back to the classroom with a friend. Hank's parent did not have a Pre interview, and there was no misalignment in Post to Hank's closed question responses.

Competence. In Pre, Hank indicated that he could build a robot by himself by indicating, both "Yes" and "I like that," which might have been about the general participation in robot building. He answered "No" in Pre to building on a team, also responding that he did not want to talk about being on teams. In Post, in the context of being asked about the Unified Robotics team, he happily said that "Yes" he was on a team, which was a change from the couple of Pre instances where he did not even want to talk about teams.

Relatedness. Hank said that he had friends on his Unified Robotics team, that he had fun building the robot, and that he would like to do it again.

Autonomy. In Pre, Hank said that he likes making choices. He indicated that he gets to make choices at school, and when asked about making choices on a team said, "I really don't want to talk about it." At that point, he was asked if he wanted to end the Pre interview, and he

said “Yes.” That’s autonomy. His parent also said in Post that when it comes to making choices at home, “We ask him lots of questions and he answers them,” with school being similar, and on the team, “The other students were really good about asking him, ‘Here, so you can go on and do this. Can you do this or that?’ So they would give an option for him.”

Kim (Team D)

Kim was noted as excited, happy, laughing, and smiling. Kim was observed in an interaction with the facilitators expressing feelings of being overwhelmed at one point regarding communication with his team; in this moment, he was asked what success meant for him that day, and he said, “Success is just being here today.”

Competence. Kim is a member of their school’s robotics team. In Pre, Kim said that they could not build a robot alone, and by Post that had shifted to, “Yes, but it would not be very complicated.” In both sections, they said that they could build one with a team and had done so. (Kim agreed that it would be a more complicated robot in such a case.) In Post, Kim said, “It was a little chaotic because I felt like everything was going really fast, and I didn’t really know how much time we had to do things,” which is perhaps less a self-assessment of their competence (i.e., the ability to do) than it is one of opportunity (i.e., the time in which to do). Kim’s parent did not participate in a Pre interview, but their Post responses matched up.

Relatedness. Kim’s parent describes them as “very compassionate and empathetic,” and was the one who said, “I got emotional during the competition because it’s so beautiful, the collaboration and just the joy that everybody is having working together.” Kim highlighted the interpersonal engagement (as well as the enticement of the kits), saying, “It’s really fun. I get to interact with a lot of people, and I like Legos.” An observation (that involves competence) talked about developing communication with Hank, “It was difficult to communicate because he was

nonverbal, but we worked together to build a robot." As for any changed attitudes, Kim responded, "Not very much, maybe a little bit. I don't know. Thinking." In isolation, it is hard to say whether Kim meant that they were still thinking about their answer (but was asked another question before finishing), or that they might have experienced a change in their thinking. Kim mentions walking by when Hank is waiting for the bus, and they do interact, but not substantially.

Autonomy. For home choices, Kim's answer remained similar across Pre and Post, namely "what to do {next}." The core content of school choices did not show much change either (i.e., how to complete assignments), although there was a shift in the decisiveness with which they stated that material:

> *Pre*: You get to choose what you want. Well, I get to choose what assignments I'm supposed... Well, I'm supposed to do all my assignments, but if I… That's not a good answer. Like, I don't really know. What answers to put on assignments, I guess.
>
> *Post*: How I'm going to do assignments and things like that.

The team choice answer referred to their robotics team experience, distinguishing in Pre between small and big choices, "Usually just smaller things, like what I'm going to code for the day, but not usually like bigger things. Those are usually for team decisions," and then in Post, "On software I get to choose what things I want to program next," meaning that in Post they responded only with the smaller choice. In Post, Kim's parent said, "I did notice that Kim stepped up and had a little bit more confidence in their self as a leader."

Simon (Team D)

The field notes describe them as excited, happy, laughing, and smiling. At each observation point, Simon was observed interacting with their team and with the adults supporting communication. Researchers noted that Simon was responsible for making jokes that brought

levity to the team, and that during one session where a team member was not present, Simon initiated making "Get Well" cards and a brief video for their ill teammate. Simon's parent did not participate in a Pre interview, but responses to closed questions in Post were in alignment.

Competence. Among their peers, Simon happens to be unusually aware of how complex robots can be (i.e., they are an experienced member of their school's Robotics Team), so in both Pre and Post they said that they could build a robot, but only a simple one. Simon skewed the quantitative results because their experience with robotics influenced their confidence in their anticipation of what would be accomplished in Unified Robotics and led them to have a lot to say.

When asked whether Unified Robotics would be good for them, Simon anticipated a potential for an increase in relatedness competence, "I think learning to adapt and to work with a very large part of the population that I get very little contact with will be incredibly helpful," and the associated decision to participate displays autonomy. In Post, we see their description of that fulfilled prediction, "I think it helped me grow as a person and grow in the way that I communicate with people." There is some specific sense of competence in that statement regarding communication, but there is also the broader notion of becoming better "as a person." That is to say, Simon is more competent at *being* (their Self). This matches up with other places where Simon talks about learning and knowing rather than just doing.

It is not unexpected, then, that Simon in particular would consider what competence meant for someone else, a member of his team:

> My partner was completely nonverbal and had very limited use of his extremities, and so that made it a challenge to incorporate teamwork into our team, but the difference that we found out was what you define as a win for somebody. And so, a win for somebody could be building a robot on their own, or it could be sticking two Legos together. And so, my

> partner was able, I think, to gain something in that he participated to the best extent that he could.

Simon has reinvented *equity*; that is to say, where the conventional concept of competence is grounded in notions of success and efficiency (i.e., which task, and how well), compassion interjects a relatedness relativizer known as "what you define as a win for somebody," plus what we do to get each person to their win (or as close as they might autonomously chose to be).

Simon's parent expressed the concern that Simon might be frustrated because, "high schoolers don't have the grounding to know how to deal with certain disabilities." Nonetheless, beyond the immediate scope of Simon's participation in Unified Robotics, they gave a presentation to the local school board about their experience, part of which recounted a great deal of competence around Hank's communication. For example, while the eye-gaze AAC device had been placed appropriately for Hank to use, it imposed a physical barrier between him and the robot that the team was building together. With the consent of both Hank and his parent (who was in attendance), they moved the eye-gaze device and relied on yes/no questions instead, which Hank was comfortable answering with eye gaze and head movements. Successfully negotiating this delicate area to everyone's satisfaction requires commendable skills.

Relatedness. As we saw above, a chunk of Simon talking about competence was tied to relatedness, that is, what they changed to be able to communicate together. Simon highlighted comfort as one type of shift in this relatedness over the course of Unified Robotics, reporting that, "It was uncomfortable at first because I had never worked with somebody with such a different way of interacting with the world than I had, and so I think that it was extremely beneficial to both of us." When asked whether Unified Robotics had shifted their attitudes towards other people, Simon said, "Not a lot" (in terms of their "worldview," below).That is, whereas Simon's comfort levels improved, their attitudes did not change, precisely because they

had already started out being appreciative of other people and critical of the systemic obstacles to relatedness in their environment:

> I have noticed that disparity between how Gen Ed children interact with Special Ed children and I've been more aware of it since. But I think my worldview as a whole stayed very similar.
>
> I think [Unified Robotics] kind of broke down the barriers that we had between us because the generalized population doesn't necessarily know how to interact with the special education population. The Special Ed population is kept isolated from the general education population, so it really helped break down the walls that separated us.

In this sense, Simon portrays comfort and attitudes as themes within relatedness, and makes effective use of figurative language around "barriers" and "isolation" mapped onto obstacles to illustrate the application of empathy.

Autonomy. When asked about home, Simon listed activity choices in both Pre and Post, giving food/eating as an example in each case, but only mentioning clothing in Post. It is interesting that in Pre they mention learning environments (being the only student to do so), whereas in Post it is living conditions more broadly. For school choices, the Pre interview sets out such "limited paths" as class choices, and where you are outside of class. In some sense, their first answer to Post had a similar flavor, concisely summarized as "Minutia," which also functions as a wry indictment of the school system. After a second prompt, they mention class choices again, but this time they add that even that choice is a gamble. For team choices in Pre, there is a mention of the choice to be on the team or not, plus the general notion of choosing which activities, but Post displays a more interesting structure: not only what to do, but how, and then not only what to learn, but from whom. That is a more complex conceptualization in Post.

Simon's parent was concerned that they, "probably don't get to dabble in some of the other areas, maybe as much as they might like to" due to the "focus on just your specialty."

Although this relates to Simon's autonomy, the references to "other areas" and "specialty" were unclear even in context.

With Simon, in reference to whether they thought that they would like Unified Robotics, we get some insight into autonomous decisions that once again are not based only on such canonical physical activities as going, doing, and eating, but rather *knowing* and *believing* as they refer to the moral and ethical imperative (with a dash of courage) represented as follows. "I was unsure about it but knew it was the right thing to go into because I have a belief that Unified Robotics will make me better as a person, and will make my community more inclusive" (which contains a nod to relatedness). It is worth noting that this is the same person who said that one of their home choices was their "learning environment." With Simon, we continue to see an unusual facility with introspection.

After Unified Robotics, when asked if they ended up liking it, Simon said, "I like the way it forced me to adapt to different communication, the ways it forced me to get the ideas for my brain out in a different way than I usually do." Although expressed in terms of being "forced," this is not a lack of autonomy, but rather Simon reiterating their choice to participate in an event precisely because of their appreciation for being launched beyond the boundaries of their familiar conceptualization and communication paradigm. Similarly, astronauts do not experience a loss of autonomy when a rocket "forces" them to go to the Moon.

Michael (Team E)

In one session, where Michael was positive, smiling, and happy, he was also observed to be frustrated, disengaged, tired, and yawning. In two other sessions he was identified as tired (without the other comments), but again this was also while being happy, smiling, and excited.

Michael was observed stimming frequently, and was somewhat physically separate from his team, but watching and easily engaged when asked to "do a job."

Michael responded with such enthusiasm to a passage that someone was reading out loud that the other members adopted his exclamation as their team's name. To the degree that team decisions are collaborative, he made a substantial contribution to that choice. Their name became a mantra for the school's Unified Robotics Team. Michael's mother also contributed a substantial story about his early childhood, which appears towards the end of the qualitative analysis of the parents' data.

Competence. In Pre and Post, Michael verbally answered 'no' to all of the questions about making robots. In Post, parent responses had shifted to 'yes', with the exception of his building them on his own.

Relatedness. Michael's parent noted that he is, "very social, and he loves to watch and laugh and be a part of things." He indicated that he has friends (who make robots and are on teams); notably, this was the only place where parent responses to closed questions did not align with Michael's. He did smile when asked whether robotics was fun. His parent notes that at dinner, Michael now happily identifies his teammates as his friends by name.

Autonomy. When asked what a choice was in Pre, Michael selected "Choice" on the Schedule page of his AAC device. He further indicated that he got to choose "Chores" at home (although he might have been responding more generally to being asked about choosing) and showed that he could also choose "Bathroom." In Post, Michael was distracted by the prospect of going swimming and answered no questions about choices (or much else). From Pre to Post, Michael's parent observed an increase in the amount of autonomy Michael has around meals at

school and described his teammates and Michael actively engaging in turn taking at the tournament.

Loren (Team E)

In Loren's first session, he is noted to be calm and disengaged, but this changes subsequently to smiling and joking. "I like that Zelda felt good about himself," his parent said in Post, and, "He was proud of it." Loren took his role on the team very seriously, noted to be often the one giving directions to the other teammates, and taking control to make sure the team was on task. He was noted to give his teammates jobs to keep them engaged. In Post, his parent said, "I love that he felt like he was helping someone to learn a new skill because I think that's one of his strengths, being able to explain things and help teach things, so I was happy that he was having that opportunity." His teammate considers him to be a friend. He and his parent answered 'yes' to all closed questions in Post. In terms of change, his parent observed that a first-year student would be prone to change over that period of time anyway, so they could not attribute that to Unified Robotics in specific.

Competence. Loren initially reported being able to make a robot by himself, but by Post had developed the awareness that while he could do it, there would be some elements that would present a struggle; in other words, he skillfully dodged the Dunning-Kruger Effect (Dunning, 2011). He also displayed an awareness of a marked increase in his communication skills, saying,

> In the beginning, if Michael wasn't listening, I wouldn't push it, but towards the end I was able to say, "Can you please come here?" and "Do you want to help with this?" and asking more follow-up questions than just asking once and giving up.

This change is, in a word, remarkable. There are all manner of people who live their entire lives in the Pre stage, and yet here we have Loren who mined this opportunity in *high school* and discovered gold.

Relatedness. Loren's parent was the one who observed that it would be difficult to say whether any change observed in a first-year student after their first term might be attributed to their participation in Unified Robotics in specific. Between Pre and Post, the number of Loren's friends who made robots flourished from "some" to "a lot." But here is the gorgeous part, "Each time I see Michael I smile at him and try to show that I still see him as someone who I would want to spend time with instead of it just being 'no' after Unified is over." As well as being a lovely sentiment, this is a prime example of autonomy within relatedness, in that Loren chooses to nurture that relationship with Michael, both in terms of buoying up his feelings now and projecting future time together. Furthermore, the confidence and comfort that scaffold that autonomy emerges from the increase in communication competence described above.

Autonomy. In both Pre and Post, Loren described decision making on teams in terms of voting, but whereas in Pre he had described it in terms of his opinion merely being heard, in Post he had elevated that to his opinion being considered and respected, even when sometimes the team doesn't make what he considers to be the right decision.

Cameron (Team E)

Cameron is noted in the first session as praising and reluctant. There was some germaphobia up front, for which he compensated in a dedicated fashion by masking and keeping social distance. There are fewer than typical field notes as there arose a need for him to serve in a technical support capacity with the installation of the coding, and less as a direct teammate for Team E. His parent did not participate in a Pre interview, but responses to closed questions in Post all matched Cameron's.

Competence. Cameron reported being the co-captain of his school's robotics team, so his atypical exposure to working with robots informs his responses to being asked whether he could

make a robot on his own. In Pre, he replied, “Depends on the type of robot, but I don’t think so,” and after having been exposed to the kits in Unified Robotics he upgraded his sense of competence with the phrase, “Probably not a very good one.” Both of his answers indicate that he could do so, but he is experienced enough to be aware of his limits and happens to have a particularly high standard for the notion of a personally-built robot. When asked if he could make a robot with a team, in Pre he simply gave an unequivocal “Yes,” but in Post he responded, “I can and have. Mountain Lake Robotics Team, and I’ve also made a robot with a team called [Team E]. [Team E], yeah!” giving an enthusiastic shout out to his Unified Robotics team.

We also see growth outside of a narrow scope of robotics. Cameron was another student whose attitudes were already inclusive before Unified Robotics, so when asked about any change, he said:

> I wouldn’t say my attitudes have changed, no. My communication skills have improved. Communicating with my peers who are intellectually and physically different than I am, I was never able to do that well and I’m now able to do that better.

Here he describes a substantive increase in communication competence (i.e., relatedness skills), shifting diametrically from a point of “never... well” to one of “better” as located on an axis of competence ranging through ‘never able’ to ‘now able’.

Relatedness. In Post, we see an improvement in relatedness characterized by an increase in scope, “I’m engaging with a different peer group than I have before, and I really enjoyed it.” Cameron expresses a concern about the relationships not seeming to persist beyond the end of Unified Robotics, saying that while he has seen Michael, “He doesn’t respond to me.” Michael’s parent reports that Michael talks about Cameron at home, so it might well be that Michael simply does not recognize Cameron outside of the Unified Robotics context, and/or he might need more processing time. In any event, the promotion of rich carryover is well worth pursuing.

We also see relatedness come up when Cameron is asked if Unified Robotics was good for him:

> It required me to think differently about my environment and my presence in it and how I conduct myself around others and it required me to, not put the needs of others before my own, but treat other people how they deserve to be treated, rather than, how you've seen them being treated.

In addition to standing for its compassionate sentiment (and identifying Cameron as being aware of the injustices around him), he is also making a statement about the healthy balance of needs in interpersonal relationships.

Autonomy. Establishing the portrayal of a common base, Cameron expressed similar sentiments in both Pre and Post, saying respectively that he made home choices across "most aspects of my life, even the inconsequential ones," and, "I make choices concerning most, if not all aspects of my life." In both cases, he gives the same examples of self-categorized "physical functions," namely eating and sleeping, with an exception in Pre where, "Certain things, financial things, I am not allowed to choose." In Post, though, he starts to fall away from this physical base and climb towards the ways in which he develops and expresses his beliefs in "what I say, and what I must say," expanding to include, "how I feel." No other participant presents the nurturing of a personal sense of rightness as a choice (i.e., "what I must say"); furthermore, the consideration of feeling as a choice is rare among the participants. That the latter is a nascent notion is indicated by his comment, "I suppose that's also a choice to some extent." We are seeing a deepening of internalization across Pre to Post, and in further interview responses, Cameron makes good on this apparent sense of his ethical responsibilities.

As for choices at school, he similarly distinguishes the balance between the physical and the internal in Pre, "On a different scale. Less in terms of mobility and more in terms of what I choose to focus on," and in Post he also applies this concept of *focus choices* (speaking to

competence as well), “I get to choose my level of engagement with the courses put before me.” When it comes to teams, Cameron said that he gets to choose, “to a large degree, with the team’s best interest in mind.” However, we do not have a comparison available when it comes to *what* he was able to choose (as the question is absent in Post); we only know that in Pre his characterization of what he gets to choose is, “Nothing without a committee.” Regardless, his placing of the spotlight on the sense of sharing is worthy of note; that is, Cameron (true to form) chooses to focus on inclusion.

As for choosing to participate, Cameron said, “I was unsure of how to feel about it at the beginning... I wasn’t necessarily sure of the reason why I was participating. I knew it was the right thing to do but I didn’t know why yet.” So, he responded to his instinct or faith that being involved was *right* and remained open to the likelihood that the experience would prove to *teach* him why. He also said, “I’m trying my best to come into this without preconceptions of what it’ll be.” Nonetheless, Cameron anticipates that participation will “unequivocally” be good for him, saying, “It is an experience that will enrich my life and allow me to work with more people than I would have been able to before.” Standing with a sense of rightness and openness, he also anticipates increases in competence, relatedness, and autonomy.

In general, Cameron’s parent identifies him as making most of his own decisions at home, albeit “obviously with some parental supervision,” and indicates that even as co-captain, “a lot of the decisions he’s making are within the framework of a group decision.” When asked if there were anything that he didn’t like about the program, his parent said, “Other than his frustration with his new leadership role, no, which again I think was formative and growing, so no, no issues.” Overall, this is a portrayal of somewhat limited autonomy, and a cost giving way to a benefit (which will be discussed in more detail later).

Catherine (Team F)

In the field, Catherine was observed to be quietly joking, laughing, and happy. She matched the affect of her teammates and was noted to be taking turns with her team throughout the Build season. Observations indicated that she demonstrated pacing that allowed her teammates to participate authentically.

Competence. In Pre, Catherine said that she could not make a robot on her own (just "No"), but "Probably" could with a team. In Post, her hard "No" had softened into a suggestion that she could build "a very simple one" (that was not as complicated as the one for Unified Robotics), and her soft "Probably" firmed up into a confident "Yes." Parent responses to closed questions were in alignment. In Post, her parent identified Catherine as making such adult decisions as where to attend college, saying that she is "pretty independent" but also "pretty mellow."

When she was talking about liking Unified Robotics, Catherine made statements associated with her capabilities, "I like just being able to build the robot and being able to communicate and make new friends and hang out with more people," which also expresses relatedness.

Relatedness. Catherine's parent identifies her personality as being "on the shy side," and credits Unified Robotics with providing an opportunity to be "more outgoing." We see relatedness material throughout Catherine's responses, and it comes up explicitly in Post (along with competence) when she is asked if Unified Robotics has been good for her, as she presents her observations about communication:

> *Post*: It definitely helped me communicate more and be able to make friends with someone who may not have the same abilities as I do. As people, some of them know they can't sometimes talk as much as we would like them to, like, "What's on your

> mind," and they can't say, "What's on yours." It's good practice as well, to be able to reach out to them and be a better friend to them.

Note that this is all wrapped up in the notion of being the *relational* version of a better person, namely a "better friend."

Catherine's measure of whether she liked Unified Robotics is also relational in nature:

> *At the beginning*: I do, maybe not as much as I did later on. Maybe at first, I was kind of shy because I'm just that kind of person.
>
> *At the end*: I really like it now. It was really nice getting to know Nelly and getting to know all the other Athletes as well. And it was really nice being able to give them the opportunity and seeing them smile and laugh and be able to meaningfully contribute to something like this.

This assessment suggests that Unified Robotics provided a haven within which a shy person could safely create friendships that might otherwise have remained too far outside her comfort zone, which brings us to the question of whether she experienced any change in her attitudes. "I think a little bit. I feel like now I can maybe try to empathize with people more. It has helped my empathy, maybe not too much, but a little bit." That statement stands as a seal of approval from someone whose relational nature already seems well apparent.

Autonomy. This is what Catherine had to say about choices at home:

> *Pre*: I get to choose if I want to do something with a friend or with my parents... I'll ask my parents, "Hey, do you want to do something today?" And I mean, it's not guaranteed that we're going to do it, but they will be like, "Yeah, we can see," or something.
>
> *Post*: I get to choose what I wanna do and what I wanna eat, whether or not I wanna hang out somewhere or stay with my parents.

Although these statements pertain to autonomy, note that Catherine is the only student who is so into relatedness that *she plays out the roles* in the social script. She only does that in Pre, though,

and by Post, she is paraphrasing the choice of who she would like to spend time with, adding the familiar notions of doing and eating.

At the top of Pre, Catherine told the interviewer that she prefers to be able to give longer answers, and she is wonderfully verbose; to wit, these are her responses about choice in school:

> *Pre*: It's more like I'm doing what the teachers are saying because that's how classes work. That's how assignments work. I just kind of hear stuff and I'll do it. I don't mind. But outside of that like with some social stuff and activities then I tend to go with the flow a little. I don't really mind doing what most other people want to do.
>
> *Post*: It's on a set schedule and everything. And you can choose classes and what you do in them. Or you can choose to ditch class, which you probably shouldn't, but you could. You could choose that, except to work very well. But you don't really choose that. You can also choose who you hang out with. Also you can pick the school, but stuff like schedule and maybe exactly the curriculum of the class itself isn't really changeable unless you just want to change classes.

In Pre, the spin on autonomy is that – within the range of official schoolwork – Catharine goes along with the orders issued by the system (i.e., where classes and assignments are directed by teachers); crucially, she does not *mind* tending to "go with the flow a little." In Post, that stance of not minding is clearly her *choice*, as she describes what you *could* do in terms of bucking the system (but "probably shouldn't"). Her discussion of available options ventures much farther outside the lines in Post.

In Pre, Catherine gives an unusual response to the question of whether she gets to choose on teams, "It depends, because you need to ask everybody else and see if it's something that everyone wants to do; I mean, I guess that would be the answer for all them." She has introduced the notion that *all* matters of choice might be tied to relatedness. That opinion aligns with her approach to going with the flow; unfortunately, she is not asked this question in Post.

When it comes to which choices she gets to make on teams, Catherine says:

> *Pre*: You get to choose like... all together. You get to like choose a lot of things. You get to like choose what do you wanna we want to do what you wanna what team, what's up to you wanna do, party, and what role you want to play in that sense. But like to make really big decisions, that's like a whole team part.

The tortuous middle passage is left cluttered so as not to disturb the ambivalence, reflecting Catherine's effort – as a person for whom relatedness is important – to resolve the boundaries between "you" and "we" and "team"; in comparison, this is what she creates in Post:

> *Post*: You get to maybe advocate for a change you think would be beneficial, but what you're saying is not fact. It's just more of like, "This is an idea. This is my idea. This is what I think." And then you have to hear everyone else's point and then see which one works out the best. Not which one but like, multiple ideas.

She has moved from (a) the boundaries of a person's identity within a team to (b) the function of her autonomous opinions/ideas while acting out a role on a team (where she is also more organized in her expression).

Nelly (Team F)

Nelly proffered short verbal and gestural responses and did not tend to use her AAC device; similarly, she preferred to give her team thumbs up or down in response to questions. Her parent notes Nelly's demeanor when they would pick her up from sessions, "She was over the moon about it. She kept trying to tell us about it. Even her teachers were telling us that she was the happiest she had ever been. She was just extremely joyful." All observations similarly demonstrated ongoing engagement and enjoyment.

Nelly answered 'yes' to the closed questions in Pre, except for having built with teams before and getting to choose at school; in comparison, her parent answered 'no' across the board. In Post, Nelly did not answer many closed questions, but parent responses about her had shifted to being entirely affirmative. Nelly's answers to open questions were brief, with her parent being

the one who provided more involved information about what she was able to choose in the three venues.

Competence. In Pre, Nelly answered all the closed questions in the affirmative, either saying "Yes" or showing 'thumbs up' (sometimes two). In Post, Nelly was responding by laughing and wiggling her eyebrows, so the interviewer abbreviated the protocol and moved straight to the question about friends. By Post, Nelly answered that she could build a robot on her own, but her parent indicated 'no'.

Relatedness. In both of the cases where Nelly used short sentences, they expressed relatedness, namely, "He my friend" and "She my friend." If nothing else, we can say that Nelly gained focus when the topic turned to friends.

Autonomy. When the interviewer was appealing to the AAC system to help define choice, Nelly said, "Choice board" (which functions as a compound word). Nelly's definition of team was "Feel. Together." While the interviewer had used the word "together" in their prompt, the word "feel" had not been used. In Pre, her parent said that they give her options at home and school from which to choose (i.e., she had not been on a team previously), so that, "If you ask her questions, she will make a decision for herself." In Post, in regards to making decisions on teams, Nelly's parent said, "She was making decisions, and she was pretty happy with it."

Jasmine (Team G)

In the interviews, Jasmine gave short responses that were verbal, with some use of her AAC device. An interview is already a prompt dependent structure, and Jasmine's communication style led to a need for creative prompting off protocol (with the teacher volunteering as an ancillary interviewer). It is difficult to tell whether we were collecting accurate responses to yes/no questions due to the repetitive patterns of her answers; however, in

the impromptu narrative portion, Jasmine did elaborate on concepts. It is difficult to tell, then, whether her responses demonstrated any change from Pre to Post.

Where Jasmine answered "Yes" to all of her closed questions in Pre (other than about building a robot on her own), her parent answered "No" to all of them, elaborating about friends on teams by saying, "This is the first time for anything. We don't know if she has friends or other people [on teams]." Jasmine's parent did not participate in a Post interview.

In the first session, it is noted that she disengaged often, but she is noted thereafter to be smiling, talkative, laughing, hugging, and dancing, where the latter is an understatement in that the notes corroborate her displays of autonomy in her role of initiator of dance party sessions: "Hey, Annie! Play Selena Gomez!"

Competence. In Pre, Jasmine said that "No," she could not make a robot by herself. In Post, she said that "Yes," she could, and answered "Yes" a second time to confirm. She says that she can and does make robots with a team and has friends who do so.

Relatedness. Jasmine's parent stated that Unified Robotics was the first opportunity that Jasmine has had to participate on a team. In Pre, Jasmine often talks about her best friend and classmate, Marie, such as when she is: (a) defining 'choice' or 'team' (which she also defined as "friend"), (b) identifying friends who make robots, and (c) listing what she gets to choose at school. In Post, she identifies teammate Claire as a friend who makes robots. Though Jasmine and Claire knew each other before the Unified Robotics project and had participated in Unified Basketball, she did not mention Claire as a friend until Unified Robotics. This change shows the development of a deeper relatedness between the two students.

Autonomy. Jasmine used her AAC system to say that at home she gets to choose Loren (the character, not the Unified Robotics team member), then she agrees when asked if she gets to

choose what to eat, and in response to being asked about choosing food, she selects “pickles.” At school, she says that she gets to pick Marie and Alice (the teacher), who then persuades Jasmine to walk around the room and point at what she could choose, which is calendar. Upon returning to her device, she chooses Taylor Swift. In Post, for school, she chose the teacher, someone else, and the name of a team that she was not on.

Claire (Team G)

The field notes identify Claire as smiling, communicating, laughing, happy, and encouraging. Observations of Claire and her team revealed that they were the ‘party’ in the room, and Claire often encouraged her teammate to approach the instructor for music changes and to have dance breaks. Claire and her team brought the fun.

Competence. In Pre, Claire said she could not build a robot alone or with a team. In Post, she said she could build a robot with her partner by saying “Jasmine was a big help.” Growth in competence is apparent when she says, “I got to learn how to make robots. I’ve never done that before.” She expressed being hopeful that Unified Robotics would be a good learning opportunity because she wants to study education for exceptional learners in college.

Relatedness. Claire made a very clear statement about relatedness with the participants, namely, “I just really like the bonds I’ve made with them.” When asked about friends on teams, she named five students from Unified Robotics. “I like the friendships I’ve made.” During Post, while students were being interviewed in the Life skills classroom, Claire came in during her lunch time to socialize with Jasmine and the other students who participated in Unified Robotics. Claire invited Jasmine to sit with her during the interview, and they were communicating in what the interviewer perceived to be a casual manner, whispering and smiling and talking directly to each other. The students shared private jokes that were not shared with the interviewer, and

Jasmine corrected Claire when she said the wrong nickname for a student whom they both know. There was an ease to their relationship that was indicative of a true friendship where both students' needs for belonging were being fulfilled.

Autonomy. In Pre, Claire reported that on teams you get put into a position and play where you're told; however, in Post, this had shifted to, "We get to choose which part each player will get to do." The most impactful change in autonomy in Post was stated as, "It just really solidified that in my future that this is something I want to do and work with these kids."

Melissa (Team H)

Melissa is observed in the notes to be smiling, happy, and encouraging, and said in Post that she "liked everything about it." There is no Pre for Melissa, as she joined Unified Robotics a couple of weeks late. Melissa was observed engaging socially, but not sharing as close a degree of proximity as her teammates.

Competence. In Post, Melissa answers all of the competence questions in the affirmative, and said that the program helped her not just to learn to build robots, but to get beyond some social anxiety and learn to converse with different people, which also speaks to relatedness. Her parent says that the program, "helped her be responsible," and notes that she was asked by her teacher to be a TA, which is tied to autonomy.

Relatedness. In Post, Melissa says that she does not have any friends on teams. Then there is an interesting combination that starts when Melissa is asked if Unified Robotics was good for her:

> Yes, I think it was good for me because I am a person who has a little bit of a social anxiety, and it was a little bit hard for me to build a robot on my own. So, it helped me with that. It was good to be involved but is hard to have conversations with different people and it is healthy for me to do that.

Her parent said in Post, “She might have a better understanding of the value of diversity and different people.” The next piece occurs with the attitude change question, where she says, “I am talking to more people in the hall, and I am trying to start conversations with kids in my school’s Special Ed program.” That is some nice growth for a person so self-identifies as having “a little bit of a social anxiety.” Finally, Melissa asked, “Do you think we could have [Unified Robotics] at [a third high school] because I think there would be some kids there who would like it.” Sharing is caring.

Autonomy. Melissa’s parent identifies her as being particularly independent and making adult decisions, such as being a TA, working two jobs, and collaborating with her parents to navigate the purchase of a car. In Post, Melissa says that she gets to choose what she wants at home “most of the time,” but she is not asked for examples; similarly, for school choices, she says “Yup,” but is not asked what.

Joe (Team H)

The field notes identify Joe as grunting in the fourth session, but beyond that they indicate joking and smiling. During all observation periods, he was observed watching the other participants in the room for social cues at some point during the session. In Post, his parent said, “He’s pretty proud of himself.” Joe is unique among the participants in the frequency with which he answers yes/no questions with (a) both ‘yes’ and ‘no’, (b) something in between those poles, or (c) a mixture of those two types of responses; regardless, his parent’s answers aligned with Joe’s, even to the point of them both noting that the ability to build a robot by yourself depends on the kind of robot. This prompted the interviewer to seek clarification, which shifted the interview somewhat off protocol.

Joe's annoyance with the team's naming (detailed below) might have affected his rating of the overall experience, as he was asked if he liked Unified Robotics directly after his recounting of that incident. There are many other places where Joe answers yes/no questions with a fifty-fifty balance, but his answer to this particular question expresses some greater ambivalence, "Not like or don't like. It was OK," where he also used terms like, "good," "kind of," "fine," and "medium." This iffiness did not, however, dampen his expressed enthusiasm for the snacks, with emphasis on the availability of muffins (as corroborated by the tournament field notes), and he did say that he liked the fact that Unified Robotics allowed him to "get away from home," and he was "trying new things." When asked what he did not like, he says, "There's nothing. It was fine," and he would do it again... perhaps due to the prospect of trying new snacks away from home.

Competence. In Pre, Joe says that he could build a robot by himself, "depending on what it is." Similarly, in Post he says, "I can, depending on what kind. It's like both. It's like fifty-fifty." His Pre response to building one with a team is, "Yeah, because that's the only way you have to do it," but says that he has not done so before. When asked if he has friends who make robots, he responded, "It's called people, yeah?" and then ultimately indicates that he does not know. Note the strict distinction that he makes between "friends" and "team" in relatedness, below.

Relatedness. As Joe anticipates what Unified Robotics will be like, relatedness appears (along with competence):

> Difficult. A lot of brain work. Decent. And work and a lot of paid attention and following, a lot of listening to each other's words and waiting and actually listening to other people's saying on choices.

Joe introduces the notion of kindness when he is asked to define a team in Pre, saying, “People who work with you and who like stick together and do things and do so kindly.” (While Lauren identifies some participants as kind people, Joe is unique in suggesting that teamwork should be kind). In Post, this has changed to, “They’re not friends. They’re teams.” When asked again about friends, he repeats, “No, it’s my teammates.” His Post definition is, “Someone who takes care of you and works together,” so he includes an aspect of mutual care, and reinforces the portrayal of caring/kindness. His notion of choice is also relational, “Something you choose and like choices you do. Yeah, you pick what you want and follow it. Yes, and be a leader and follower.” As noted above, this relatedness drops out in Post in favor of a focus on morality, in a sense, which is apparent when we discuss autonomy for Joe.

Note that we cannot know how much a student’s exposure to the Circles curriculum (James Stanfield Co., 2022) might affect their selection of ‘group’ vocabulary terms, such as when Joe says, “They’re not friends. They’re teams.”

Joe reports that his attitudes did “not really” change, and when asked whether he met any new people, he says, “Yes and no. I saw it but I didn’t meet like I actually talk to them.” This depiction of peripheral involvement aligns with the field notes.

Autonomy. The discussion of choices was not unusual in Pre. He gets to choose at home “sometimes,” such as, “If it like TV I can choose that, like disks. I can do that. Play outside, depending on if I want to or not.” Similarly, for school, Joe says, “Drawing, I can choose, if I ask it, or take a break. I asked to do it,” followed by reiterations of drawing as a choice. Before Unified Robotics, his example for choosing on teams is, “Just doing stuff.” While his description of choices at school remained similar in Post (breakfast and books), his descriptions of choices at home and on teams soured (for lack of a better comprehensive term).

To begin with, his definition of a choice changed, “Something you pick from right to wrong or something that comes to your mind.” Relatedness drops out (i.e., his notions about leading and following, discussed below), and morality steps in. Asked whether he gets to choose at home, Joe now says, “Not really, kind of, and it’s different,” elaborating with, “My mom usually really she picks for us or does everything else,” which becomes, “If I was picking, we have to do these things. And if I get angry, I’ll go to sleep so I don’t talk back to her.” When pressed about his ability to choose at home, he says, “Ok, we don’t really. It was like kind of both. You don’t really get anything to choose. But maybe a little bit?” Joe’s answer might well have been influenced by a prominent memory of a (merely speculated) recent event, much as happens with his recounting of the naming of the team, as follows.

When asked about choosing on teams, Joe answers, “Yes and no. It’s kind of like they messed up on the name. Just a little annoyed.” He was under the impression that his suggestion had been selected for the team’s name, but then got changed to something else without his agreeing. Beyond that, he says that he did not choose anything, but only listened.

Summary of Student Results

Although some students reported little or no changes in attitude, further analysis showed that this was because some students identified themselves as already having been open-minded before participation in Unified Robotics. Overall, analysis of the interview material makes it clear that a student’s participation in Unified Robotics is meaningfully associated with self-reported increases in their perceptions of all three SD needs, which is further corroborated by the field notes.

Parents

The student interviews were treated per person because students were direct participants who evinced consistent involvement across sessions and questions. In contrast, the parents were only sporadically involved, so their interviews did not end up constituting as steady a collection. Therefore, that corpus will be analyzed in aggregate, per question, in the sequence determined by the interview protocol. Pre then Post, we shall be interpreting the expressions that portray their perceptions of themselves and others as regards dis/comfort levels, attitudes that changed (or not), costs, benefits, interest in involvement, and other intriguingly fragrant comments emerging from their volunteered information. After the section devoted to the individual questions, we shall present two longer statements by individual parents that deserve special attention.

There are many sections that contain large collections of illustrative quotes, which helps to avoid the qualitative pitfall of preferentially displaying only the few, plainest examples that safely support our reliably rated interpretations, and therefore our contentions. That would not only feel too much like sacrificing the data to save the theory but would ignore all of the subtle variations on the themes that represent the personalities in individual people's stories. We have resolutely eschewed cherry picking to this point and will not start now.

Decisions Made at Home

Prompt: What decisions does <Name> make at home?

In general, the parents characterized their children as being *allowed* to make choices at home; that is to say, they have the freedom to make their own decisions as long as those choices are not grossly misaligned with those of the parents. This perspective matches up with what the students said, for example, students were portrayed as being able to choose their bedtime, if the parents did not feel that the chosen routine was beyond their notion of reason.

This is the initial environment in which these students have learned about ‘choice’ and continue to do so. Even students who are legal adults tend to be subject to the rule that is widely referred to – in a variety of languages – as ‘while you’re living in *my* house’. Of note, none of the students explicitly recounted the culturally common theme about wanting to move out and live by their own rules; however, parent responses indicated that leaving-the-nest conversations were taking place.

Parents described their children as being free to make “lots of choices” about “day-to-day decisions,” but they would still be subject to “supervision.” Such mundane decisions often included:

- what to eat (listing “breakfast,” “lunch,” “snack,” “dessert,” and “dinner,” albeit a couple of parents suggested that dinner was more of a family event with fewer options, and one said that the student would cook sometimes),
- what to wear (including, “He gets himself dressed every day”),
- hygiene parameters (like “showering,” “deodorant,” “brush hair,” and “brush teeth”),
- when to engage in mandated chores such as vacuuming, taking out the trash, and keeping their room clean (which portrayed a time window for completion, but was up to the student to notice the need),
- how to organize their time (with homework and chores prioritized), and
- what their sleep and wake routines would be (“with oversight,” where one parent identified as being “tough” about that bedtime constraint).

The examples also covered leisure activities, such as reading books, watching TV or YouTube, listening to music, going outside, and visiting friends; however, those decisions were largely accessed only if their chores were already done, and in one case only on the weekends.

Some students were described as exercising a greater degree of latitude. One student was identified as having jobs (plural). They decided what their schedule would be for "work outside the home," where this same student was reported to have collaborated with their parents on the purchase of a car. When it came to choosing to participate in Unified Robotics, one parent (who had identified their child as being particularly independent, including "He's ready for adulthood") said that the student approached them and said, "I'm going to do this, Dad and Mom. Sign these forms." This sort of depiction was naturally much more common in the responses from the parents of the older participants.

Parents also talked about certain decisions that students were *not* allowed to make, even when they were 18, such as that they "have to show up at school even if [they] don't want to," where that constraint gets compounded by the notion that the student cannot move out (or look for a "better apartment") until after they have graduated from high school. This restriction is associated with reference to a diffuse set of larger "financial" and "college" decisions.

Despite there being so many more parents participating in Post, there was very little difference between Pre and Post when it came to describing decisions made at home, other than there being fewer specific types of chores itemized in Post. We are unable to say with confidence what that subsequent lack of detail might signify in terms of changes in the parental perception of the self-determination of the (adult) child in their home. Such a change might have been expecting too much of Unified Robotics, or perhaps not.

That said, one parent did note that after Unified Robotics, model building had become a new favorite on the list of the student's choices of things to do at home with family, where before they had not realized that the activity was within his proximal zone. *That* represents a

powerful, concrete increase in that particular student's self-determination. That benefit is tangible.

Decisions Made at School

Prompt: What decisions does <Name> make at school?

When it came to school, some parents were not entirely sure or expressive about the specifics, as in, "I don't know hardly anything about school," "Classes and things like that that she does," and, "I don't even know how to sign on to Parent View." That said, parent responses often corroborated those of the students in characterizing decisions at school as being much narrower than those at home, where school is "a little bit more structured" with "a really specific schedule that they follow" and they are "doing what the teacher says." Decisions are controlled by teachers, advisors, and administrators (i.e., 'the school'). That is, students have only as much autonomy *as they will let them have*.

Parents note that students who are trusted by 'the school' to make decisions that conform to the paradigm are left to operate with less direct interference, or are accorded some measure of supervised authority, sometimes as teaching assistants. General education students were portrayed in this manner as being rewarded with a taste of the authority that they had been mirroring, which is not a denigration of the students' skills, but rather an observation of the dynamic within which those skills were developed. In contrast, students with dis/abilities are noted to be afforded only limited decision making that tended to be portrayed as choices within a small, specific field of options, such as food choices at meals and tasks or free-time activities from a choice board.

It is intriguing to suggest that the general education students who are trusted by 'the school' to make the 'right' decisions simply have more options on their analog of a choice board.

To wit, school was often portrayed as having its equivalent of the day-to-day activities that were identified at home, such as what and where to eat, and with whom. In fact, many parents mentioned the choice of *which* classes, and *how many*. Decisions around the related use of time came up as "schedule and scheduling," and, "He makes his own schedule and decides when to come and go," which includes the availability of "free choice time." A couple of parents reflected student comments about ultimately having the choice of whether to "go to class or not," or to "engage" or "participate" at all in the activities that were directed by the school. Similarly, one parent said that the student could "choose to enjoy" these activities.

Once again, there was little difference between interview seasons, other than that it was only in Pre that parents said that students get to choose their friends and sports, which also is not representative of a big change in parental perspectives. However, and *crucially*, compare the following between Pre and Post, where both observations are from the same parent:

> *Pre*: They didn't know that he liked ranch with his carrots 'til the middle of last year. Well, they would say, do you want ranch? And he just wouldn't respond.
>
> *Post*: I was just talking to him at dinner time about Loren and Cameron and he's saying their names, and he looked up at me. So, he considers them friends.

Participation in Unified Robotics led to Michael making a decision that did not involve a choice board, and that he did not meet with silence. He chose *friends*.

Decisions Made on Teams

Prompt: What decisions does <Name> make on their team?

Regarding decision making on a team, one parent was unsure, saying, "It's a collaborative process. I don't know where that starts and stops." However, in aggregate, the remaining parents painted a picture of varying types of teams, and then responded in terms of where the student fit on the particular team that they had in mind.

Sports teams were portrayed as hierarchical in structure, and Band was seen similarly (although used as an example only once): coach, captain, “co-captain,” “student head,” and “team member” (with “adult guidance”). A “formal and informal leader [can] make the final decision and many times,” and “assists other people coming to participate in their project work.” Parent comments tended to mirror conventional portrayals of team authority attenuating as it spreads downward, where decisions are similarly passed down to lower levels, with some choices put to a vote, and others being offered to a member as options from which to choose. People can make decisions based on their assigned roles, such as starting and stopping the robot in Unified Robotics, or which way to run on the court in basketball. Team members cover for each other. Unlike students, parents did not mention the option of choosing to participate or not.

The readily noticeable difference between Pre and Post was that Unified Robotics participation had offered some parents the opportunity to observe specific examples of the decisions that their child had made on their Unified Robotics team. In two cases, the Pre interview had not branched to this question because the parent had said that the student was not on any teams, but once having been a member of a Unified Robotics team, the parents were able to say of their child:

> [Loren and Cameron] had worked with [Michael] enough to say, “Okay, it’s your turn,” and he knew what to do. Part of making decisions is knowing what to do. He would say “Stop” and “Go.”
>
> She was taking decisions with her classmates, the teacher, the person that helped her. She was making decisions.

The parent who only had a Post interview said:

> The other students were really good about asking him, like, “Here, so you can go on and do this. Can you do this, or that?” So, they would give an option for him.

One parent had spoken in both interviews about a decision that his child had made on his basketball team (namely running the wrong way down the court), but he added in Post:

> And then at the robotics tournament, he was mingling with people. He felt free to compliment and he was like, "Hi, how are you?" to some people he didn't know. And then he knew what was happening next with the team member, the [Partner] that was working with him. And he would [push] the start button on the robot. And I noticed that the other kids didn't tell him to.

Other parents responded without giving specific examples. From Pre to Post, then, the perception of self-determination changed for *some* parents at least to the point where it had adopted some awareness of their child being able to make decisions on their team.

What Unified Robotics Will be Like

Prompt: What do you think Unified Robotics will be like? (Pre Only)

Unlike the previous questions, this one was not asked directly in both Pre and Post. Instead, it is more loosely compared in Post to the things that someone did or did not like about Unified Robotics, which will be examined in the next three sections. The intent was to prompt expressions that might contain information about anticipated benefits and costs from statements addressing the speculated content and aims of Unified Robotics. Overall, everyone suggested that there would be benefits, and no one indicated that there would be a net deficit, but most answers tended to be general rather than detailed.

Responses that were very concrete, such as Unified Robotics being an afterschool activity in which they were building a robot or a pirate ship, did not reflect a description of *consequent* costs or benefits to participation, where a couple of examples suggested that the benefits of Unified Robotics would be similar to those in Unified Basketball. Some responses schematically predicted such very general benefits as being "awesome," "exciting," or "enjoyable and interesting."

Two cases expanded upon broad gains related to the three SD needs, one of which is interesting in its cautions about possible costs, offering specific examples:

> I'm hopeful that he'll have fun. I'm hopeful. I'm hopeful that he will make friends. I'm not sure if his coordination sometimes is able to put little teeny pea parts together, but if shown and helped, he can do that. And I know at home he absolutely loves, "Hey, come and help me with, and come and help me with." He loves to be part of things. He loves to have something to do. So, I think that he'll respond well, and I'm looking forward to seeing how he does. I think at first he might be like "What's going on?" But after he kind of gets to know people, I think he's going to be really excited because he is very social, and he loves to watch, and he loves to laugh and be a part of things.

Added to the general hopefulness in this illustration, all three SD needs are on display as benefits, such as:

1) the *relatedness* of making friends, getting to know people, and working with people at home;

2) the *competence* of learning to put the parts together;

3) the *autonomy* of loving something to do, and loving to watch and laugh, which suggests choosing these pursuits; and

4) the *combination* of those needs in the likes of helping with things, being shown and helped, being very social, and being a part of things.

The cost offset, or risk, would be the potential for the student's initial unease, and the possible discomfort when trying to compose parts whose little teeny pea-ness might be distressing.

Finally, there was one parent whose perspective in Pre was driven by their familiarity with the school's robotics team, plus the ingrained influence of the hospitality paradigm, where the Partners were portrayed in the role of hosts, however benevolent:

> [Robotics team] members would be there to lend their experience and expertise to the other students who are experiencing building things like this for the first time. [Robotics

> team] students are doing it for the first time too because they don't build this kind of robot, but they do have a generalized knowledge that the other students probably don't, so they can give some expertise to that. And I think they also can give a lot of confidence and confidence building to the other students who, if you haven't been on a team before, haven't had opportunity to have people encourage them in their ideas and encourage them to try something and get it wrong in front of other people, and that it's okay. This is a safe space where you can make mistakes, and nobody makes fun of you for it.

The full passage is displayed here to convey the density and entrenchment of the information devoted to the portrayal, and the intricacy of the paradigm. *Crucially*, this outlook will contrast distinctly with this same parent's portrayal of their perspective when asked why they liked Unified Robotics *after* their child had participated in Unified Robotics.

Liking Unified Robotics in the Beginning

Prompt: No prompt (Post Only) - volunteered information

This question about liking Unified Robotics in the beginning was designed to be closed, but some parents volunteered more information even in the absence of further prompting. Some parents indicated that they had felt unsure or did not know, others described general benefits around being excited and having a good time, and one did express a concern about the cost to the family:

> Because of his disabilities, it takes a fair amount of energy on our part; obviously, we had to be there to participate in the help, and really kind of help them, so it didn't provide us with independence for him to do something on his own.

This is a valid expression of a genuine cost to parents, and it absolutely needs to be addressed. Notably, it is a problem common to all afterschool activities and not just Unified Robotics.

Liking Unified Robotics Now

Prompt: What do you like about Unified Robotics? (Post Only)

This question aimed at a later vantage point than the previous one, namely after Unified Robotics had been completed. There were 16 parents involved instead of ten, albeit one was not

asked the question. A couple of answers were short and sweet, namely, “Everything” and “Perfect,” and many others were similarly general in their identification of benefits but ranged further in length, such as, “It was wonderful,” “I think it’s a great idea,” and, “The overall experience was a very positive combination of events.”

Other statements aligned with the need of competence in mentioning the learning that had occurred, where several such instances also displayed the needs of relatedness or autonomy. Such statements often conjoined with independent sentences that identified additional needs, as relatedness is something in which you can choose to engage, that is, an autonomous choice to display competence.

It is interesting that *independent* expressions of autonomy were necessarily rare because the participants were usually interpreted as autonomous *in relation to* competence and/or relatedness. Even the examples that were pretty clearly about autonomy alone still displayed at least a hint of competence, namely in the *skill* of knowing one’s own self-worth, or they suggested that the students were committed or dedicated *to something about which* they were competent, such as relatedness, or that a student made a decision *related to* another SD need. Such expressions do not have to be long and complex, such as this elegant phrase: “He loves being social,” which in context referred to decisions the student made in order to be so.

There was only one instance where a statement could not viably be deconstructed into its syntactically independent clauses without losing the relevant meaning:

> It was some of his first experience in the co-captain leadership type role, and he chafed some at it because it was less hands-on than he had previously been used to. But I think that was good for him, especially for learning for other robotics experiences he would have.

In this case, an apparent cost is said to have rendered a benefit, which is an important meaning to maintain for later analysis because in this section that focused on *benefits*, this was the only apparent statement of *cost*.

When analyzed as a unit, the following example stood out for its direct comparison to the Pre counterpart that is presented above:

> I really liked the careful language around it, and the fact that you see that students were called Athletes, that the emphasis in the language wasn't as much on, "We're coming in to help you do a thing," as it was about getting to know each other in kind of a mentoring and teamwork feel, which I thought was really nice, and, you know, not something everyone is careful about and thinks about. And that seemed like that was a really positive step up in how to relate to people who are differently abled.

In Pre, this parent had made a statement that was grounded in the hospitality paradigm, namely describing their anticipation that their child would be cast as an Athlete in the supraordinate role of host. In contrast, there has been a substantial shift in perspective in Post to a much more balanced relationship among participants.

Not Liking Unified Robotics

Prompt: What don't you like about it, if anything? (Post Only)

In six cases, the response about what was liked was so exhaustive (e.g., "Everything") as to pragmatically preclude the parent deciding to express anything that they did not like. Two parents explicitly stated that there was nothing that they disliked. There were instances of what might be called forehanded insults, such as expressing that they disliked not having Unified Robotics be "a normalized activity year-round." On a somewhat similar note, one parent remarked that the elimination format of the tournament competition made some students' participation too short after all of their preparation. In particular, they would have liked to have seen more of their child using the robot with the team during the event. Another parent brought

up the scheduling, namely the fact they had to find a way to manage a lot of robotics all going on at the same time.

One parent of two of the students responded that "the collaborative process can be difficult." He was the only parent to describe dislikes that he felt that his children might have had, rather than his own, saying that one might have been frustrated while establishing a new leadership role, which the parent nonetheless appreciated as "formative and growing." This was the same parent who was identified in the previous section as listing a cost that had turned into a benefit. He said that his other child "probably doesn't get to dabble in some of the other areas, maybe as much as they might like to" due to the "focus on just your specialty." Unfortunately, the identity of that specialty focus is not clear. Finally, he also said,

> The other issue that I think we would see in that with people with disabilities, especially with high schoolers, you know, they don't have the grounding to know how to deal with certain disabilities. And so that can be, I think, a little frustrating, but also challenges are good things often.

So, this is another cost leading to a benefit. The dislike appears to be on behalf of the frustration that general education students might feel when operating outside of their comfort zone. These responses might be associated with an idiosyncratic understanding of the question, where the notion of a dislike seems to be more along the lines of 'frustrations that my child might be experiencing, but which would likely prove to be of benefit to them'.

Unified Robotics can evolve to address all of these issues, other than that it definitionally remains a collaborative process, and scaffolding people into overcoming their discomfort is its purpose rather than a cost.

Why (Not) Participate Next Year

Prompt: No prompt (Post Only) - volunteered information

All 16 parents said that yes, they would want their student to participate again, but there was no explicit prompt for ‘why’, only for ‘why not’ (which turned out not to be needed), so the only more elaborate responses were volunteered as follows:

> `Cause he enjoyed it.

> He loved it so much, and he’ll talk to me about robots, and then put some robotic words on his talker. I actually got him some little robot kits for his birthday. He was really excited because when he opened it up, he knows what it is now. And he’s like, “Look, you got it, robot!” So yeah, he learned a lot.

That tallies up to one response that expressed a general benefit, and one that elaborated on a general benefit with all three of the SD needs, namely: he has learned about robot kits, decides to engage in conversations with people about them, and pursues both pragmatic and preferred activities regarding this new endeavor. That’s a composite benefit.

Why Unified Robotics is Good for a Participant

Prompt: No prompt - volunteered information

All 16 parents said that participation in Unified Robotics was good for their children, with one commenting that their student’s continued participation would be good for Unified Robotics in return. One parent said that they were unsure about ‘why’, but the rest expressed the reasons. It is worth taking the time to report these in detail so as to help maintain those aspects of the intervention that were explicitly identified as beneficial.

To begin with, many responses contained expressions of general benefit, comprising either part of, or the whole of, their statement. One type of that response described either: (a) the parent’s happiness (“It’s exciting,” “I think it’s pretty awesome”); (b) the student’s level of happiness, using the following sorts of terms:

- {really} happy/excited

- the happiest she had ever been
- extremely joyful
- over the moon
- S/he enjoyed it/that.
- He had a good spirit about it.
- He wanted to go and enjoy the tournament.
- I got a picture of Christopher with the team and big smiles.

or (c) both, as in, “He was super excited about this program, and I am too.” In a small number of cases, excitement was expressed on behalf of their child (e.g., “I’m excited for him”).

Another example of a general benefit statement would be when two parents identified the opportunity to take part in an afterschool activity in specific, with others expressing variations on the theme of having an activity in which to engage. In one such case, value was attributed to the student feeling like the activity was a special thing just for them, and not his sister. A couple of parents indicated that their child had come to feel proud of their accomplishment. As general benefits go, with no apparent associated costs, this is an impressive list.

There were a couple of different ways that comments about competence manifested, one of which was where Unified Robotics was described as comfortably matching an existing skill set for the student, and the other way was a description of a new or modified skill set, including a description of skills that had been learned, which occurred several times. As usual, these statements that emphasized competence also expressed the other two SD needs.

Some responses profiled relatedness more prominently than the other two SD needs. In addition, there were two cases where parents provided valuable details about their decision being influenced by their impression of how well their child had been treated by their teammates:

> Basically, when we were building the robot, there were lots of steps along the way. And so, there were choices they could make in terms of following this roadmap of how to make the robot. But there were still color choices, piece choices, that type of thing. And so, they were very good about asking him, "Hank, do you want to do *this*? Do you want to do *this*? What do you think about naming our team?" So, they were very good about offering him options and letting him actually make the decision. And so, kind of whatever he said kind of stuck for the team, which was cool.
>
> I do think that it definitely had a contributing factor to it, being able to talk to typical kids who learn to wait and give him responses and like wanted his responses. Sometimes, in other activities, he's just been somewhat pushed to the sideline and relegated to a spectator type of thing, where in this he was expected to participate. "Come on, we got to go here. Come on, you're trying to push the button." And so, he would learn that he was important or necessary. It was so cute to see him. It was really one of my favorites.

This is not problematic 'inclusion'. This is not the exclusive hospitality paradigm. These parents described their children being freely accorded their rightful presence.

All in all, parents described benefits to both Athletes and Partners. Note that there is once again a distinct lack of reference to costs.

Changed Attitudes of Students

Prompt: Have <Name>'s attitudes towards other people changed since Unified Robotics? (Post Only)

Only 12 of 16 parents were asked this question, three of whom said that their child's attitudes had *not* changed (where a fourth was a qualified 'yes'). However, those 'no' answers indicated that the lack of change was due to their child already having had good attitudes. Some 'yes' responses spoke directly to changed attitudes toward other people, as in, "a better understanding of the value of diversity and different people," and other cases expressed changes in self-esteem and self-confidence, such as, "He's proud of himself for completing this and being part of it." Sometimes, it was both, "It's given her some confidence in knowing that she can walk into a situation with differently abled people and not feel intimidated by that situation and know

that she can actually communicate and be helpful and be a part of an experience in a positive way." The latter two types were not as clearly what the question asked, but are great benefits nonetheless.

There was one relatively ambivalent response, which aligned with a notion brought up by another parent to create an interesting point:

> Not really very much. Nothing I would have thought of or pinpointed, but there could be. Maybe it's just growth. I mean, people have school and they're doing really, really well. So not really that I think I notice, but anything like that, that's so positive and a learning experience like that must be.

Related to this notion of "just growth," one parent identified a confound, namely that a first-year student was likely to experience *some* change in the fall *anyway*, so it would be difficult to attribute any change specifically to Unified Robotics alone. However, that parent still said, "It definitely was a piece of his growing and a piece of his maturity." Again, this is still a benefit.

So, while some of the students were identified as already having good attitudes toward other people, there were still many perceptions of positive change, and no regressions or other costs.

Changed Attitudes of Parents

Prompt: Have your attitudes towards other people changed since Unified Robotics? (Post Only)

Only nine parents were asked this question, which suggests that there might be a design flaw in the protocol, part of which might simply be because this question comes toward the end of the interview. Of the six parents who then elaborated with reasons, one was a simple, "No, not really," and another was a 'no' of the type due to preexisting good attitudes. Beyond that, this turned out to be a topic about which some parents had involved opinions, and it is worth looking

at those responses in detail to illustrate the cultural context within which the notion of attitudes toward others resides.

> To begin with, one parent with germane job experience reasoned their way to 'yes':
>
> It was a new experience for me. I've not seen Unified Robotics, so I can say it's a good opportunity for me. It allowed me to see a different way to engage other students that may not have opportunities elsewhere. So, one of my values around [the job venue] is to provide an opportunity for all kids to play and so this is just kind of a new experience for me, to see a different type of event that I know nothing about. I have to see the whole play. So, I will say 'yes'.

A different parent's percolation led to a less definitive destination:

> I'm happy that people are out doing this type of work to give opportunities to students that might not be able to have these types of robotics experiences. So that makes me happy. It gives me hope for the world. I don't know.

And then one parent of two children answered 'yes' because of observing their two individual experiences:

> I have to say that watching Simon deal with somebody with severe physical and potentially mental delays and issues and watching them deal with such patience and understanding certainly gave me a kind of a refreshing take on my own child. So, yeah, certainly watching somebody else be compassionate and patient like that helps you grow your own compassionate empathy.
>
> Because he's a little older, watching him go through a struggle with how to be a leader and how to be a resource and less hands-on and less part of the actual collaboration collaborative process, I think you can't help but learn a little bit, not only about your kid, but also from watching their struggles and learning a little bit more about how to be better at that kind of thing yourself.

Finally, there was one parent who started with a variation on the 'preexisting good attitudes' theme, saying, "I always typically give people the benefit of the doubt, and so I think people are generally good," which then moved on to talk about changed attitudes towards 'inclusive' events:

> But as far as their reaction to Michael, I tried to involve him in Special Olympics some time ago, but the age differences were so great it wasn't like the inclusive friend making time that I hoped he would have. And so having the opportunity to provide robotics with peers of similar age was such a gift. It really was for him in his social development. And I'm really hoping that basketball will do the same. And so having these opportunities to do these Unified things is huge. It's huge, at least for my kid and I'm sure for other neurotypical kids too.

The point is that some parents are not just glossing over their own attitudes when it comes to activities and environment in which their children participate. This is a personally meaningful endeavor for them. And taken all together, these attitude changes stack up preponderantly on the positive side and are attributed to the influence of participation in Unified Robotics.

Anything Else

Prompt: Is there anything else that you would like to ask me, or tell me?

Other than one parent terminating an interview early in Pre, all parents were asked this question, and all responded. In Pre, seven parents had more to say than "No," and eight in Post. It is important to do more than try to simply summarize these responses, because this question gave some parents a chance to express ways in which the experience particularly reached them, in a manner similar to the previous one.

General Trends. In Pre, five such statements were conventionally polite farewells or valedictions along the lines of: thanks; reiterations of the student being excited; compliments of the program; hopes/requests for expansion, and an offer of help to do so; and a request that their child be invited again next time. One parent asked if students got to take the robots home when they were done. (They do not. The ships must be painstakingly sorted back into their kits by Unified Robotics staff who are taken by surprise before they can flee to safety.) Two parents took the opportunity to provide some further background information about their child. In one case, the statement included some protected medical information, so we are not going to quote it,

despite anonymization; however, the gist is that the parent identified participation in events such as Unified Robotics as being helpful to their child for maintaining focus and providing a sense of being fulfilled. In the second case, the parent recounted a story of their child facing rejection at a very young age, to contrast with the anticipated Unified Robotics experience, where that narrative has been reproduced below with permission.

In Post, seven parents offered the same sorts of leave-taking comments as in Pre, such as, "Keep doing what you're doing." One offered a reminder to be careful to invite students who, like her child, were in special education, but not Life Skills. Hank's parent made clear the burden that schools shift onto the shoulders of parents when classroom personnel opt out of supporting students at these events, where that discussion is included in its entirety below. He also reinforced the importance of the districts arranging for their AAC specialists to get support in place early so that germane material can be incorporated prior to the event about which the student should be able to communicate.

Two parents took advantage of this open-ended opportunity to tell us in detail what they thought, felt, and believed about issues of rightful presence. Their stories follow.

Benefit - Michael's Parent. Michael's mother has given permission for the following story to be included here. This narrative describes the "Pre" context for many people.

> We didn't know that Michael had Down Syndrome until he was born, or even six hours after he was born, because he looked perfect to me. And then they're like, "There is something called Down Syndrome," and there he was. And then, you go through all the things that… "Oh, he's never going to be accepted. He's not going to live a normal, inclusion life. He's not going to have friends He's never going to be invited to a birthday party." You just think these things, and you think, "Well, at least he has siblings, and we'll just make him this happy area where he is."
>
> Anyway, when he was in kindergarten, he was in Gen Ed kindergarten, because he was doing pretty well, and he got an invitation to a birthday party in the mail, and I cried as his mother. I cried and I showed it to him. "Michael, you got invited to a birthday party"

> And so, you know, he knows about birthdays, and he knows about parties. He's like, "Birthday cake party!", you know, he says these things.
>
> And so, we go and we get a present, and we go to the house on the day. We're standing on the porch, and Michael is all grand, and he's got a big smile. The kid opens the door, and he goes, "Oh, you, you're gonna break my toys." My heart dropped. I mean, I'm grateful for the parent that invited everybody in the class, but these little kids hadn't been taught anything, and it was just sad.
>
> So, we stayed, and I'm asking around and made sure that he didn't know any different. Of course. He's five. He was just thinking this was fun, and the other parents were sweet, but the kids like left the room when he came in and, "Oh, I don't want him to play with that." And it was just so sad, whereas other situations that we've been in since then, these other kids who were like trying, and know him, are like, "Come on, Michael, let's do this. Come on, Michael, be a part of it." It just makes such a difference when the kids have been kind of taught how to say a lot in the long break. Even if my child doesn't understand the rejection, it's hard for him or me. And it's even harder when your kid understands.
>
> That's my sad story.

This is one of the very stories that this research is designed to address. It is important to understand that when we talk about the hospitality paradigm, this story is a perfect illustration, and *as things stand*, they do not get substantially better in high school.

Cost - Hank's Parent. Hank's parent describes a context that affects many of the participants in our study, one which deserves the attention of a separate dissertation; fortunately, one such work is readily available in the research of Mirranda Riley (2021):

> My findings suggest that mothers confront and hold up an underfunded and poorly implemented special education system that does not meet their children's needs. Despite the rhetoric of inclusion, the current implementation of special education in these districts leads to student exclusion and other institutional harms, putting disabled children's personhood at risk. These mothers are laboring in schools alongside staff to minimize harm and ensure inclusion and educational access for their children. Their stories reveal how special education relies on the invisible, unpaid, and devalued labor that they invest. (p. iv)

It is important that interventions such as the one studied in this research do not reap their benefits at this sort of cost to parents. Hank's parent lays out an instantiation of this schema that illustrates his family's experiences:

> I think that one thing that might be a challenge, let's just say my wife and I, we couldn't participate. It would be hard for him to probably have gone there on his own. He wouldn't have gotten a lot out of it if there was someone who didn't know him better, like one of his IAs. You have someone who knows him more specifically, so I think if you just threw him in there and said, "We'll pick you up in an hour and a half," it'd be like, "I don't know." So, really, anything for each kid, obviously depending on what their needs are, it would be nice if maybe someone from the classroom, familiar with him at least, could have been there to help if we weren't available; I mean, fortunately, I worked out that my wife and I, our schedules were available, we could do it.
>
> He also likes the independence of not having us around. He thinks that's kind of fun and he gets to do things on his own. I think that he would have enjoyed that as well. So, again, that would be the only thing. I know that's challenging, but I think that would be fun.
>
> Well, I tried to just go do something else for a sec and let the team know. I tried to let him do this thing, but yeah, I still felt like that having us there was important just in case something happened, for someone who didn't really know him well. I mean, how do you reposition him if he's falling over? How do you do this? How do you do that? All that stuff. Having one of us there, in the beginning, more so, but we could back off as he was more comfortable with his peers and whatnot, and how it was going. But I still felt like we needed to be there just to intervene if something came up that was different.

Classroom supervisors and staff might do well to take this under advisement when making their decisions about supporting such programs as Unified Robotics; frankly, it feels like this should not need to be said. But it does.

Summary of Parent Results.

The analysis of the parents' interview material, demonstrates self-reported increases in their perceptions of all three SD needs in each of their respective children, and sometimes in their portrayals of groups of students as well. The costs were suggestions for program adjustments, which were far outweighed by the benefits.

Teachers

This group includes teachers and specialists who are professionally steeped in general and special educational experience. Their participation in Unified Robotics – while often direct with the students, *and* their parents, *and* each other – was also more diffuse when acting as an observer of the entire system; that is, a teacher's view of their classroom will be quite different than that of any given one of their students, or any given one of the students' parents, unless of course that parent also happens to be a teacher.

The student and parent interviews each tended to focus on select individuals (sometimes as they acted within a system), but the teacher corpus reflects the perceptions of people who are practiced at observing principles in action within systems as they influence groups of people, and their expression of such systems statements can often go on at length and in detail. This effect was all the more pronounced because many of the teachers and specialists had taken on specific roles in bringing this Unified Robotics event to life.

This corpus will therefore be approached as an aggregate, classifying passages as they address each of the principles under analysis, such as costs, benefits, the three SD needs, and rightful presence. That material will not tend to be analyzed per independent sentence, but rather as topics align with an expression regarding those categories. As an exercise in categorization, this section would be prone to displays of large chunks of evidence; however, there is also a need to observe some amount of digestion to avoid losing the forest for the trees.

Costs

The only costs that were identified were the initial stress of leaving one's comfort zone, which passed quickly, and a concern that the season did not last long enough, which can be remedied in future.

Initial Stress. One cost was the stress of ramping up into unfamiliar territory, but the stress was described as abating organically over time. One passage stood out as a prime exemplar:

> I think [the students] got closer. So, at first, I think the students with disabilities were a little bit anxious, a little bit worried, they weren't sure what was going on, and now I feel like they know these people, they know the other students, and they're able to pick them out in the hallway. They know their names. They start conversations. I think they feel safe and supported now. I'm hanging out with them right now.

This portrays the steps across which comfort was developed: (a) teachers are anxious for students who are anxious; (b) teachers relax as the students relax as they get to know other students; (c) the relaxed students communicate socially in the hallway; and (d) the consequently non-anxious teacher hangs out in the hallway with them. These steps elicit a stairway as an apt metaphor.

When Sarah Winchester developed arthritis, she had the staircases in her home replaced with easy risers. Given her diminutive stature, each step rose only two inches, meaning that "One stairway… has seven flights and requires forty-four steps to go ten feet" (Smith, 1967, p. 38); similarly, the teachers described mitigation strategies to make the 'comfort climb' less steep, namely, train some trainers, and rely upon experienced students as trainers. This dynamic was identified to overlap the cost of 'stress as ameliorated by training' for teachers *and* for students, where the teacher's discomfort was sometimes associated with their understanding that they might tend to be looked at as an authority in any classroom.

These are costs, yes, but in the sense of investments. They are not costs as in damage.

Not Enough Time. The following is a cost to the extent that time is approached as a limited resource that gets spent in allotments:

> I wanted more time. More time. More time.

> I think, more time, they would have enjoyed it. I think they would have grown more and appreciate and understand what robotics is to them.
>
> I wish it was longer. I think that's my main takeaway. I wish there was a longer time period for it because it just felt too rushed.

This cost is yet another investment, not damage. The request could certainly be addressed in future seasons of Unified Robotics.

Benefits

Offsetting these costs are the several benefits that ensued, which were described in terms of the teachers' observations of perceived increases in the three SD needs, the promotion of rightful presence, and a general sense of emotional uplift that they attributed to participation in Unified Robotics.

Competence. A frequent theme was one of improved competence by exposure to 'something different',, as in, "I think it was really beneficial to them to interact with students with disabilities and to learn about them and to humanize them," or, "When we think of Legos, we think of something fun to build with your hands, and that's a different type of tool to get students to engage." That different thing can be STEM in specific, or, more specifically, 'STEM instead of just sports', which often adds an element of relatedness, as, "And you know not everybody wants to play basketball or play soccer, so it kind of includes this other population but they can still be competitive." Or the different thing can be 'STEM instead of just art and music', "A lot of their general education classes that they push into are more arts and music and things that are inherently, stereotypically less educational." Art and music are educational, of course, but the teacher's meaning is clear in regards to the cultural canon regarding the 'hard' sciences.

Across such instances, plus much longer passages offered by the teachers, Unified Robotics is described as scaffolding the competence derived from exposure to entities that are

not just different, but different in a variety of ways, where the level of teacher support is reduced over time as the students become more independent, which is aligned with autonomy. Many of these portrayals included aspects of relatedness, not just because their skills were increasing in the making of friends, but because learning is relational.

Relatedness. Some comments were very straightforward expressions about observed increases in relatedness, plus longer passages describing ongoing interactions between students outside of Unified Robotics that began well before the season ended. To begin with, what more genuine manifestation is there than being able to express yourself freely and do what you want, which also involves autonomy and some competence, as in these descriptions by two teachers:

> Friendships have grown. They've grown friendships. They literally talk about anything they want now. It's nice to have an open atmosphere for them just to say whatever, and if something happens, we just go with the flow on it.

> They could do whatever they want. In our Unified Robotics group, all of the adults were just on the sidelines, and the students could do whatever they want. Whatever they wanted to put on their robot was offered to them. There's no limits, so they're able to independently communicate with and work with their peer to determine what do they want their robot to look like.

Participation was reported by several teachers to foster some changes in perspective, which we shall talk about more after covering autonomy, of which these are representative examples:

> The Athletes will see them in the hallways and they'll wave. Our students just feel happier and feel so much more included, like, "I'm just a regular high school student," and that's all that we try to hope that they feel.

> Every now and then, some of those Partners have come by and just stopped in the classroom just to say 'Hi'.

> I thought was really great because it made them feel like, "Oh, I'm not just a Life Skills student, I'm a Spring Meadow High School student."

Just the sheer volume of material that the teachers devoted to the descriptions of relatedness is striking. It was the most prominent among the topics.

While we might speculate that the scaffolded environment helped the teachers to *teach* the students how to connect with one another, there is certainly at least *some* aspect more akin to van Helmont's proposed spontaneous generation of mice from wheat kernels and a dirty shirt, namely that the mice are *already* present in abundance with nary a care for our guesswork as to their origins:

> Pulse beetles, fleas, bedbugs, worms, etc. do not only originate from us, and from our excrement: but also if we compress a dirty shirt into the mouth of a vessel which has wheat kernels inside, in twenty days or thereabouts, the leaven from the shirt is altered by the fumes from the kernels, transmuting the wheat as remade with its hulls into mice, which are differentiated by a diversity of sex, which then multiply their species by breeding one with the other, and indifferently with those who are born of the seed of fathers and mothers. (p. 103)

Yes, it might be that participation in Unified Robotics taught the students new skills, and they were then explicitly choosing to be kind to one another after having ingrained some increased competence with a new relatedness reflex. Or maybe kindness is just a natural choice for them, and all we need to do is allow them the opportunity to express themselves without our first having to carefully craft a bed of shirts and kernels. At the very least, and without claiming any causation, the Unified Robotics sessions provided the context within which the critical mass of friendships bloomed and boomed.

Autonomy. As in the interviews with the students and parents, responses that focus tightly on the making of decisions are similarly rare among teachers, some of which manifested in the expression of choice, as in, "The volunteering of all kinds of opinions," and "The students got a lot of choice." Of course, these tend to be short because other needs are introduced as the expressions get longer. Two teachers addressed autonomy in terms of communication (which

tends to invoke relatedness), where the first remarked on the creation of general support for decision making access for nonverbal students, and the second specifically identified the addition of germane information on the AAC systems. Some also profiled the steps taken to ensure that there was access to that expression for all students. Note that the earlier sections of this analysis display all manner of evidence regarding which decisions were being made, and what sorts of things were being chosen.

Rightful Presence. When it comes to the promotion of rightful presence, one teacher spoke repeatedly about allowing or letting students with dis/abilities "occupy space," as in, "It allowed them to occupy space that they weren't necessarily allowed to before, permitted to, or assumed to be able to do before, and to build meaningful connections with general education peers. Some spoke more to the sense of 'belonging', such as, "I can tell my students that they are perfect, and they are welcome and they belong as much as I want within the confines of the room." That distinct qualifier, "as much as I want within the confines of the room," should not pass unnoticed. Unified Robotics established a safe space, which is clearly smaller than the world.

Testimonials

The remainder of the teacher corpus fell into a category of positive comments that the teachers made about Unified Robotics, including expressions of thanks, hope, enjoyment, amazement, and such comments as, "It is hands down one of the best things this year that I've been able to be a part of." On top of those glowing reviews, no one panned Unified Robotics.

Summary of Teacher Results

The extraction of themes from the teacher comments is clear. Despite some reticence about the unfamiliar venue, and the sentiment that the program should have been longer, the

teachers all agreed that Unified Robotics fostered increases in their perceptions of all three SD needs, as well as providing for some promotion of belonging. And everyone said that they liked the program. The benefits were clearly worth the cost.

Summary of Results

Students and parents participated in both Pre and Post. They consistently reported increases in their perceptions of student self-determination after Unified Robotics, across all three of the SD needs, without regard to their individual dis/ability identifications. Teachers were interviewed in Post and contributed to the field notes, where the extracted reports of their perceptions corroborated those of the students and parents.

Responses of 'no' to the questions about changed attitudes towards people after Unified Robotics were associated with expressions from those participants who identified as having been open-minded already. Students reported increases across all three SD needs after their participation in Unified Robotics, as supported by parent contributions and the quantitative. comparison. Parent reports were the same for their respective children and for the groups. They reported entirely tractable costs that were outweighed by the benefits reaped. The teacher's responses were the same. In addition, gestalts emerged clearly from the teacher interviews, namely that any feelings of unease were temporary, and the program supported rightful presence.

Despite occasional comments about experiencing some initial, temporary discomfort associated with Unified Robotics representing a foray into the unknown, plus remarks that the program should have been longer, everyone (a) bestowed positive ratings upon Unified Robotics, (b) agreed that it was good for the students, and (c) said that they would like to participate again.

5. Summary, Implications, and Outcomes

> After all is said and done, more is said than done.
>
> – Aesop

> Change your heart. It will astound you.
>
> – James Warren (1980)

Salutation

All has not been said; however, there *are* tens of thousands of words in this document alone. And we *have* been doing more, as described herein; nonetheless, more *yet* needs to be done, likewise. Welcome to the end of the tunnel.

Summary of Findings

The two research questions respectively focused on potential changes in an area of expressed perception after participation in Unified Robotics, namely: (a) students and their self-determination, and (b) parents and teachers and the costs and benefits to students. That dual scope allowed for verification by collective triangulation (i.e., cross-match and parallax), including (but not limited to) an analysis of parent perceptions of their child's SD needs and student perceptions of program costs and benefits. These research questions resided entirely within a context of rightful presence, which necessarily entailed pursuing the contention that – contrary to historical practice – the dedicated provision of equitable access to communication would prevent any participant's data from being sacrificed to save the theory.

R. 1. - Self-Determination Needs

The first research question profiled student self-determination:

> What are the perceptions of Autistics and Allistics, and students with intellectual dis/abilities and their general education peers, in terms of the three self-determination

> needs of competence, relatedness, and autonomy, after their participation in the expansively designed Unified Robotics program?

Across all three of the SD needs, without regard to identified dis/abilities, students consistently reported increases in their perceptions of self-determination after their participation in Unified Robotics, with the exception that people who reported already having had good attitudes towards others prior to participating in Unified Robotics tended to report no changes in those attitudes, or ones that were only minor. These reports were corroborated by parent and teacher interviews and field notes.

R. 2. - Costs and Benefits

> The second research question centered parent and teacher program evaluations:
>
> What are the perceptions of parents and teachers of the benefits and costs to Autistics and Allistics, and students with intellectual dis/abilities and their general education peers, after the students' participation in the expansively designed Unified Robotics program?

All parents and teachers agreed that they would like the students to be involved in Unified Robotics again. Many opined that the program should be longer, and none said shorter. A few reported a temporary sense of discomfort when they initially faced the unknown, which they asserted would be mitigated with preseason training, and which abated quickly with exposure to the program. One crucial outcome was that two parents took advantage of this platform to share thorough depictions of the need for rightful presence and empathic education in the lives of their families.

Equitable Access to Communication

Every participant's data was able to be validly incorporated into the analysis. Equitable access to the intervention and the interviews was conscientiously supported through the mutual engagement of everyone's conventional, augmentative, and alternative communication systems.

Conclusions

Regarding student participation in the expansively designed Unified Robotics program, the logical conclusion has two components:

> Participation was followed by an improvement in the perceptions of Autistics and Allistics, and students with intellectual dis/abilities and their general education peers, in terms of the three self-determination needs of competence, relatedness, and autonomy.
>
> Participation was followed by an improvement in the perceptions of parents and teachers of the benefits and costs to Autistics and Allistics, and students with intellectual dis/abilities and their general education peers.

Finally, in this environment of rightful presence, we can conclude that active support for all participants' equitable access to communication preserved the availability of everyone's data.

Needs and Unified Robotics

Participation in Unified Robotics was followed by an improvement in a student's perception of self-determination, and the benefits as reported by parents and teachers clearly outweigh the costs. Unified Robotics is grounded in persuading people to cross their discomfort thresholds into previously unknown territory, where an inherent part of its design is a robust system for helping them to do so. In Post, everyone said that they liked the program, that it was good for the students, and they would want to attend again. Future implementations could certainly be expanded to meet the requests for more time.

Competence. Perceptions of competence improved. Given an increase in Post in the instances of express hedging around the notion of being able to build a robot on their own (i.e., if there are instructions, if it is an easy one), participation in Unified Robotics clarified a student's understanding of their robotics competence, allowing it to be more realistic, that is, to be based on what they know, instead of what they do not know (cf. Dunning, 2011). People learned to build robots, take turns, make friends, share control, meet minds, and dance (at least a little).

Students were found to be prone to give longer answers about those areas in which they already felt some competence. For students who are already involved in robotics, we do not tend to see a substantial change in their expressions of competence in that specific domain (i.e., their general familiarity with building robots), but we do see a shift in the breadth of their application, such as more types of robots, more teams, and the like. Some students learned (i.e., expressed in Post that they had come to understand) that what counts as a 'win' can validly vary among people; that is, not everyone has to be measured with the same meterstick.

Relatedness. Perceptions of relatedness improved. Students who were noted to be somewhat reticent to engage socially were later observed to have reached out, and those who had been said to approach things on a more relational basis to begin with were noted to be in their element, and to extend that relatedness to a more diverse group of people. Participants increased their familiarity across augmented and alternative forms of communication. When not already good before the intervention, attitudes towards others improved, and the distance between 'self' and 'other' diminished. In their interviews, many students identified each other by name as friends. Students were observed to enjoy a more open sense of belonging, socializing more broadly, where many comments talked about the Athletes being afforded the opportunity to be as rightfully present as any other student in the school.

Autonomy. Perceptions of autonomy improved. All students were able to contribute to decision making, although access to autonomous 'explaining' was still found to be inequitable. Parents varied in their estimation of the readiness of their respective child for adult autonomy. The program was effective without anyone's autonomy needing to be compromised by an inequitable hospitality paradigm, either at the classroom/program level between Athletes and

Partners, or in the structure of the team; in short, improvements were measured despite the absence of hierarchy.

Recasting Inclusion and Unified Robotics

The intervention successfully implemented the application of design principles that went well beyond conventional 'inclusion' to promote empathic education and rightful presence.

Empathic Education: Empathy and Reflection. Participation was followed by uniform reporting across all participants of positive changes in their attitudes toward others, and of parent and teacher perceptions of positive attitude changes in the students. The proviso is that people who identified as already having had positive attitudes, or who characterized their students likewise, reported no substantial, additional change. Nonetheless, most participants still described the intervention as activating reflection, that is, their intellectual and emotional conceptualization of other people's lives.

Rightful Presence. The design and implementation of the intervention was associated with a preponderance of participant descriptions of the program as equitable. That is, following their participation, they no longer conveyed the conventional portrayals of any guest-host dynamic. It is reasonable to conclude that participants responded to having a place to be present where every person shared an equal right to be in the space and defined their success individually.

Aggregate Conclusions

Across participant groups, the Unified Robotics intervention was followed by a self-reported perception of substantial benefit to each of the students, all at negligible cost; similarly, across all groups, there was a perceived improvement in the students for all three of the SD needs

that contribute to the development of a person's inherent, personal control over their determination of Self.

Although Unified Robotics is not listed as evidence based, it follows UDL principles and provides a natural, expansive environment within which we scaffolded self-determination skills all while revering each student's rightful presence, that is, *without* reliance upon any collateral subjugation rising from the outmoded, damaging hospitality paradigm. Each student was accorded a just and equitable value as a person in this educational experience, working toward a common goal. This expansive design further validates the effective application of Sullivan and Masters Glidden's 2014 findings.

This we put our collective back to inclusion and journey forward.

Discussion

This study contributes to a much larger social change founded on progress in civil and human rights. The results fill gaps in that progress. We continue the pursuit of the provision of STEM and extracurricular opportunities for all as identified in copious previous research studies (Basham et al., 2010; Buck et al., 2020; Dymond et al., 2020; Estrada et al., 2016; Greene & Lawler, 2016; Griffith, 2010; IDEIA, 2004; James et al., 2020; Jong et al., 2020; Klimaitis & Mullen, 2021; Li et al., 2020; Lipscomb et al., 2017; Mäkitalo-Siegl et al., 2011; Mohr-Schroeder et al., 2020; Moon et al., 2012; Museus et al., 2011; Ricci et al., 2020; Suh et al., 2020; Thomas & Allen et al., 2021; U.S. Government Accountability Office, 2010). In this work we offer another set of positive outcomes, in an environment designed to exceed simple inclusion as called for in the existing body of literature (Amado et al., 2013; Bramston et al., 2002; Freeman, 2000; Haber et al., 2016; Keith & Schalock, 2000; Özer et al., 2012, Piercy et al., 2002.)

In particular, while we demonstrated an association with social behavior benefits (Copeland & Cosbey, 2008; Dovidio et al., 2003; Jackson et al., 2012; Wehmeyer 2006; Woodman et al., 2016), the most prominent anchoring of this study to other benefits of participation was in self-determination perceptions while locking into an existing framework. The significance lies not just in its extension of the development of autonomy and sense of Self to another sport as seen in Sullivan and Masters Glidden (2014), or the proof that the 'inclusion' hospitality paradigm is obsolete in its inequity, but in the way that empathic education *animates* the rightful presence of everyone *in the research itself*. The documented template for that open design is this endeavor's unique contribution. The implication is that all future research, policy, and culture can be truly welcoming.

Self-Determination Needs

In terms of SD needs, the field has long demonstrated how important they are for the development of autonomy in the broader sense of establishing one's sense of Self, and for being an effective agent in one's own life and promote programs demonstrating increases in positive perceptions (Leyser et al. 1994; Nilsen, 2020, Shogren & Broussard, 2011). By extension, this study fosters improvements in the perception of SD needs in our current cultural context where support for civil and human rights continue to evolve (Ouellette-Kuntz, et al., 2010; Scior, 2011; Siperstein, et al., 2007), albeit in fits and starts.

This research makes plain the additional struggle that people with dis/abilities face in simply getting access to the resources that allow for their pursuit of self-determination, much less their equitable achievement. That path involves learning to become an effective advocate for one's right. The ease with which the students in this study simply blended into rightful presence, not even questioning it, not needing explicit instruction (Gutiérrez, 2012, Jurow & Shea;

Gutiérrez, 2012) and exhibiting the adoption of perspective and empathy to another person's truth (Morukian, 2022) makes it easier to imagine an environment in which active engagement in equitable programs would naturally vaporize those barriers. It is so very long past time to practice the autonomy of impatience.

In this study, we confirmed Thomas & Allen's (2021) assertion that students who believe they can do the work, find the content meaningful and are supported by their teachers and peers, experience a greater sense of belonging do indeed report more positive outcomes. They also establish more substantive networks of relationships simply by spending more time in proximity (Copeland & Cosbey, 2008; Jackson et al., 2012; Wehmeyer, 2006).

Competence. Students who had more experience with robotics, including those who gained it through participation in Unified Robotics, were more realistic and detailed in their responses about their ability to build a robot, either on their own or with others. Competence was demonstrated not in isolation, but interacted with the other SD needs, such that a student could become more skilled in their social interactions and decision making, furthering Deci and Ryan's (1989) assertion that competence is reflected in knowledge concerning control over academic outcomes and the internalized belief that one can effect these outcomes. Education is held to focus on competence in specific academic areas, on *skills*, but more attention should be paid not only to *skill in what* (such as other SD needs), but *skill with whom* (equitably), and *how skills are best exercised together* (in what we accomplish while other centered).

Relatedness. The word 'friend' was revealed to be used as an essentially curricular term in the Athlete's classrooms, where the awareness of degrees of familiarity along social circles receives explicit instruction, and the notion of a friend was sometimes held to be incompatible with that of a teammate. That said, the distinction in terms in no way hampered the friendships

that developed among the participants. In alignment with Dovidio et al. (2003), acceptance was bolstered by contact through cooperative activities. Students were observed to enjoy a more open sense of belonging, spending more time with each other outside of the Build sessions well before the season ended. Some parents reported that this was happening at home as well, providing further evidence that students with extensive support needs who spent more time integrated among general education peers demonstrate improved interpersonal skills and have more substantive networks of relationships (Copeland & Cosbey, 2008; Jackson et al., 2012; Wehmeyer, 2006).

Lauren's cited response does elicit curious thoughts about the types of people against whom she is comparing, the liars who are not nice and kind, and for whom simple liking is not enough to foster friendship. Regardless, it is good to know that Unified Robotics provided her with an opportunity to experience the contrast, which supports previous findings that classmates experience positive outcomes when students of all ability levels work together (Kalambouka et al., 2007; Ruijs & Peetsma, 2009; Ruijs et al., 2010; Sermier Dessemontet & Bless, 2013).

Autonomy. Student self-esteem and self-confidence were reported to have improved. Evelyn's statement in Post that expanded to include "How I express myself" is representative of noteworthy shifts in forward self-expression. The flat structure of the teams dampened any reflex towards a host-guest or hierarchic feel that is present in conventional 'inclusion' programs and many team activities, which promoted positive power dynamics (Ryan & Deci, 2017). We note that when it comes to scaffolding decision making skills in schools, as children become young adults in the presence of so very few adult role models, there is a sense in which school only allows Athletes and Partners to have choice boards, which suggests that more needs to be done to explicitly promote the development of autonomy for students.

Costs and Benefits. We have seen that the costs were perceived to be well worth the associated benefits, and that a recurring theme portrayed an experience in which the unfamiliar situation brought some people a feeling of unease, where that feeling went away after a session or two. This seemingly simple dynamic requires some unpacking.

There are two types of cost: the ones that buy you something, and the ones that do not. The former is an investment, and the latter is damage. The stress that was associated with an initial, fleeting lack of familiarity does not represent damage, or a cost with no benefit, but rather an investment in the eradication of xenophobia (at varying levels of intensity). That sense of discomfort with the unfamiliar, where any difference is feared as a risk of harm, is not the fault of Unified Robotics. It already resides within people, like a grenade that someone inherited along with an old, unexamined trunk in the attic, which tells us: *ignorance does not represent safety*. When it comes to costs, 'horizon curiosity' is a risk that nurtures investment, whereas isolationism is a risk that guarantees damage.

This concept of 'exploration' elicits a lesson to be learned from the Age of Imperialism, namely: "*Don't*." Just don't do it. Don't conquer. Don't pillage. Don't subjugate. And above all else, note intimately well that there *is no later Age* with which to contrast Imperialism because it *has not stopped yet*. Some nations continue to crush others; however, individual people and their communities can give rise to emergent properties that could foster an Empathic Age.

With that in mind, Unified Robotics itself *is* training. It is training in Rightful Presence. Then there is the distinct alignment with the fight for rightful presence as waged by Angela Calabrese Barton and Edna Tan (2019, 2020). In addition to this more general sense of exposure, there is an introductory session during the preseason that is designed to help all participants transition out of their comfort zones. Naturally, some people feel uncomfortable *there* as well.

Creating an even *earlier* training to ramp people into that preseason training is not a viable solution because some people will not be comfortable *there* either. That sort of *regression through previous attempts* to help the Fearful to feel 'comfortable enough' to face unfamiliar 'Others' is called *The Past*, which has not only worked execrably, but exceedingly slowly. Instead, our results suggest that this comfort can best be approached together in the classroom of the future… very near indeed, one hopes. We can all share *cool robots* and *snacks*.

To be clear, this discussion is not an equation of teachers with the dominant paradigm more than it identifies them as members of the Winchester clan. The author of this work is a teacher and is a member of neither of those groups. It is an illustrative metaphor driving home the point that we must stop looking at this relationship *as if our comfort matters* when that self-centeredness is delaying anyone else's access to their rightful presence.

Limitations

We mitigated the consequences of limitations associated with the following: researcher bias; bugs that cropped up while using the Unified Robotics program for the first time; structural component constraints with the initial, conventional interview formats; the restricted meaningfulness of the quantitative analysis when viewed in isolation; and establishing equitable communication across the participants as the study was ramping up. Limitations related to the specific design choices for this study, such as it not being longitudinal in nature, are addressed in the discussion of future research to avoid redundancy.

PI Bias. As a special educator who has grown up in a culture of 'inclusion*',* I was moved by the students' self-reflection of learning in community in a space of rightful presence. Careful steps were taken to reduce potential bias, such as implementing strict procedures for establishing interrater reliability; however, the research collaborators were deeply invested in the success of

this project. I am also a parent of two of the participants, but I was neither the researcher who interviewed them nor the parent who provided their interviews.

Extraneous Influences on Participant Perceptions. Instructions and rules are published by Unified Robotics every year. This was the first year that the Unified Robotics program was made available in this study's settings, and the kit was not built and tested by a mentor until after breakdowns were encountered that might have led to some frustration for the participants.

Interview Components. Three factors might have affected the integrity of the data, namely: participation consistency; equitability of access to an interview format; and ambiguity in the interpretation of interview questions. The study was able to adapt to the first two while in progress.

Participation Consistency. We were not able to get full participation of all students at both pre and post. Therefore, the groups of students at each time point are different. Of all the participant groups, students were the easiest to contact for interviews, being in essence a captive audience. However, two were too ill to participate at pre, one joined too late for pre, and one declined to participate at post. Many parents did not make themselves available for an interview at pre, and sometimes only provided cursory answers at post while indicating that they were generally busy or specifically otherwise occupied. For example, one parent was waiting for a medical appointment to start for their child, so the interview was truncated and was not rescheduled. None of the teachers responded to a request for a pre interview; however, eight of them were available for post interviews. The result was that direct pre and post comparisons did not include sets pared down to only those members who had participated in both pre and post interviews.

Equitability of Access to an Interview Format. We wanted to make sure that everyone's story was equally rich and not dependent on their ability to access conventional narrative skills. To address this issue, we enlisted the support of specialists who not only had a depth of expertise in AAC, but who were the specific specialists who supported the systems used by individual students. That said, the expression of a person's story should not be based solely on their ability to express themselves symbolically. We also relied on the presence of family members at the student interviews, as they tended to be the maximally familiar communication partners for each student, although that did run the risk of facilitator bias.

For some students, the prompt dependent structure of an interview did not support their expressive communication. In these instances, field notes, which were observations of a student's spontaneous expression, provided a richer demonstration of change. Furthermore, in these and all instances, parent interviews contributed to understanding the changes of SD needs.

Ambiguity in the Interpretation of Interview Questions. The wording of some questions supported greater ambiguity in interpretation than expected:

- The question about liking Unified Robotics "in the beginning" was intended to mean the earliest days of the event, but as it was asked in post, it allowed for responses to reference anytime from before Unified Robotics started to after a few sessions into the season.
- Building a robot on a team was not clear in that some people did not include the UR team with whom they had built a robot.
- When asked if they liked UR, some people talked about both likes and dislikes, such as liking it even though they were worried at first about facing the unknown.
- The question "can you build a robot on our own" revealed these issues: 'know how to' versus 'physically able to'; 'with instructions' or not; and 'how complex a robot'.

- What counts as a friend? One student was insistent on differentiating friends and teammates, while another named new friends on the Unified Robotics team. A few made a distinction essentially between friends and acquaintances.
- When asked ‘What will Unified Robotics be like’ in pre, some folks had already started the program, and then in post, ‘Did you like Unified Robotics at the beginning’ was taken to refer to the first few sessions.
- In the question about Unified Robotics being good for the student, the tenor changed from pre, which was an anticipation, to post, where it was an informed evaluation.
- There was ambiguity around what kind of team we were asking about. Teams vary in their hierarchy, which affected the answers about whether a team member got to choose on a team; in fact, one parent gave the sole “No” response directly after talking about what the student did choose on their teams. So the confound is the concept where ‘I’ don’t choose, but ‘I’ am still involved when ‘we’ do.

While some of these issues became apparent as the interviews were being conducted, others only became readily apparent during analysis. Regardless, we could not change the wording once the process had started. This list serves as advice for future research.

Establishing Communication Between Team Members. We did not want to entrench guest-host relationship stereotypes as that the Partners were somehow more responsible than the Athletes for team member communication. Nonetheless, there was some appearance of that dichotomy because we had also inherited a context of cultural imbalance. Although the issue is complex, for ease of discussion we shall resort to an overgeneralization, namely: people benefit from some scaffolding when they volunteer to be brave enough to forgo some of the privilege that they have been enjoying, so we did provide preseason training for the Partners that included some advice about unfamiliar communication styles. Although we did not have a planned training for the Athletes, we did talk with them about the program in which they would be participating. Crucially, they were already well familiar with trying to accommodate the

communication styles not only of the dominant paradigm, but of each other. Earlier in this study, we described the professional communication support that was a component of the procedures for data collection.

Significance

The significance of this study substantially emerged from what we did *not* do. We did *not* drape an authoritarian hospitality structure over the participants as if this were a typical inclusion event, which meant that we did *not* accord privilege to just one specific subset of the participants, so we did *not* block anyone's access to their SD needs.

There were only two reasons for the distinct Athlete and Partner designations, neither of which was hierarchic: 1) to ensure that team membership was distributed evenly enough to promote interactions between previously isolated groups of students, and 2) to categorize data for the purposes of comparison when we still had a quantitative component. In other words, the magic ingredient was the environment of universal, rightful presence within which the students rapidly faded our interference by exercising the simply expedient of *not needing us*. Again, while components are described in Appendix G1, they tend to be mechanical, in that the real effect was determined in Step 0: Do not force an 'inclusion' structure onto the student interaction event.

When the hospitality paradigm was not forced upon them, their *reflex* was egalitarian. Sullivan and Masters Glidden's (2014) study found similar results in that simple exposure and cooperative interdependence allowed participants to appreciate the strengths of each team member toward pursuit of a common goal. This study disrupted power and positionality in alignment with Gutiérrez (2012) and Jurow and Shea (2015), who found that the broader inequities of traditional inclusion were mitigated, and consequential learning increased with this type of participatory engagement.

The importance of autonomy for all students is further supported by our research, as is the crucial role played by the teaching of self-determination skills in the development of that autonomy, both in its perception and its actual manifestation, by scaffolding *all* SD needs in an environment of rightful presence, not just in robotics as one more sport, but universally. We emphasized their experience of relatedness by making this lesson equitably available to all students, not just the 'hosts', where the perceived cost was negligible compared to the demonstrated benefits, all while moderating the burden that was placed on the parents. This was all done while being able to honor the stories expressed by all participants in this research.

Implications

About 200 years ago, a variably motley confederation of privileged people thought that it made sense to teach children how to be adults by imprisoning 30 or more of them all day long in a confined space with just one adult, on top of which they decided that children outside the dominant paradigm would not even be allowed *that* much. Things are (always) said to be changing, albeit that speed is traditionally miscalculated by the dominant paradigm, much as a snail who is hitching a ride on a passing terrapin is heard to gleefully yell "*Wheee!*" Our research results imply that it is long past time for us to slink away from conventional, exclusionary 'inclusion', and travel (faster than the turtle) toward empathic education programs where students live more deeply in rightful presence.

The teaching of self-determination skills should be an explicit and prioritized part of the curriculum. When asked whether they can choose at school, students should be able to honestly *affirm* such without hesitation. Rather than telling us that they can choose only what teachers *let* them choose, or that they can only make decisions about "Minutia," they should come to express an aware list of the *meaningful*, effective available decisions that they can make at school,

without an administrative veto that puts the lie to the power. In the pursuit of further evidence to inform this approach to change, supportive research endeavors have no further need to treat the participation of students with dis/abilities as nothing more than a source of 'bad' data. *Everyone's* story can be honored, with no student privileged as a 'host' or subordinated as a 'guest'. This research demonstrates just one such implementation. In short…

Invite *every* student to your birthday party. *No one* is going to break your toys.

Future Research

In addition to straightforward replication, future research could valuably grow in the following ways:

- Expand the study to evaluate changes in intrinsic and extrinsic motivation, furthering examination into the impact on self-determination.
- Collect periodic interval data in the form of qualitative interview regarding the longevity of the intervention effects.
- Address the request for more time (i.e., more seasons per year, longer Build season, more time to use robots at the tournament).
- Refine the preseason training (and emphasize that some discomfort is both expected and healthy).
- Extend to other sports and activities.
- Examine the impact on the student composition of existing robotics clubs on school campus.
- Engage during conventional school hours.
- Locate out in the community.
- Balance the ratio of adult role models in programs that scaffold adult decision making.
- Place Unified Robotics on an evidence-based footing (beyond UDL).

In association with any of these pursuits, it is *crucial* to research the burden on parents, and to further analyze those costs and benefits in more detail.

Valediction

> The following interaction was witnessed at rally protesting the Iraq War (Mansfield, pc):
>
> Giant Solider (angry and looming): *I* am fighting for a world where you're *free*!
>
> Tiny, 90-year-old Quaker woman: *I* already live here, love. I'm just waiting for you to *join* me. Now *c'mere*.
>
> Giant Solider, who evidently knows what's good for him, deflates into a tiny but fierce hug.

That memory was elicited by the following quote from one of the teachers:

> But in my heart, the richness was those experiences, right? Because having Mondays with a room full of kids and people and good vibes and all of that, that floated me through this fall. And does that send positive vibes through the community? *Sure*.

Ultimately, that is our message:

> We already live here, love.
>
> We're just waiting for you to join us... only, we are clearly losing our patience.
>
> Now *c'mere*.

APPENDICES

APPENDIX G1: Guidelines for Program and Session Schedules

APPENDIX F1: Field Observation Notes

APPENDIX D1: Derivation of Scales

APPENDIX S1: Student Interview Prompt

APPENDIX S2: Student Interview Questions (Mostly Closed)

APPENDIX S3: Student Interview Questions (Some Open)

APPENDIX P1: Parent Interview Prompt

APPENDIX P2: Parent Interview Questions (Mostly Closed)

APPENDIX P3: Parent Interview Questions (Some Open)

APPENDIX T1: Teacher Interview Prompt

APPENDIX T2: Teacher Interview Questions (Mostly Closed)

APPENDIX T3: Teacher Interview Questions (Some Open)

APPENDIX X1: Spreadsheet Example

APPENDIX G1

Guidelines for Replicating Program and Session Schedules

Except for the introductory ramping up components that are described in Procedures, Build sessions are all very similar in structure, albeit they will vary in tone due to the rapid fading of adult interaction over time. Across all sessions, communication support specialists are available and circulate, modeling use of AAC devices and demonstrating communication skills in turn taking and clarity; however, after the second session they only intervene upon student request. The laminated communication matrices are available throughout the season, with at least one placed at each teamwork area.

Sessions are mildly differentiated as follows:

Session 1 – Teams are randomly assigned by the PI, albeit with even distribution of Athletes and Partners. Students introduced themselves, negotiated what table to move to, and opened the kits. A video of the game for that season (the pirate ship competition) was shown and the students were asked to name their team, which they negotiated among themselves with encouragement from the PI to share all of their ideas. Names were written on kits. During this session, teachers and specialists interacted with all teams, modeling and providing support with communication. At the 55-minute mark, clean up was announced and teams packed their in-progress robot in the provided kit box and stored them in a storage closet. Athletes and Partners exited the school together with adult volunteers.

Session 2 – This session was not differentiated in terms of the team pursuits. Students entered the room and located their kits in the closet. They took them to their table and followed the provided instructions to continue building the robot. Students were offered snacks by an adult volunteer. Teachers and specialists repeated demonstrations of AAC and other communication, modeling and encouraging equitable participation in general, in anticipation of fading out by the next session. Requests for background music were

solicited, and occasional brief dance break ensued for those who chose to partake (all of which promoted the development of self-determination). At the 55-minute mark, clean up was announced and teams packed their in-progress robot in the provided kit box and stored them in a storage closet. Athletes and Partners exited the school together with adult volunteers.

Sessions 3 – This session also was not differentiated in terms of the team pursuits. Students entered the room and located their kits in the closet. They took them to their table and followed the provided instructions to continue building the robot. Students were offered snacks by an adult volunteer. Teachers and specialists continued to encourage equitable participation and model communication, but only if breakdowns were evident. Requests for background music were solicited, and occasional brief dance breaks ensued for those who chose to partake. Noted in this session for both schools was an increase in dance participation. At the 55-minute mark, clean up was announced and teams packed their in-progress robot in the provided kit box and stored them in a storage closet. Athletes and Partners exited the school together with adult volunteers.

Session 4 - This session was also not differentiated in terms of the team pursuits. Students entered the room and located their kits in the closet. They took them to their table and followed the provided instructions to continue building the robot. Students were offered snacks by an adult volunteer. Demonstrations of AAC had been faded out at this point, but occasional prompts to use AAC were given by teachers and specialists. Requests for background music were solicited, and occasional brief dance break ensued for those who chose to partake. More students chose songs to play by shouting them across the room for themselves or at the request of their teammate. At the 55-minute mark, clean up was announced and teams packed their in-progress robot in the provided kit box and stored them in a storage closet. Athletes and Partners exited the school together with adult volunteers.

Session 5 – In this session, as before, students entered the room and located their kits in the closet. They took them to their table and followed the instructions to code their robot.

Instructions were given to the whole group verbally and by demonstration on the classroom's interactive whiteboard. Students connected robots to the classroom computers and uploaded the Scratch program provided by Unified Robotics. Students were offered snacks by an adult volunteer. Teacher and specialist intervention remained faded, and they tended to actively engage in conversation with one another, standing ready to provide any needed support, often with their backs turned to the students so as to reduce the sense of authoritarian monitoring. These mentors visually checked in on the students, but did not initiate assistance. Requests for background music were solicited, and occasional brief dance breaks ensued for those who chose to partake (all of which promoted the development of self-determination). The team that finished coding first used the Unified Robotics Game Rules Manual to begin designing a practice field with materials provided by the engineering teacher. As students completed coding, they assisted with building the practice fields. At the 55-minute mark, clean up was announced and teams packed their in-progress robot in the provided kit box and stored them in a storage closet. Athletes and Partners exited the school together with adult volunteers.

Session 6 – This was the final session of the Build session, and there are no details that substantially differentiate the *format pragmatics* from the other sessions running up to the tournament. Students built until finished, then iteratively coded and tested. Teacher and specialist interaction remained faded, and they continued to actively engage in conversation with one another, standing ready to provide any needed support, often with their backs turned to the students so as to reduce the sense of authoritarian monitoring. Once again, the mentors visually checked in on the students, but did not initiate assistance. During this time, students practiced various roles and responsibilities related to the function of the robot during testing, such as who would start it, who would retrieve ammunition, and so on. At the 55-minute mark, clean up was announced and teams packed their in-progress robot in the provided kit box and stored them in a storage closet. Athletes and Partners exited the school together with adult volunteers.

In the case of this study, one student acted as the point of contact for troubleshooting the coding.

APPENDIX F1

FIELD OBSERVATION NOTES

Observation Date: _____ Start time: _____ End time: _____

Team Color: _____ Athlete # ____ *or* Partner # ____

COMPETENCE	Athlete	Partner
Effective Performance	☐ Explaining ☐ Using materials ☐ Taking turns	☐ Explaining ☐ Using materials ☐ Taking turns
No Effective Performance	☐ Not working on project	☐ Not working on project

AUTONOMY	Athlete	Partner
Free Choice	☐ Expresses difference of opinion ☐ Expresses choice ☐ Engaging outside of the rules	☐ Seeks permission of Athlete
No Free Choice		

RELATEDNESS	Athlete	Partner
Social Connection	With Partners: ☐ Communicating ☐ Sharing personal space ☐ Working with ☐ Encouraging ☐ Sympathy or ☐ Empathy	With Athletes: ☐ Communicating ☐ Sharing personal space ☐ Working with ☐ Encouraging ☐ Sympathy or ☐ Empathy
Social Isolation	Alone: ☐ Not communicating ☐ Not sharing personal space ☐ Not working with Partners ☐ Not working with anyone	Alone: ☐ Not communicating ☐ Not sharing personal space ☐ Not working with Athletes ☐ Not working with anyone

EMOTIONS	Athlete	Partner
Positive (e.g., happy, smiling, laughing)		
Negative (e.g., frustrated, sad)		

APPENDIX X1
Derivation of Scales

The questions were adapted from two relatively novel scales that had been derived from the SDT framework for use with the population of study: the Work Group Inclusion Scale (WGIS) and the Perceived Group Inclusion Scale (PGIS). The items on the surveys became interview design guidelines, as detailed below in the description of the interview protocol components. Both scales have strong psychometric properties and were designed to be adapted to assess inclusion in STEM for student groups and classrooms, both of which are settings for this experiment.

The WGIS is a ten-item measure that examines an individual's perceived degree of belonging and uniqueness in their workgroup. A sample item is, "I can share a perspective on work issues that is different from my group members." This scale has been rigorously validated, and its factor structure has been verified in the context of faculty and staff of an American university. The PGIS is a 16-item measure that assesses the extent to which an individual perceives that they are included in their workgroup. Although this scale uses SDT as its theoretical framework, this measure is composed of two distinct subscales, namely: affection (i.e., a feeling of belonging) and authenticity (i.e., being allowed to remain true to oneself). A sample item from this scale is, "This group encourages me to be who I am." The PGIS is a valid and reliable instrument whose factor structure was examined and verified in various academic and work settings. Both measures were adapted to measure inclusion in the context of classrooms.

APPENDIX S1
STUDENT INTERVIEW PROMPT

Both Pretest and Posttest

"Our interview has two parts. Both parts will be a few minutes long. In the first part, I am going to ask you 10 questions. Depending on your answers, I might ask you up to 4 more. For almost all of the questions, you can answer just 'yes' or 'no', but if you *want* to say more, that's fine. For a couple of the questions, I might ask you for longer answers."

Only Pretest

"In the second part, I will ask you 2 more questions. For those last 2, you might want to give me longer answers."

Only Posttest

"In the second part, I will ask you 6 more questions that you can also answer 'yes' or 'no'. Depending on your answers, I might have up to 4 more questions. For those last 4, you might want to give me longer answers."

Both Pretest and Posttest

"At any time, if you want to stop, just say 'Stop'. I am going to record our interview so I can listen to it later, and write things down. There are people who will help me do that. Is there anything that you want to ask me before we start?"

- UNTIL NO: Answer their questions, then…
  - "Is there anything else that you want to ask me before we start?"
- WHEN NO: "In that case, here is the first question."
  - [PROCEED to "Interview Questions (Mostly) Closed"]

APPENDIX S2
STUDENT INTERVIEW QUESTIONS (MOSTLY CLOSED)

All prompts on this page are to be used in BOTH the pretest and posttest environments.

Initial Prompt: "This is the first part of our interview."

Competence (Effective performance)

- (Y/N) "Can *you* make a robot by yourself?"
- "What is a team?" ["Thank you."]
  - IF NO ANSWER, say, "A team is when people do something together."
- (Y/N) "Can *you* make a robot with a team?"
  - IF YES: (Y/N) "Have you made a robot with a team before?"

Relatedness (Social interconnection)

- (Y/N) "Do your friends make robots?"
- "Tell me again, what is a team?" ["Thank you."]
  - IF NO ANSWER, say, "A team is when people do something together."
- (Y/N) "Are you on any teams?"
- (Y/N) "Do you have friends on a team?"

Autonomy (Freedom of choice)

- "What is a choice?" ["Thank you."]
  - IF NO ANSWER, say, "A choice is when *you* get to pick what *you* want."
- (Y/N) "At home, do *you* get to choose what you want?"
  - IF YES: "*What* do you get to choose?"
- (Y/N) "At school, do *you* get to choose what you want?"
  - IF YES: "*What* do you get to choose?"
- IF YES previously to ON ANY TEAMS: (Y/N) "On your team, do *you* get to choose what you want?"
  - IF YES: "*What* do you get to choose?"

APPENDIX S3

STUDENT INTERVIEW QUESTIONS (SOME OPEN)

Medial Prompt: "Now we are ready for the second part of our interview."

Only Pretest

- What do you think Unified Robotics will be like?
- Do you think that Unified Robotics will be good for you?*

Only Posttest (Mostly Y/N)

- (Y/N) Did you like Unified Robotics at the beginning?*
- (Y/N) Do you like it now?*
  - IF YES: What do you like about Unified Robotics?
  - YES or NO: What don't you like about it, if anything?
- (Y/N) Would you like to do Unified Robotics next year?
  - IF NO: 1) Why not? AND 2) "How about doing regular robotics instead?
- (Y/N) Was Unified Robotics good for you?*
- (Y/N) Have your attitudes towards other people changed since Unified Robotics?*
  - IF YES or NO: Please explain. [Thank you.]

Both Pretest and Posttest

- Is there anything that you would like to ask me, or tell me?

Final Prompt: "And that's it. Our interview is over. Thank you very much for participating."

*Adapted loosely from Sullivan and Masters Glidden (2014)

APPENDIX P1
PARENT INTERVIEW PROMPT

Both Pretest and Posttest

"Our interview has two parts. Both parts will be a few minutes long. In the first part, I am going to ask you 7 questions. Depending on your answers, I might ask you up to 5 more. For almost all of the questions, you can answer just 'yes' or 'no', but if you *want* to say more, that's fine. For a couple of the questions, I might ask you for longer answers.

Only Pretest

"In the second part, I will ask you 2 more questions. For those last 2, you might want to give me longer answers."

Only Posttest

"In the second part, I will ask you 6 more questions that you can also answer 'yes' or 'no'. Depending on your answers, I might have up to 5 more questions. For those last 5, you might want to give me longer answers."

Both Pretest and Posttest

"At any time, if you want to stop, just say 'Stop'. I am going to record our interview so I can listen to it later, and write things down. There are people who will help me do that. Is there anything that you want to ask me before we start?"

- UNTIL NO: Answer their questions, then…
  - "Is there anything else that you want to ask me before we start?"
- WHEN NO: "In that case, here is the first question."
  - [PROCEED to "Interview Questions (Mostly) Closed"]

APPENDIX P2
PARENT INTERVIEW QUESTIONS (MOSTLY CLOSED)

All prompts on this page are to be used in BOTH the pretest and posttest environments.

Initial Prompt: “This is the first part of our interview.”

Competence (Effective performance)

- (Y/N) “Can <NAME> make a robot on their own?”
- (Y/N) “Can <NAME> make a robot with a team?”
    - IF YES: (Y/N) “Has <NAME> made a robot with a team before?”

Relatedness (Social interconnection)

- (Y/N) “Do <NAME>’s friends make robots?”
- (Y/N) “Is <NAME> on any teams?”
- (Y/N) “Does <NAME> have any friends on a team?”

Autonomy (Freedom of choice)

- (Y/N) “Does <NAME> make decisions freely at home?”
    - IF YES: “What decisions does <NAME> make at home?”
- (Y/N) “Does <NAME> make decisions freely at school?”
    - IF YES: “What decisions does <NAME> make at school?”
- IF YES previously to ON ANY TEAMS: (Y/N) “Does <NAME> make decisions freely on their team?”
    - IF YES: “What decisions does <NAME> make on their team?”

APPENDIX P3
PARENT INTERVIEW QUESTIONS (SOME OPEN)

Medial Prompt: "Now we are ready for the second part of our interview."

Only Pretest

- What do you think Unified Robotics will be like?
- Do you think that Unified Robotics will be good for <NAME>?*

Only Posttest (Mostly Y/N)

- (Y/N) Did you like Unified Robotics at the beginning?*
- (Y/N) Do you like it now?*
  - IF YES: What do you like about Unified Robotics?
  - YES or NO: What don't you like about it, if anything?
- (Y/N) Would you like <NAME> to do Unified Robotics next year?
  - IF NO: 1) Why not? AND 2) "How about doing regular robotics instead?
- (Y/N) Was Unified Robotics good for <NAME>?*
- (Y/N) Have <NAME>'s attitudes towards other people changed since Unified Robotics?*
  - IF YES or NO: Please explain. [Thank you.]
- (Y/N) Have your attitudes towards other people changed since Unified Robotics?*
  - IF YES or NO: Please explain. [Thank you.]

Both Pretest and Posttest

- Is there anything that you would like to ask me, or tell me?

Final Prompt: "And that's it. Our interview is over. Thank you very much for participating."

*Adapted loosely from Sullivan and Masters Glidden (2014)

APPENDIX T1
TEACHER INTERVIEW PROMPT

Both Pretest and Posttest

"Our interview has two parts. In the first part, I am going to ask you 7 questions."

Only Pretest

"If you are not already familiar with Unified Robotics, then the first part won't take long at all as your answers will likely be quite short; however, if you *are* already familiar with Unified Robotics, then the first part might take several minutes. In the second part, I will ask you 3 more questions whose answers might take a sentence or two."

Only Posttest

"As you are now familiar with Unified Robotics, the first part might take several minutes. In the second part, I will ask you 7 more questions that you can answer with just 'yes' or 'no'. Depending on your answers, I might have up to 6 more questions. For those last 6, you might want to give me longer answers."

Both Pretest and Posttest

"At any time, if you want to stop, just say 'Stop'. I am going to record our interview so I can listen to it later, and write things down. There are people who will help me do that. Is there anything that you want to ask me before we start?"

- UNTIL NO: Answer their questions, then…
  - "Is there anything else that you want to ask me before we start?"
- WHEN NO: "In that case, here is the first question."
  - [PROCEED to "Interview Questions (Mostly) Closed"]

APPENDIX T2
TEACHER INTERVIEW QUESTIONS (OPEN)

All prompts on this page are to be used in BOTH the pretest and posttest environments.

Initial Prompt: “This is the first part of our interview.”

Knowledge of Program Components

- “What two main inclusion components are built into Unified Robotics?”
- “How is rightful presence supported in Unified Robotics?”
- “How are shared goals supported in Unified Robotics?”

- “What three self-determination factors are scaffolded in Unified Robotics?”
- “How is competence scaffolded in the program?”
- “How is relatedness scaffolded in the program?”
- “How is autonomy scaffolded in the program?”

APPENDIX T3
TEACHER INTERVIEW QUESTIONS (SOME OPEN)

Medial Prompt: "Now we are ready for the second part of our interview."

Only Pretest

- What do you think Unified Robotics will be like?
- Do you think that Unified Robotics will be good for the Athletes?*
- Do you think that Unified Robotics will be good for the Partners?*

Only Posttest (Mostly Y/N)

- (Y/N) Did you like Unified Robotics at the beginning?*
- (Y/N) Do you like it now?*
  - IF YES: What do you like about Unified Robotics?
  - YES or NO: What don't you like about it, if anything?
- (Y/N) Would you like to do Unified Robotics next year?
  - IF NO: 1) Why not? AND 2) "How about doing regular robotics instead?
- (Y/N) Was Unified Robotics good for the Athletes?*
- (Y/N) Was Unified Robotics good for the Partners?*
- (Y/N) Have you seen attitudes between Athletes and Partners change?*
  - IF YES or NO: Please explain. [Thank you.]
- (Y/N) Have your attitudes towards other people changed since Unified Robotics?*
  - IF YES or NO: Please explain. [Thank you.]

Both Pretest and Posttest

- Is there anything that you would like to ask me, or tell me?

Final Prompt: "And that's it. Our interview is over. Thank you very much for participating."

*Adapted loosely from Sullivan and Masters Glidden (2014)

APPENDIX X1

Spreadsheet Example

Anoname	Build by yourself	Team def	Build with team	Built w/team before	Friends make robots	On teams	Friends on team	Choice def	Choose at home	What at home	Choose at school	What at school	Choose on teams	What on teams	UR be like	Good for you	Good+	Tell me
X	N	√	Y ||	N	N	Y	Y	√	Y ||	Wha	Y ||	You	N ||	Not	I thi	Y	I rea	I do

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