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Augmenting Communicative Environments for People With Acquired Neurogenic Disorders

Exploring Situated Discourse Analysis

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This theoretical review article describes *situated discourse analysis* (SDA) and explores its implications for communication sciences and disorders. Drawing on situated theories of cognition and communication, SDA aims to understand *real-time communicative processes* of people engaging in complex *sociocultural activities* in specific *sociomaterial environments*. For SDA, discourse points first to the multimodal processes, not the products, of communicative interactions people engage in, and recognizes that these processes are fundamentally complex, distributed, and emergent. The article begins by defining SDA and describing four theoretical principles that guide this approach. We illustrate ways SDA might alter and advance theory, research, and clinical practice by considering its application to understanding the use of augmentative and alternative communication (AAC) technologies by adults with neurogenic communication disorders and their routine partners. We then explore empirical evidence from a methodologically diverse set of cases. The first considers Mialet's (2012) ethnographic study of Stephen Hawking and his use of AAC technologies, which highlights the complex, distributed, and emergent nature of situated discourse. We turn then to our clinical experiences, reflecting on what we have learned from our clients who have creatively repurposed technologies to remediate their activities and to mediate successful interactions and situated learning. Finally, we discuss a participatory design research project that used SDA as a guide for the innovative design of PIMs, pseudo-intelligent mediators (i.e., devices that sense the environment and act as active agents to mediate interactions). We conclude the article with a discussion of ways SDA contributes to and advances our research and clinical practice.
Key words: *adult-acquired cognitive–communicative disorders*, *augmentative and alternative communication (AAC)*, *distributed communication*, *functional systems*, *rich communicative environments*, *situated discourse analysis (SDA)*

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IN AN INTERACTION we detail later in this article, Jessie, a young man with cerebral palsy, is at a computer store on a college campus with his personal assistant (PA) and three researchers observing and recording his interactions. Jessie is at the store to buy a device, but when he asks for it, the clerk does not understand the word he is saying. After several repetitions, Jessie's PA does understand the word he is saying and repeats it more clearly for the clerk. The clerk now understands the word, but thinks it refers to a different device from the one Jessie is seeking. Jessie and the PA try again, the

PA acting out an imagined scene of using the device. Only then does the clerk take them to the device Jessie was seeking. This interaction is emblematic of a central argument in this article, that situated discourse is complex, distributed, and emergent, and that language alone is a much less robust and efficacious resource than it is often imagined to be.

Discourse is a tricky term. In vernacular uses, guided by our everyday folk theories, the meaning becomes clear from the contexts of use. The *Oxford English Dictionary* (2019) details some of this word's complex history, but in modern times it points to two broad notions: discourse as a product (e.g., "a body of statements" or forms) and discourse as a process (e.g., "interaction"). As a technical construct in linguistics, discourse also has a complex range of meanings, signifying different dimensions of language (and its contexts) depending on particular theories of language. For example, in formal linguistic theories, *discourse* often refers to linguistic contexts beyond the sentence (e.g., a paragraph or story), highlighting phenomena such as anaphora. In sociolinguistic theories, *discourse* points to social contexts, that is, to how linguistic forms (e.g., phonology, syntax, and semantics) vary in use across social groups (e.g., nationality, gender, and social class), highlighting phenomena such as regional dialects, professional discourse, and specialized genres. In functional linguistics, *discourse* signals ways that extralinguistic contexts support meaning-making by integrating grammatical phenomena (e.g., verb tenses) with semantic features (e.g., mental processes) and pragmatic functions (e.g., managing social relations), highlighting the interpersonal, referential, and social dimensions of texts (written or spoken). Despite their differences, formal, social, and functional linguistic theories have primarily defined and studied discourse as something a person produces, that is, as a product rather than as an emergent process (not preordained and fixed) of communication among people situated in specific *sociomaterial environments* (i.e., in which physical, biological, and social characteristics are always deeply entangled).

In contrast, as we discuss in the next section, we define *discourse* as the processes of communication people engage in, processes that are fundamentally complex, distributed, and emergent and that draw on diverse resources (only a few of which are captured in linguistic theories). Synthesizing process traditions from cultural sociolinguistics (e.g., Duranti, 1992; Gee, 2011; Hymes, 1974; Ochs & Capps, 2001), linguistic anthropology (e.g., Agha, 2007; Hanks, 1990, 1996), interactional sociolinguistics (e.g., Tannen, 2007), ethnomethodology (e.g., Goffman, 1981; Goodwin & Goodwin, 1996), conversation analysis (e.g., Heritage & Maynard, 2006; Sacks et al., 1974), and sociocultural psychology (e.g., Cole, 1996; Hutchins, 1995; Lave & Wenger, 1991; Rogoff, 2003; Wertsch, 1991), we describe an approach to *situated discourse analysis* (SDA) and explore its implications for communication sciences and disorders (CSD). After defining SDA and describing four theoretical principles that guide this approach, we then consider how SDA can be applied to theory, research, device design, and clinical interventions around AAC. We begin by noting persistent problems that have contributed to AAC device refusal or abandonment. To explore ways SDA might advance our understandings of the use of AAC technologies by adults with neurogenic communication disorders and their routine partners, we next consider empirical evidence from a methodologically diverse set of cases. The first considers Mialet's (2012) ethnographic study of Stephen Hawking and his use of AAC technologies, which highlights both the power and limits of AAC as well as the complex, distributed, and emergent nature of situated discourse. We turn then to three cases drawing from our clinical experiences, reflecting on what we have learned from our clients who have creatively repurposed technologies to remediate their activities and to mediate successful interactions and situated learning. Finally, we discuss

a participatory design research project that used SDA as a guide for the innovative design of pseudo-intelligent mediators (PIMs) (i.e., devices that sense the environment and act as active agents to mediate interactions). We conclude the article with a discussion of ways SDA contributes to and advances our research and clinical practice.

SITUATED DISCOURSE ANALYSIS

Broadly, SDA represents a theoretical approach focused on understanding *real-time communicative processes* of people engaging in complex sociocultural activities taking place in specific sociomaterial environments. Thus, *discourse* is conceptualized as communicative processes (not simply as products or behaviors) that may or may not include the use of linguistic forms; *situated* highlights that communicative processes always emerge in materially, spatially, and temporally constituted situations, and also that such situations are linked to past events, other co-present contexts, and projected futures; finally, *analysis* highlights the common task of researchers and participants alike—to develop a sense of what is going on in an interaction and test that sense out. The theoretical assumptions of SDA can be summarized in four basic principles (Hengst, 2020). Communicative interactions always:

1. are situated in *sociocultural activities* and *sociomaterial environments;*
2. are shaped by people's alignments and evolving *patterns of participation*;
3. are mediated by diverse *multimodal communicative resources*; and
4. serve as a locus of individual learning and social change, what Lave and Wenger (1991) formulated as *situated learning*.

In conceptualizing the relation of sociocultural activity and sociomaterial environments to language, SDA is aligned with Hymes' (1974) challenge to start with the *social matrix*:

> [I]t will not do to begin with language, or a standard linguistic description, and look outward to social context. A crucial characteristic of the sociolinguistic approach is that it looks in toward language, as it were, from its social matrix. To begin with language, or an individual code, is to invite the limitations of the purely correlational approach, and to miss much of the organization of linguistic phenomena. Functions and contexts of use join together what structural description by itself may leave asunder . . . . (p. 76)

SDA also assumes that sociomaterial environments are complex and emergent. They have resources built in by previous activity and other participants (e.g., imagine a teacher lecturing in a classroom), but those resources are routinely altered, added to, ignored, and taken up and repurposed in creative fashion by participants in an interaction (e.g., in response to a student's question). They are also complex and emergent because more than one activity is always going on in (and available to) any interaction (e.g., when a teacher "calls out" a student who seems to not be attending), what Goffman and others have referred to as *lamination* (Goffman, 1981; Goodwin & Duranti, 1992; Hengst, 2015).

By shifting our focus to processes of communication, SDA challenges researchers to identify complex, distributed, and emergent objects of study. Drawing on the classic work of Edwin Hutchins, we have focused on *distributed cognition* and *functional systems*. Hutchins's (1995) research focused on specific sociocultural activities relating to navigating the oceans, like teams of sailors using tools (devices, various annotated maps, landmarks, and stars) to compute the location of a ship at sea. However, his central contribution was in reconceptualizing the basic theoretical framework for cognition. Instead of locating cognition solely in individual minds, he saw cognition as *distributed* in *functional systems* that are composed of people, tools, and environments, functional systems that are distributed over time (e.g., a team using maps made decades ago and annotated earlier in the day for work at this moment). Hutchins's research made it clear that functional systems are not static contexts within which activity happens, but emergent assemblages

of *sociomaterial environments* (including diverse tools, communicative resources, and people) to accomplish specific sociocultural activities, assemblages that rapidly respond to, and reorganize around, ever-changing local events, needs, and goals.

Whereas Hutchins analyzed functional systems to track the distributed nature of cognition, we focus here on *distributed communication* (Hengst, 2003, 2015, 2020; Hengst & Duff, 2007; Hengst et al., 2016). As Clark (1992) argued, communicative interactions are fundamentally collaborative accomplishments, like shaking hands or paddling a two-person canoe, and referential sense (i.e., situated meaning) is negotiated in the moment based on people's specific historical experiences (what Clark called "common ground"). Thus, communicative success depends on how people align to and collaborate in activity. In SDA terms, success depends on emergent realignments as functional systems respond flexibly to changing, often unanticipated, conditions and as different systems are assembled around different goals and sociocultural activities. In contrast with theories that equate communication with transmission of linguistic messages, SDA understands what is often called *language-in-use* as not only distributed, but also multimodal, involving, as the linguist Agha (2007) suggests, "an array of signs ... being performed and construed by interactants, of which language is but a fragment ... of a *multi-channel sign configuration*" (Agha, 2007, p. 6, emphasis added). Discourse then involves whatever multichannel and multimodal sign configurations are at play in particular moments of communicative interaction.

In summary, SDA begins with sociocultural activity (the social matrix of interaction), attends to the emergent character of people's ongoing participation, understands communication as distributed and mediated by multimodal arrays of resources (not achieved by language on its own), and sees learning/change as ongoing and inextricable from interactions. Situated discourse analysis, thus, contrasts not only with approaches that treat discourse primarily as the linguistic forms people produce (e.g., linguistic units larger than a sentence; linguistic patterns that define discourse registers), but also with conversation analytic approaches that focus primarily on conversational patterns (e.g., adjacency pairs and turn-taking in conversation). By focusing on communicative processes, SDA disrupts a number of received categorical dichotomies (communication vs. learning, individual vs. social, theory vs. practice, and material vs. social), as its principles instead point to the deep entanglements among such categories in real-time human activities. To illustrate how SDA contrasts with traditional approaches and can be applied to CSD, we focus in this article on AAC, an area of theory, research, and practice where designs of devices, therapies, and social supports have all been strongly shaped by more product-focused theories of language, discourse, and activity. Situated discourse analysis offers alternative principles for designs of devices, therapies, and social supports.

CONTINUING CHALLENGES TO SG-AAC

There is no doubt that advances in digital technologies have revolutionized augmentative and alternative communication (AAC), expanding possibilities for the many people who are unable to speak intelligibly (or at all) due to a communication disorder and for their many everyday interlocutors. The potential of digital AAC devices that can "speak for" such individuals is aptly illustrated in the case of the late, world-famous physicist, Stephen Hawking. However, as we discuss in the next section of this article, close attention to Hawking's use of speech-generating (SG) AAC technologies also shows that these devices' dependence on prefabricated language and on constant management by teams of people means that SG-AAC devices by design remain quite limited in their ability to mediate complex everyday communicative interactions.

Over the last two decades, as technology has advanced and users of all ages

have grown more accustomed to portable, daily-use technological tools (e.g., tablets and smartphones), researchers have explored the use and various levels of acceptance of high-tech (computerized) AAC devices. In the early 2000s, clinicians reported that many clients chose to either not pursue these devices or ultimately abandoned them due to a variety of barriers (Dawe, 2006; Hodge, 2007; Johnson et al., 2006). Johnson et al. (2006) surveyed practicing speech–language pathologists (SLPs) who had on average worked with 100 AAC clients. The results indicated that only about 40% of their clients successfully used their AAC devices, whereas almost 30% had completely abandoned devices they had purchased, and no data were reported on the number of clients who had refused to trial an AAC device. Reports from various contexts since the early 2000s have suggested that these problems have persisted.

For example, in an observational study of the use of SG-AAC devices by three children in elementary school classrooms, Mellman et al. (2010) identified significant challenges to AAC use even in highly structured environments. Although the children had been using their devices for 7–36 months and their teachers, aides, and classmates were familiar with the devices, the most basic barrier to use was simply that the devices were often not available (e.g., left at home, in closets, or on shelves out of the children's reach). Likewise, to understand the barriers that lead clients and families to reject or abandon devices, Moorcroft et al. (2020) undertook a retrospective study of 12 children with complex communication needs who had abandoned AAC devices after weeks and even years of use. They conducted semistructured interviews with the biological mothers about their children's communication practices and AAC experiences and used questionnaires to collect detailed demographic data about members of their households. Four themes emerged that suggest why the children and their parents ultimately abandoned their AAC devices. First, families were often influenced by negative and conflicting attitudes among professional stakeholders (e.g., different SLPs advocating for different systems; school personnel strongly discouraging AAC use). Second, families often did not feel supported by SLPs (e.g., SLPs having limited experiences with devices and not providing, or arranging for, adequate training). Third, communication among professionals and parents was often poor (e.g., minimal collaboration around AAC device implementation across therapies; professionals devaluing parents' opinions, goals, and experiences). Finally, parents often reported the absence of a supportive community to implement AAC in everyday interactions (e.g., children needing many more communication partners who were willing to interact with them using the device; parents needing support groups with other parents). Based on the results, Moorcroft and colleagues argue for implementing family-centered services, echoing the long-acknowledged importance of communication partners in supporting clients' successful AAC use (e.g., Bailey et al., 2006; Beukelman & Mirenda, 1998; Glennen & DeCoste, 1997).

These challenges have not only been identified for children's use of AAC. Researchers across the past two decades have identified barriers more specific to clients managing adult-acquired neurogenic communication disorders. For example, adult clients may not accept that an alternative means of communication is needed or have cognitive–communicative impairments that impact full or efficient use of an AAC device (e.g., Baxter et al., 2012; Fager et al., 2006; Judge & Townend, 2013; Lasker & Bedrosian, 2001). Fager et al. (2006) also highlight the fact that adults requiring AAC after an acute event are likely to transition through multiple medical or residential settings (e.g., acute care, subacute rehabilitation, and skilled nursing facilities) and require well-trained facilitator support to maintain AAC use within and across those settings. Finally, adults may focus on the technology or the tool itself rather than the goal of functional and efficient communication (e.g., McNaughton & Light,

2013). Researchers (e.g., Purdy & Dietz, 2010) have also stressed that for clients to learn to operate, manage, and flexibly use an AAC device to meet their own communicative goals requires complex integration of multiple cognitive processes (e.g., attention, memory, and executive function), which are likely to be affected for a number of individuals with adult-acquired communication disorders resulting from brain injury/trauma.

What is striking is the persistence of these problems even as the speed and power of digital devices have grown exponentially and costs have decreased. In previous work (Hengst et al., 2016), we argued that the limits of AAC are not fundamentally technological, but theoretical—that is, a question of how we theorize, study, and support everyday communicative interactions. The design and implementation of AAC approaches have largely been driven by prosthetic models that conceptualize devices as replacements for damaged body structures and functions and by language ideologies that conceptualize communication as a "speaker's" independent transmission of linguistic messages. Grounded in these theories, device design, training, and support have centered on accommodating the (dis)abilities of individual clients by augmenting abilities to access and select items from extensive and multiple databases of words and phrases as quickly as possible (e.g., Beukelman & Ball, 2002). Broadly, these deficit-focused approaches also tend to discourage use of AAC in treatment of clients with adult-acquired disorders, as AAC is still too often conceptualized as a compensatory strategy to be employed when impairment-focused approaches fail to restore expressive language abilities, especially spoken language.

AAC intervention has continued to focus on matching devices to clients, training clients (and family members) in using the chosen device, and ultimately building the client's skills in using the device to produce meaningful messages in a variety of settings (Fried-Oken et al., 2011). Recently, with the explosion of online technologies and social media, interest has grown in adapting AAC to expand the social networks and functional independence of clients through engagement with cloud-based services (e.g., Brunner et al., 2019; Shane et al., 2011). In addition, some researchers have been arguing for more integrated multimodal approaches to AAC development and use (Hux et al., 2010; Lasker et al., 2005) as well as for integrating digital technologies and AAC devices into traditional treatments (e.g., Cherney & Van Vuuren, 2012; King et al., 2013). However, situated analysis of everyday discourse has rarely guided device development or approaches to intervention, or, when used, has focused narrowly on optimizing conversational turn-taking, managing breakdowns, and supporting the joint construction of messages (see Hux et al., 2010). In this article in contrast, we take up the theories of SDA to imagine AAC not as a *prosthetic device* to augment areas of language deficit, but as a *mediational means* (a communicative resource) that supports alignments of people, practices, things, and environments in assembling everyday functional systems (see Hengst et al., 2016).

DISTRIBUTED AAC—RETHINKING THE IMPLICATIONS OF THE CASE OF STEPHEN HAWKING

The late physicist Stephen Hawking is the most famous case illustrating the potential of modern SG-AAC devices, and many of us can conjure up images of Hawking speaking to varied audiences. In *Saving Millie*, Kondracke (2001) offered a popular account of the steep challenges of supporting his wife after her diagnosis of Parkinson's disease, including attempts to use several different SG-AAC devices similar to those Hawking used. Finding them too complicated to operate, Kondracke reports that he and Millie eventually abandoned them, concluding "that one had to have Hawking's IQ to program it" (p. 189). However, as we have outlined in earlier work (Hengst et al., 2016), Mialet's (2012) ethnographic account of *how* Hawking actually did his work and communicated so effectively, as well as the limits he still

faced, make it clear that his genius mainly accounted for the resources he was able to marshal to build distributed support systems and the willingness of sponsors to refashion communicative environments to accommodate his communicative practices.

Mialet's (2012) ethnographic study explored how Hawking's remarkable SG-AAC use provided him the freedom to speak publicly despite his growing paralysis. Hawking had lived with amyotrophic lateral sclerosis (ALS) for over 50 years by the time of his death in 2018 and had used an SG-AAC system for over 30 years. The WordsPlus[1] software he used was elegantly designed to allow him to select, store, and speak words he wanted to say. Indeed, he hosted his own TV special, made guest appearances on other shows (e.g., *StarTrek*), and delivered an untold number of professional lectures and public speaking engagements around the world. However, Hawking's success was supported by much more than the AAC software. Mialet's (2012) deep ethnographic case study of Hawking highlights the extended systems of people, practices, institutions, and artifacts that constituted Hawking's identity. Her account provides "a thick description of the network of competencies—the computer/the synthesizer/the personal assistant/the graduate assistant/the nurses—that transforms a man deprived of speech and movement into 'the genius we all know'" (p. 6).

Mialet describes how Hawking accessed his AAC system with a switch by scanning words and phrases that he and others had preprogramed or spelling words out one letter at a time. Although the computer could fluently voice preprogrammed speech (such as a lecture) and although he was extremely efficient at using his system, Hawking could at best produce spontaneous conversational speech at a rate of 15–20 words/min in contrast to a typical speaking rate 10 times that. Thus, when Hawking answered questions at the end of a lecture or in an interview, they were almost always provided in advance so his answers could be prepared ahead of time, and no follow-up was allowed. Otherwise, it would take him minutes of laborious work to produce even a short answer to an unscripted question. In other words, some of his apparent ease displayed in interactions depended on assembling controlled, scripted, and predictable functional systems, which minimized the need for rapid and flexible realignments around emergent goals (e.g., only asking prescripted questions after a talk).

Moreover, Hawking's communicative interactions involved teams of people. Students and PAs helped daily to maintain his AAC systems (e.g., making sure computer batteries were charged and access switches correctly connected), and computer engineers designed and continuously updated the hardware and software that made up his AAC system. In many everyday interactions, Hawking relied on a network of familiar people (i.e., his family, friends, and assistants) who interacted with him (without using AAC devices) by reading his subtle gestures or responding based on their understanding of his routines and preferences (e.g., doing what's expected). Mialet concluded: "Contrary to the solitary genius depicted by the media, Hawking resembles a manager at the head of a company, a company that has explicitly become his extended body" (p. 22), an observation that gave rise to the title of her book: *Hawking Incorporated*. Few AAC users will ever combine such extensive resources and the prestige and power to have communicative environments adapt so readily to his team's requests for change. In this sense, Hawking represents an extreme best case scenario for successful SG-AAC use.

From transmission of messages to distributed communication in emergent functional systems

From an SDA perspective, both clinical evidence documenting the high rates of abandonment and rejection of AAC devices and ethnographic evidence detailing the complex

[1]In addition to Mialet's (2012) account, there are numerous published accounts of Hawking's AAC system, e.g., https://www.wired.com/2015/01/intel-gave-stephen-hawking-voice/

practices around Hawking's use of AAC illuminate the fundamental character of communication—communicative interactions are *complex*, *distributed, emergent accomplishments* and are fully enmeshed in people's everyday sociocultural activities, in what people are doing and who they are being at particular moments in time. Hawking's case reminds us that successful deployment of communicative resources, including AAC devices, must be understood within the ongoing assemblage of such functional systems. Thus, to understand and intervene in processes of communication, we need to trace the way situated functional systems are being assembled and reassembled, as people dynamically pursue multiple and shifting goals, align multiple and shifting patterns of participation, and draw on their full arrays of multimodal communicative resources.

In short, high rates of failure and severe limits of AAC devices for everyday interactions are likely to persist as long as AAC remains grounded in theories and ideologies of communication that assume communicative success depends on isolated abilities of individuals, that linguistic demands can be predicted by types of environments, and that communication can be reduced to the transmission of linguistic messages. As Morton and Millie Kondracke navigated her Parkinson's disease, they had good reason to abandon their attempts to use high-end AAC devices; however, the lesson should not have been that AAC users need individually to be geniuses. Instead, we argue that the lesson is that we need to shift our focus to situated discourse in complexly laminated and emergent communicative environments, to the ways people co-engage in activities and structure participation in functional systems, and to the emergent, dynamic repurposing of communicative resources to mediate those interactions.

RETHINKING COMMUNICATIVE ACTIVITY: LESSONS LEARNED FROM OUR CLIENTS

Combined, we (Hengst and Sherrill) have over 30 years of clinical experience providing clinical services for adults with acquired cognitive and communicative disorders (e.g., aphasia, dysarthria, and executive function disorders) due to a variety of etiologies (e.g., stroke, traumatic brain injury [TBI], tumors, and ALS) and across all levels of care (e.g., acute care, rehabilitation programs, extended care facilities, and home care). Across these settings, our experiences have included working with diverse AAC technologies and supporting clients' AAC use in a variety of settings. Over these decades of experience and clinical reflection, we have learned much from our clients and several of these lessons go quite directly to questions of the nature of communication and the poor fit of typical AAC design and practice with clients' everyday communicative activities. Our goal in this section then is to further explore situated discourse in AAC contexts.

Here, we share our reflections about three of our clients—"Larry," a young man with ALS; "Henry," an older man with severe aphasia; and "Rhonda," a young woman with moderate aphasia. By some metrics, these clients were all successful in using high-tech systems to augment their face-to-face communicative interactions. The first two clients (whom Hengst worked with) were highly motivated to obtain and use dedicated SG-AAC devices, were well supported by family, and would likely be described as successful AAC users, although their pattern of device use varied greatly. The third client from Sherrill's more recent caseload is a woman who was using her commercially available tablet only reluctantly as a homework device for her treatment program and fully resisting its use as an AAC device to support communicative interactions. However, when Sherrill shifted to an SDA framework for her therapy, Rhonda's engagement with her device changed quite radically. Each of these cases illustrates key insights about situated discourse in everyday communicative environments.

Larry's case: Communicative disorders are also distributed

Almost 30 years ago, Hengst worked as an SLP on an interdisciplinary team providing

ongoing outpatient consultations and home visits for clients with ALS and their families. In this setting, SLP services focused on counseling clients and their families about communicative disorders associated with ALS, on developing and revising communication strategies to compensate for the client's loss of function, and on anticipating and identifying their communication needs to support continued communication success. An important component of the SLP services included screening patients for device needs, securing or providing AAC devices as needed, and providing consulting services as the patient/caregiver adjusted to its use. As was typical of AAC interventions at the time (1990s), Hengst focused on providing patients and their caregivers with multiple and evolving unaided and low-tech AAC systems (e.g., eye blinks and eye gaze boards, paper and pencil, and prerecorded phone messages). In addition, the team owned several high-end computer systems with specialized WordsPlus software (similar to Hawking's device) that she could loan clients. Perhaps not surprisingly, only a small number of clients opted to trial and learn the computer systems. "Larry" was one of the clients who did (see also Hengst, 2020).

Larry's ALS progressed quickly. Within a year of his diagnosis, he had lost his ability to move, speak, and eat orally. Throughout his decline, Larry continued living at home with his wife and children; and his wife was highly involved in all aspects of his care. After Hengst secured the device for Larry, he and his wife needed very little support in using the system, quickly developing a routine to support his everyday communicative interactions. Specifically, his wife would set up the system so that Larry could use it during his "alone time" to type out messages to friends and family he knew would be visiting him later. Hengst provided consultation support as needed; however, they were independent in managing the system and requested little support.

Although Larry was the person with ALS and an acquired inability to speak, he was struck by how many of his friends and family had "trouble talking to someone who can't talk in return." Larry wrote frequent and long notes to his wife, but fewer and shorter notes to his friends (many of whom slowly drifted away as his disease progressed). After his death, Larry's wife printed out a copy of one of the notes he had typed to her, thanking her for learning along with him. Hoping it would be helpful in training future SLPs, she shared the note:

> How much I appreciate your talking. To me, that is. That may seem like a funny thing to be grateful for, but now that I'm not able to talk, neither can some of my family and friends. At least not to me. Now only a nurse, t v, tape and radio are able and available to me. Some people simply disappear. Others make a kind, but embarrassed visit, leaving as soon as possible. Some people pop in for a few minutes; but even though they show love to me, they also have trouble talking to someone who can't talk in return.

Nearly 30 years later, this note continues to resonate for us. Larry's poignant observation that his inability to talk meant that some of his family and friends had also lost the ability to talk with him reminds us that communication disorders are also distributed. From an SDA framework, there was limited flexibility in these functional systems—Larry no longer had the physical flexibilities to quickly adjust contributions; his device did not support rapid formulations of spontaneous utterances, conversational repetition, or back-channel feedback; and many of his communication partners could not muster the communicative and affective resources to shift their communicative roles and practices.

Henry's case: Mediating interactions is not just messaging

About a decade later Hengst worked with "Henry," who was around 60 years old, living at home with his wife, and in the chronic phase of recovery from a left hemisphere stroke. Although his acute right-sided hemiplegia had mostly resolved, he continued to have severe aphasia and apraxia of speech with no functional spoken language, minimal

reading and writing (e.g., he could recognize signs, sight-read familiar words, and sign his name), and modestly more preserved auditory comprehension. In addition, his profile was complicated by a previously undiagnosed TBI (from a car accident more than a decade earlier) that left him with symptoms consistent with frontal lobe damage. Henry was easily frustrated and impatient, but was a highly motivated and persistent communicator (despite his often limited success).

Hengst began working with Henry shortly after he had been discharged from his subacute rehabilitation program. At that time, he and his wife wanted to support Henry's communication in everyday activities (e.g., church, travel, and visiting with family and friends) and to find out whether a dedicated SG-AAC device would help him "speak for himself" and "get his points across." Initial sessions focused on introducing them to, and conducting trials with, a range of different AAC devices until Henry settled on a dynamic-display device from Dynavox[2]. This state-of-the art device (for that time) allowed for generative construction of novel messages, included enhancements to speed up access (e.g., word prediction), and offered multiple layers and levels of programmable pages to accommodate different settings and activities. In addition, it was portable and the company provided extensive technical support for families.

Henry's wife took primary responsibility for programing and managing his device, and Hengst continued to consult with them as needed to help optimize Henry's device use in different settings. Each week, Henry and his wife spent time at home interacting (Henry using nonverbal means primarily) about their activities and deciding what Henry wanted to communicate. Then during therapy sessions, we discussed ways of organizing different pages on the device (e.g., around activities or settings), where to put the different stories Henry liked to tell and how to store them in segments (for easier telling), and how not to overly duplicate endogenous supports Henry could readily use in specific settings (e.g., menus and bulletins).

Similar to Larry's experience, Henry's wife was particularly concerned that other people often struggled to communicate with Henry using his Dynavox. For example, she noticed that during Sunday morning coffee hours at church, people would rarely try to visit with Henry—quickly waving "hi" or shaking his hand, but too often seeming to avoid him altogether. However, when Hengst observed Henry at his adult daycare center (which he attended several days a week), his pattern of device use was striking and surprising. For example, during one observation, a group of school children were visiting the center, and Henry (who loved kids) had been anticipating their visit. He waved a few of the children over to where he was sitting and gestured to them about his Dynavox, inviting them to "push the buttons" themselves. As one boy tentatively explored the device, Henry guided him to different pages so he could select different songs to play. Much like strangers chatting around a jukebox, Henry and this boy had a sustained nonverbal interaction around the different songs he had programed into his device. It was also interesting to see how this interactional pattern caught on, as other children stopped by to watch them and stepped in when the first boy left.

Henry loved his Dynavox, took it everywhere, and by many metrics, he and his wife were excellent AAC users who never considered abandoning the device. At home, his wife's ongoing management and updating of the device was a familiar collaborative activity that anchored family interactions. However, it is important to recognize that in other familiar, long-standing settings (like church), the device did not help mediate Henry's interactions. It is also important to note that

[2]An earlier version of the Tobi Dynavox, see: https://www.tobiidynavox.com/en-US/devices/multi-access-devices/i-110-na/

when Henry used his devices successfully with the children at the adult daycare, he did not use it in a "traditional" or expected way. Instead of using the device to craft expressive messages or carry on a conversation, Henry used it along with nonverbal means to invite social interaction and play songs, which supported meaningful, fun, engaged social interactions with the kids. In SDA terms, Henry's distributed use of the device in that setting supported and enabled him to successfully assemble functional systems within and around the sociomaterial environment and to accomplish situated goals. Finally, it is important to highlight that the device's key function for Henry was less about giving him a voice to express his ideas and more about its ability to mediate positive, sustained social engagement (as seen in both his lengthy and repeated interactions with his wife around programming the device and his use of it as a digital jukebox with the kids).

Rhonda's case: Digital photography can mediate distributed communication

Our last case is from Sherrill's clinical work a few years before this article, at a time when use of nondedicated devices and computer-based apps (for both AAC and speech–language exercises) had become better established practices. Rhonda was a highly educated woman in her 40s, a computer programmer, and mother of three small children when she had a left hemisphere ischemic cerebrovascular accident (a complication from her cancer treatments). About 5 months into her recovery, Sherrill was assigned to work with Rhonda as part of the outpatient rehabilitation program. At that time, Rhonda presented with a severe nonfluent aphasia and mild right-sided hemiparesis. Early in her rehabilitation, an SLP had encouraged Rhonda to purchase an iPad to support their therapy goals (using drill-based apps) and to augment her current communication needs (using a dedicated AAC app). Throughout her inpatient and outpatient rehabilitation, Rhonda had been dutifully bringing her iPad to therapy sessions. Outside of therapy she only used it, with limited success, for her SLP homework assignments. Rhonda's husband reported she had not used the AAC app or any other features "even once" to initiate or support communicative interactions of any kind (e.g., face-to-face, email, and social media). Despite her professional computer knowledge, Rhonda referred to the iPad simply as her "homework."

Over 3 months with several different SLPs, Rhonda had been receiving drill-based, impairment-focused, outpatient therapy that focused on improving word-level productions (e.g., single-word repetition and confrontational naming) and phrase-level auditory comprehension (e.g., responding to abstract wh-questions and complex yes/no questions) with instructions to use the apps as a self-guided home exercise program. Rhonda's treatment did not involve her family members; in fact, they were asked to remain outside the therapy room during her sessions. Rhonda had demonstrated very limited improvement. She and her family were frustrated with the lack of carryover of even her modest clinical improvements to functional activities/language use. To address this frustration and the lack of progress, Sherrill decided to adapt the collaborative referencing intervention (CRI) to better address everyday communication goals. Briefly, the CRI situates the client and clinician as game play partners who collaborate around identifying and placing personally relevant photographs on their playing boards (for details, see Devanga et al., 2020; Hengst et al., 2008, 2010).

Critical for our discussion here, the CRI aligns the client and clinician around practices typical of friendly game play (rather than those of a clinical task) with a goal of building *rich communicative environments* to support learning (see Hengst, 2015, 2020; Hengst et al., 2019). This notion of rich communicative environments translates neuroscience research documenting the positive impacts that enriched environments have on laboratory animals' abilities to learn new tasks and recover from injuries (e.g., Greenough, 1976; Hebb, 1949; Van Praag et al., 2000).

That research has highlighted three principal components of enriched environments: *environmental complexity, voluntary participation,* and *optimization* of such environments. Reviewing the evidence that enriched housing environments have positive effects on learning, neuronal structure and function, and recovery from brain damage, Hengst et al. (2019) observed that "there is no treatment approach that has been more well replicated to improve function in rodent models of acquired brain injury than housing in a complex environment" (p. 218). Integrating the neuroscience findings on enriched housing environment with SDA theories, we characterized *rich communicative environments* as ones that "are likely to include multiple participants who are engaged in multiple activities, who actively use diverse multimodal communicative resources (including language, gestures, physical tools, and instruments), and who take up and shift among various communicative roles (such as people switching between storytellers and audiences as they swap stories)" (Hengst et al., 2019, p. 221).

To start the CRI program, Sherrill asked Rhonda to collect current photographs of her home, family members, and day-to-day activities to use during the CRI sessions. The "camera" function on iPad provided a ready-to-hand and efficient tool to collect the needed photographs. At the next session Rhonda arrived with several photographs stored on her iPad, which Sherrill printed for use in the CRI game. As this new therapy program progressed, family members became involved in multiple ways. At first Rhonda shared photographs with her family as she was taking them. Soon family members began actively suggesting and choosing photographs for her to use (e.g., "this is her favorite," "this is a good one for mom!"). From the beginning, family attended these sessions, watching Sherrill and Rhonda play the game and talking with Rhonda from the sidelines offering suggestions and personal cues. By the fourth week, family members began taking turns playing the game with Rhonda. As treatment continued, pictures became more and more complex (e.g., from a close-up picture of a pair of favorite socks to a landscape picture of their local park). Rhonda began voluntarily taking her iPad with her on family walks and errands.

Interactions around a swimming lesson photograph provide a striking example of how Rhonda's use of the iPad began to augment her communicative environment. One day Rhonda brought in a photograph of her son's swimming lesson, but would not accept any label during the session. Sherrill noticed a pair of goggles on the side of the pool and commented on them. Rhonda became very excited, and immediately turned to her spouse, gestured, and handed him the iPad with the photograph. Apparently, her son had lost his goggles that day so was unable to finish the lesson. When he heard about the missed lesson, Rhonda's husband assumed their son had somehow misbehaved, and Rhonda had been unable to explain that is was simply that their son had lost his goggles. Using the photograph on the iPad during the CRI treatment, the goggle story was worked out by the group. By the end of the interaction, Rhonda was crying—so relieved to be able to explain a simple situation.

Rhonda's children quickly picked up on the power of this resource to mediate instances of misunderstanding or potential problems and began to "cue" her to use the iPad to "take a picture of this," or "take a picture so we remember to tell Dad that." Selection of pictures became a routinely distributed process involving all family members, impacting not only their participation in therapy, but also their personal relationships. Rhonda and her family created a nontherapy folder on the iPad ("Just Mom") where her children could upload photographs of things or events they wanted to discuss with her "privately." Eventually, they deleted the Speech Therapy and AAC apps in order to store and arrange the growing collection of photographs. Outside of therapy sessions, Rhonda began returning to parent–teacher association (PTA) meetings

at her children's schools and began practicing amateur photography with her iPad. After leaving the area, Sherrill kept in contact with Rhonda and her new SLP and learned that Rhonda had enrolled in a digital photography course and her SLP focused on working through that course content during clinical sessions.

Although Sherrill had extensive experience developing and supporting AAC systems for clients with neurogenic disorders, at the time she had not conceptualized either the CRI or photography as AAC. From an SDA perspective, Rhonda and her family's adaptations of the CRI to mediate everyday interactions was striking. Not only did they readily and creatively repurpose the iPad photograph functions, but they also developed new practices to engage in distributed communication (both through collectively working to take key photographs for later use and through family interactions mediated by those images).

Reconceptualizing AAC through these clinical cases and SDA

These clinical cases and our reflections on them highlight mismatches between dominant transmission models of communication and prosthetic models of AAC and the experiences of these clients using devices as mediational means. What in a transmission model would lead us to expect that Larry's ALS would silence many of his friends and family? Why did many of Henry's most successful uses of his AAC device involve drawing attention to and mediating social engagement rather than sending messages to express his ideas and needs? How did CRI and general photography apps lead to a richly articulated set of AAC practices for Rhonda and her family, a shift from frustration and lack of progress to deep engagement and functional gains (including Rhonda's return to schooling for digital photography)? Each of these cases chipped away at the traditional prosthetic model, as we saw the distributed and creative adaptations that clients and their routine communication partners made to assemble successful functional systems as well as the way inflexibilities in distributed communicative environments could lead to failed communication. In the next section, we turn to a participatory design AAC project grounded in SDA and centered on asking how communication is mediated through people's participation in complex communicative environments of everyday activity.

PARTICIPATORY DESIGN AND THE CASE FOR PSEUDO-INTELLIGENT MEDIATORS THAT BROKER PARTICIPATION

The sense that SDA offers a different theoretical framework for modeling communicative practices and that complex, distributed, and emergent discourse is needed for fast interactions in mobile, laminated everyday activities led a team of computer scientists and engineers, communication researchers, disability experts, and potential users to undertake a participatory design project (Hengst et al., 2016). The project began when an engineer approached one of us (Hengst) about working together to design AAC devices that would allow a richer range of voices (customization of sound), a project very much in the prosthetic tradition. Over a series of interactions, Hengst suggested that lessons from situated studies of discourse argue for expanding the role of AAC devices to function as PIMs that can actively mediate and broker communication. The engineer was intrigued, and we began a multiyear, multidisciplinary team collaboration. Our design team aimed to explore the potential of digital technologies to function as PIMs in everyday multiparty interactions, to blend strengths of human mediators (or brokers) with features of current AAC devices.

Long-standing traditions in artificial intelligence and assistive technologies have argued for the importance of understanding the situated practices that technologies are being designed to replace or support (e.g., Dreyfus, 1992; Kaptelinin & Nardi, 2012; Suchman, 1987). As a critical first step then, we undertook SDA in everyday environments

at a university campus to help the team identify what kinds of tools might help people with communication disorders mediate the fast-paced, mobile, minimally scripted, and densely laminated interactions typical of campus life (Hengst et al., 2016). Using ethnographic methods, we collected interview and observational data with 13 primary participants from the campus community (seven of whom used assistive technology because of physical or communicative disabilities and six of whom reported no known communicative or physical challenges) along with secondary participants (friends or personal aides of primary participants) and incidental participants (unplanned participants who agreed to be video recorded during observations of target participants). Our initial analysis (Hengst et al., 2016) reported on the 16 campus observations (over 11 hr of video) completed with six of the primary participants who used assistive technologies (five self-identified with cerebral palsy and one with bilateral hearing loss). Our analysis included transcribing all sessions, coding sessions for specific discourse resources, and completing SDA of selected interactions.

As we argued in Hengst et al. (2016), even activity-oriented approaches to human interaction have tended to be anchored to a specific setting, with research looking at how people work and communicate *in* school or *at* work or *in* consultations with doctors. However, this focus on anchored settings and their officially dominant activities sits uneasily with two facts. First, people move across multiple settings in daily circuits that are only partly predictable (e.g., taking a bus to the university, going to a coffee shop, and then traveling with a friend to a class). Second, any setting is open to multiple, emergent and laminated activities. A coffee shop line to the register may at one moment be a service encounter with a barista, at the next a conversation with a passerby about a homework problem from class, and then a sharing of stories with a friend about a party over the weekend. These shifts across and within specific sociomaterial environments require communicative resources that can link words and other multimodal signs to different times and places, different people and social roles, and different activities. The notion of *indexical grounds* (Hanks, 1990; Hengst, 2020) points to the complex, emergent, shifting grounds (imagined and material) within which signs make referential sense. For example, if someone says "the book," the words might refer to a book sitting on a table at the coffee shop (the centered, here-and-now, co-present indexical ground); a book that a homework problem came from (the decentered, not here-and-now, indexical ground of a class both people are taking); a shared notebook where the friends record strange, funny, and telling actions of their acquaintances for an end-of-year friends' roast (a decentered, interpersonal indexical ground built over a dispersed series of interactions); the Bible (another decentered indexical ground built up over a long history); or many other potential specific referential senses. Communicative success routinely requires such situated signaling and recognition of relevant indexical grounds, not just a knowledge of the general meaning of words (or other multimodal signs).

Given our interest in designing PIMs, we became particularly interested in service encounters where a PA was mediating a target participant's interactions, often with unfamiliar others. Here, we revisit the interaction with Jessie at the computer store that we briefly described at the beginning of this article. The interaction happened during the second observation with Jessie, where Jessie, his aide, and the researchers went to a small tech store at the Student Union (see Hengst et al., 2016, pp. 23–25). The visit had not initially been planned during the observation, but Jessie's first errand at the Union was quicker than expected, so he decided to add this visit to our observation. At the time of the study, Jessie was a 30-year-old doctoral student who was working part-time as a teaching assistant. Jessie self-identified with cerebral

palsy, used an electric wheelchair to navigate campus, and employed several PAs. He reported people often had difficulty understanding his speech. Although he had used a dedicated AAC device when he was younger, he had not used one in recent years and did not plan on using one in the future. In fact, Jessie rejected the notion that he needed a specialized device, arguing that people just needed to be willing to give him the time and attention he needed to communicate. Here, we revisit a close discourse analysis of a stretch of interaction from Jessie's visit to the tech store to trace the complexly unfolding and shifting indexical grounds built multimodally in this short, quite mundane stretch of interaction.

The observation involved a total of six people—Jessie and his PA, three researchers (who managed the recording equipment), and the store clerk. Jessie decided to go the tech store during this observation because it was close by, we had the time, and he wanted to buy something, but the PA and researchers did not know what he wanted. We next present in three phases a brief stretch of interaction (about 1 min), where Jessie, his PA, and the clerk worked to align around what Jessie wanted to buy.

Opening exchange The group enters the small store, which is empty except for the clerk (Z). In this initial scene, Jessie takes on the role of shopper by addressing the store clerk, who attentively engages with his request. However, Jessie seems unsure what the item is called, offering a description and then a possible reference (clickers), but the clerk displays trouble understanding Jessie. Jessie tries to clarify with two self-repetitions, and then looks to his PA in an apparent invitation to assist. In lines 4 and 5, Z offers another possible reference and Jessie repeats "clickers" a third time:

1. J: I would wonder if you had uhm if you sold uhm the [unclear utterance] to change the slides or change the pictures? [*looking at clerk*]
2. Z: The wireless- [*looking at Jessie*]
3. J: Clickers. (..2..) Clickers. [*looking at PA*]
4. Z: Speakers? [*looking at Jessie*]
5. J: Clickers. [*looking back at clerk*]

Negotiating references and roles. As the exchange continues, the PA displays (line 6) that she now understands the word, emphatically saying "clickers" and repeating it. However, the word does not clarify what Jessie is seeking. The clerk first interprets clickers as the I-Clicker, a classroom response tool often required of undergraduate students. After Jessie says "no" and tries to clarify, the PA backchannels her understanding and fleetingly acts out using a remote control device to change slides. In line 9, she multimodally refigures herself as a presenter (maybe Jessie), holding a (virtual) remote in her right hand, and projecting the slides onto her other hand, now refigured as a screen in a virtual space (perhaps a class or conference room):

6. PA: CLICKERS! Oh clickers, I'm sorry. [*looking back & forth at Jessie &clerk*]
7. Z: The I-Clickers (looking at PA, then back at Jessie)
8. J: No, when you have a presentation. [*looking at clerk*]
9. PA: OhYeah, if you're giving a presentation like [*making a hand shape as if holding a remote; raises other hand as if it were a screen and shifts gaze toward the imagined screen*] if you have PowerPoint up and you need to li- [*clicking gesture with hand*] right?
10. J: Yeah. [*looking back at clerk*]

Shopping. The PA next (line 11) seamlessly shifts from enacting the scene of an imagined presentation to taking the role of co-shopper, expressing her own interest in these devices as well and asking Z if the store carries them. Z thinks so and leads the group to the back of the store:

11. PA: Actually I could totally use one of those (.1.) do you guys sell those? [*looking at clerk*]
12. Z: Um I think we have them at the back [*shifts body and points to the back of*

the store] over here (.1.) [*clerk begins to lead group to back of store*] [*As they walk to the back of the store, the PA asks what they're called and the clerk says*, "presentation remotes."]

Although this chain of interactions seemed to begin with a word-level trouble source around the intelligibility of Jessie's repeated word, "clickers," the breakdown was not an issue of intelligibility alone. When Jessie's PA said the word and the clerk repeated it, the clerk first guessed the wrong device. Neither Jessie nor the aide seemed to know (or be able to recall) the name of the device he was looking for, and the name the clerk gave it was only uttered after what Jessie wanted was clarified and they were heading to look at the devices. To clarify the word, the PA orchestrated verbal and nonverbal resources to produce a narrative-like performance—enacting a fleeting imagined and figured scene (a decentered, imagined indexical ground) where she (probably figured as Jessie) was holding a (virtual) remote with one hand, pointing toward her other hand (figured as an imagined screen), and gesturing with her hand to simulate clicking the remote to advance slides in that decentered indexical space. This embodied enactment worked not only to clarify Jessie's meaning (to confirm he was looking for a presentation tool, not a student response tool), but also to project Jessie into an alternative role for the clerk, one where Jessie was an instructor or presenter giving a lecture.

In the short stretch of interaction at the tech store, we identified four patterns of alignment the aide used in mediating Jessie's interactions with the store clerk: she translated his unintelligibly spoken word "clickers," produced an embodied enactment of using an imagined presentation remote to try to clarify his meaning, co-participated in the activity (taking on the role of enthusiastic co-shopper), and socialized with Jessie (joining as a friend in a laugh a bit later). The rapidly shifting indexical grounds and participatory alignments of the aide and her complex mediation of Jessie's shopping offer a snapshot of the complex work that a PIM might be designed to help accomplish. However, only a small portion of the aide's mediation, the first word-level trouble source, would be designed for in a prosthetic and transmission model of AAC, and had Jessie programmed a device to say "clickers," the programming would not have done the work needed in this interaction (just as the PA's clear enunciation of that word did not do so). Situated discourse analysis highlights the key, but complex work of negotiating indexical grounds in interactions.

Situated discourse analysis shifts our unit of analysis from the deficits of a "differently embodied person" to the mediating activities of people and tools within functional systems. Drawing on SDA analyses of the communicative interactions across the observations, we concluded that PIMs might play varied roles and would need varied resources to mediate interactions. Pseudo-intelligent mediators could actively read and shape the indexical grounds of talk (not just producing strips of talk), have dialogic capacities (e.g., the ability to search past histories of interaction with particular people for relevant common ground), and engage as diverse kinds of partners in diverse kinds of discourse (participating in episodes of play, narrative, and procedural discourse). Pseudo-intelligent mediators could produce reported speech to voice the user's words. Our participatory design research suggested the value of a device with facial recognition capabilities to cue up relevant communicative resources (in part through histories of recent interactions with the person) regardless of the context. If you walk into a doctor's office and see a friend there, the PIM should be calling up resources for the friend, not just medical reception routines. Using GPS, the PIM could also offer running commentary (e.g., identifying spaces, commenting on landmarks, and recalling relevant memories). We also began to recognize the importance of mundane attention-getting and floor-holding resources

(e.g., throat-clearing; use of fillers like "um" and "just a second").[3]

Our analysis suggested a key design parameter is *agility*, the ability to recognize and navigate rapidly shifting activities, communicative resources, and indexical grounds. Drawing on our observations of human mediators, we imagine PIMs designed to co-participate and socialize *with* the user and others (as Jessie's aide did at the tech store) in order to draw less agile humans into successful interactional frameworks. Pseudo-intelligent mediators would not need to reproduce the competence of accomplished human communicators, but would need to be able to mediate the distributed work of people in an interaction, goals that sometimes can be achieved in quite simple ways (e.g., throat clearing to get joint attention). Situated discourse analysis research, in other words, points toward PIMs designed to facilitate communicative activity distributed in historically deep but locally assembled functional systems.

IMPLICATIONS: USING SDA TO REIMAGINE AAC AND OTHER CLINICAL PRACTICES

In relation to this special issue's focus on advancing discourse analysis, SDA offers a theoretical synthesis of multiple approaches to situated communication, action, and learning. This synthesis takes discourse as complex, distributed, and emergent processes using multimodal communicative resources that mediate people's sociocultural activities, as they assemble functional systems to achieve goals in particular sociomaterial environments. Situated discourse analysis has already contributed to a line of novel and theoretically significant analyses of communicative interactions of individuals with acquired cognitive and communication disorders, including aphasia, amnesia, dementia, and TBI (e.g., Duff et al., 2006, 2008, 2009, 2013; Gupta et al., 2011, 2012; Hengst, 2003, 2006, 2010). That research has also begun to be translated to the development of a specific clinical intervention, the CRI (Devanga et al., 2020; Hengst et al., 2008, 2010), and to the identification of a novel learning model for clinical interventions, *rich communicative environments* (Hengst, 2020; Hengst et al., 2019). Here, we have begun to explore how SDA can offer a different communication model for theory, research, clinical intervention, and device design in another key area of clinical practice, AAC.

For AAC, these SDA perspectives lead us to argue that the prognosis for computerized AAC devices to support everyday unscripted interactions across the varied settings of daily life will remain poor as long as those devices are grounded in the combination of a prosthetic approach to speech production and models of language as an abstract system (of phonology, syntax, semantics, and pragmatics) for transmission of messages. The cases we have worked through here display that the development and implementation of AAC systems must be informed by theories like SDA that acknowledge complexly laminated and distributed communicative activity in emerging functional systems (as seen with Jessie and the PA in the tech store). The ability of current AAC approaches to give someone like Stephen Hawking a voice is a remarkable achievement, but it remains a very narrow and specialized accomplishment that depended on creating functional systems that would align around Hawking's need for prescripted talk (like his lectures) and his fame (which not only led to a rich system of human and technological supports but also allowed him to reset the rules for

[3]Our team worked together for three years with significant university seed funding. We identified two models for PIMs, as dedicated, multifunctional devices (e.g., tablets that would operate like communicative robots) or as a suite of applications that could be used on common mobile devices, like phones. We did some initial prototyping with primary participants. Although grant proposals were reviewed positively, the team was never able to secure the major grant funding needed to move to the next stage and the team eventually moved on to other projects.

his interactions, as he did in limiting questions to those presented ahead of a lecture). The success of an SG-AAC device in these specialized conditions can deflect attention from the ways communicative success and failure are always distributed across people and resources (Hawking, Larry, and Jessie), the ways functional systems and interactional roles are always assembled in support of multiple activities (Henry), and the ways clients' flexible uses of technologies (including AAC devices) emerge through their engagement in meaningful activities with others (Rhonda's case).

More broadly, we suggest that SDA aligns well with what could become an important tool in clinical practice across settings, participatory design (see Hengst, 2020; Spinuzzi, 2005). When we reflected on our clinical cases, we saw the power of clients and their routine partners participating actively and creatively in identifying needs and preferences, in imagining potentials, and in repurposing resources. Participatory design argues for a shift from a traditional delivery model focused on *offering* therapy, training, and devices to clients and their families to a design model focused on *collaborating with* clients, their families, and others to design environments and tools for their own motivated learning, communication, and sociocultural activities. In his introduction to participatory design research, Spinuzzi (2005) highlights the critical importance of beginning by building a design team, and then outlines three iterative phases that such teams cycle through: (1) initial exploratory phases; (2) discovery processes; and (3) prototyping or trying out potential tools or activities. Both theoretically and methodologically, participatory design aligns well with SDA and provides a framework not only relevant to AAC design and interventions, but to clinical work more broadly. What all of these cases also highlight is that we need theories of learning across the lifespan—of how individuals with communication disorders and the social groups they interact with continuously learn to recognize and deploy communicative resources and reorganize their communicative lives.

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