Social Interaction Involving Non-speaking Children with Severe Cerebral Palsy and Intellectual Disability

The role of communication partners and speech-generating devices

HELENA TEGLER
The overall aim of this thesis was to investigate the use of speech-generating device (SGD)-mediated interaction with children with anarthria, severe physical impairments and intellectual disabilities due to cerebral palsy with a focus on partner strategies and social practices.

Studies I and II were cross-sectional studies that used questionnaires, which were analyzed using descriptive statistics and directed content analysis. In Study I, speech and language pathologists’ (SLPs) practices and perceptions of communication partner training in SGD-mediated interaction were examined. In Study II, communication partners’ (i.e., caregivers’, teachers’, and assistants’) practices and perceptions of communication partner training in SGD-mediated interaction were examined.

Studies III and IV were qualitative observational studies that used video recordings, which were analyzed with ethnomethodological conversation analysis. Study III investigated how multiparty classroom interaction was organized when one of the students used an eye-gaze accessed SGD. Study IV explored the social actions that mobilized SGD-mediated responses when the child was a beginner user of the eye-gaze accessed SGD.

The findings suggest the following: all participants (i.e., SLPs, caregivers, teachers, and assistants) considered that SGD-mediated interaction was beneficial for the children. SLPs were important providers but they provided few training sessions and used mostly verbal instructions. Communication partners could benefit from more support from SLPs and SLPs should consider using additional instructional approaches such as feedback and role-play when coaching communication partners in SGD-mediated interaction. Children could interact with their eye-gaze accessed SGDs in multiparty classroom interactions provided that the turn-taking in Initiation-Response-Evaluation (IRE) sequences was applied and that the teacher or the assistant provided contingent on-screen gaze and deictic scaffolding actions. Communication partners to children who were beginner users of an eye-gaze accessed SGD may need to produce repeated turn transition relevance places and use contingent on-screen gaze and deictic practices to scaffold an SGD-mediated response.

This thesis brings new knowledge to the field of SGD-mediated interaction. Partner strategies that can enhance children’s linguistic skills were seldom used in multiparty classroom interaction, but other social practices were used, which facilitated social inclusion and participation.

Keywords: Augmentative and Alternative Communication, Speech-Generating Device, Partner Strategies, Social Practices, Cerebral Palsy, Intellectual Disability, Multiparty Interaction, Classroom, Ethnomethodological Conversation Analysis

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This thesis is based on the following papers, which are referred to in the text by their Roman numerals.

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Abbreviations and terminology

AAC  Augmentative and Alternative Communication
CP   Cerebral Palsy
Dyadic Two participants in interaction
GMFCS Gross Motor Classification System
ID   Intellectual Disability
IRE  Initiative, Response, Feedback/Evaluation sequence
MACS Manual Ability Classification System
Multiparty Four or more participants in interaction
SGD  Speech generating device
SLP  Speech and language pathologist
Preface

I had been working as a speech and language pathologist (SLP) with non-speaking children with severe cerebral palsy for 20 years when eye-gaze technology was first launched. We were all exited; non-speaking children with severe physical impairments, who were not able to use their hands, could now independently access a speech-generating device (SGD). The devices were tried out at the local habilitation centre in collaboration with the multi-professional specialist unit team at the regional paediatric habilitation centre. It was wonderful to see how children could joke, ask for things and people, take photos and play games, and indicate if something was wrong, all thanks to this technology. Yet, we soon discovered that the implementation of these SGDs was challenging, despite the fact that caregivers, teachers, and assistants were all positive about the technology and received as much technical support as they requested. We had what appeared to be a perfect technological solution, but it was seldom used; not at school nor at home. We were convinced that the eye-gaze accessed SGD could enhance the children’s participation. I was curious. What was missing? Why did the teachers not use the SGD in the classroom settings even though they were supplied with a vocabulary that corresponded to the content of their lessons? The children showed competence and eagerness to use the technology, so why was it not used more often? How were the SLPs teaching theses communication partners about SGD-mediated interaction? Was the support that was provided to the communication partners insufficient? If so, how could it be improved? The questions were many and I was very enthusiastic and thankful when I received funding from the Sävstaholm Foundation and I could start my doctoral studies in February 2015.
Background

All children, regardless of their functionality, have equal human rights to full participation in social interactions and to equitable education (United Nations, 2009; World Education Forum, 2016). However, children who have speech and language impairments in combination with physical impairments have fewer friends, they participate in fewer activities and are less likely to be included in social interactions than children with typical speech and language development (Batorowicz, Campbell, von Tetzchner, King, & Missiuna, 2014; Raghavendra, Virgo, Olsson, Connell, & Lane, 2011; Thirumanickam, Raghavendra, & Olsson, 2011). Moreover, non-speaking children with severe physical impairments and intellectual disability depend completely on the knowledge, skills, attitude and confidence of supportive communication partners (e.g., caregivers, teachers, and assistants) in scaffolding augmentative and alternative communication (AAC), for example, in their use of a speech-generating device (SGD) (Light & McNaughton, 2013). SGDs can provide these children with a voice and the opportunity to participate in face-to-face and remote interaction. However, opportunities for SGD-mediated interaction are often restricted (Andzik, Chung, & Kranak, 2016; Batorowicz et al., 2014; Hemsley, Kuek, Bastock, Scarinci, & Davidson, 2013).

The focus of this thesis was to investigate (i) adult communication partners’ use and learning of partner strategies (e.g., environmental arrangements and aided language modelling) and (ii) their use of social practices (e.g., first pair parts of adjacency pairs and meta-interactional prompts) in SGD-mediated interaction. Two theoretical pathways (one more individualistically- and the other more dialogically oriented) underpinned two sets of studies in this investigation.

Study I and Study II, which examined the use and learning of partner strategies, were informed by theories within the individualistic pathway (Delprato & Midgley, 1992; Kolb, 2015; Mezirow, 1997; Piaget, 1959; Searle, 1969). Study III and Study IV, which examined how participants organize eye-gaze accessed SGD-mediated interaction in multiparty classroom interaction and in dyadic interaction, were informed by theories within the dialogical and ethnomethodological pathway (Garfinkel, 1967; Mondada, 2011; Sacks, Schegloff, & Jefferson, 1974; Streeck, Goodwin, & LeBaron, 2011). The background begins with an overview of the medical diagnosis of the children included in the studies in relation to their environment.
Cerebral palsy and intellectual disability

Cerebral Palsy (CP) is the most common cause of childhood physical impairments (Stanley, Blair, & Alberman, 2000). It is a neurodevelopmental non-progressive condition that is caused by damage to the foetal or infant brain affecting body movements and posture (Bax et al., 2005). The prevalence of CP is 2-2.5 per 1000 live new born children (Oskoui, Coutinho, Dykeman, Jette, & Pringsheim, 2013) and it can be described in terms of its type (spastic, dyskinetic/athetoid, ataxic, or mixed type), location (unilateral or bilateral), severity (mild, moderate, or severe), muscle tone (hypo- or hypertonic) and by its function. The gross motor classification system (GMFCS) and the manual ability classification system (MACS) describe how CP affects gross and fine motor function (Eliasson et al., 2006; Palisano et al., 1997). The Viking Scale describes how speech is affected (Pennington et al., 2013).

CP is usually associated with other conditions such as impairments in eating and drinking, speech, language, communication, attention, executive functions, cognition, vision, hearing, and epilepsy (Bottcher, Meulengracht, & Uldall, 2010; MacLennan, Thompson, & Gecz, 2015; Stadskleiv, Jahnsen, Andersen, & von Tetzchner, 2017). About 50% of all children with CP have speech and/or language impairments, and 20% lack speech (i.e., have anarthria) (Andersen, Mjöen, & Vik, 2010; Nordberg, Miniscalco, Lohmander, & Himmelmann, 2013). Furthermore, the majority of children with severe physical impairments have both anarthria and intellectual disability (Påhlman, Gillberg, & Himmelmann, 2019).

Intellectual disability (ID) has three criteria: (1) an IQ score of 70 or lower, (2) limitations of adaptive functions, which affects home life, school, work, and the individual’s degree of engagement with the community, and (3) the onset of both intellectual- and adaptive dysfunction before 18 years of age (American Phsyciatric Association, 2013; Brue & Wilmshurst, 2016). ID results in limitations within a person’s reasoning, language comprehension, reading and writing, executive functions (e.g., planning, realisation, and completion), emotional and behaviour regulation, and memory. Individuals with ID often have a reduced ability to understand interactional cues, which can affect social interaction.

Medical diagnoses such as CP or ID provide important information on the prevalence and risk of associated conditions, but they do not explain how the impairments affect the daily lives of specific individuals. In order to understand the association between medical conditions and environmental factors, the World Health Organization (WHO) has developed the International Classification of Functioning (ICF).
The International Classification of Functioning

ICF is a bio-psychosocial model, consisting of an international language and framework that describes an individual’s health-related conditions, such as CP or ID, in relation to his/her environment. ICF-CY (2007) is a development of ICF that covers children up to 17 years’ of age.

ICF-CY consists of two parts. The first part, Functioning and Disability comprises the components of Body function (i.e., physiological functions), Body structure (i.e., anatomical body parts), and Activity and Participation. According to the WHO, “Activity is the execution of a task or action by an individual” and “Participation is involvement in a life situation” (WHO, 2007, p. 9). Krummheuer, Klippi, Raudaskoski and Samuelsson (2016) objected to such an individualistic definition of activity and participation. They argued that participation is not a stable phenomenon but a phenomenon that develops in interaction through participants’ cooperative practices in various activities. The second part, Contextual factors comprises the components of Environmental factors (i.e., Products and technology; Natural environment and human-made changes to environment; Support and relationships; Attitudes; and Services, systems and policies) and Personal factors (e.g., gender, age, lifestyle, social background, and education). Personal factors can affect the outcome of an intervention, but they are not classified in ICF-CY (2007, p. 16). Researchers have used the ICF-CY framework to illustrate how speech and language impairments affect participation in social interaction and to highlight the necessity of including environmental components in augmentative and alternative communication (AAC) interventions (Light & McNaughton, 2015; Urbanowicz, Leonard, Girdler, Ciccone, & Downs, 2016).

Augmentative and Alternative Communication

AAC comprises all communicative modalities except speech. AAC is an intertwined practice of linguistic resources (e.g., letters, pictures, and symbols), embodied resources (e.g., gaze, gestures, sounds, and sign language), artefacts, and partner strategies (e.g., responsive interaction) (American Speech-Language Hearing Association, 2017; Pilesjö, 2009). AAC is typically divided into unaided AAC, which comprises for example gestures, mimic, gaze behaviour, and body orientation; and aided AAC, which includes artefacts, for example, objects or photos, pictures, and symbols that are arranged on communication boards or in speech generating devices (SGDs) (Beukelman & Mirenda, 2013).
Speech generating devices

SGDs range from simple, battery-driven SGDs to computerized high-tech SGDs with analogue, digitized, or synthetic speech production capabilities. In this thesis, the focus was on interaction with high-tech SGDs because they can be accessed by techniques other than just direct pointing. Children with severe physical impairments, i.e., children who cannot use direct pointing, can use eye gaze technology to access a computer, for example an SGD (Perfect, Hoskin, Noyek, & Davies, 2019). Eye gaze technology works like a mouse curser. An infrared light registers the child’s eye movements. The eye movements are recorded and calculated by algorithms in a sensor on the computer. The movements are then presented as the mouse cursor on the SGD screen. The vocabulary of SGDs consists of pictures, photos, symbols, letters or words, which are systematically organized in groups of symbols according to semantic organization (e.g., people, places, actions) or by event schemes, routines or activities.

SGD-mediated interaction can provide non-speaking children with a voice, increased independence, enhanced social participation, and self-determination (Borgestig, Rytterstrom, & Hemmingsson, 2017; Caron & Light, 2016; Rytterström, Borgestig, & Hemmingsson, 2016). Furthermore, it may facilitate comprehension and learning in school settings, but it can be difficult to implement (Rytterström et al., 2016; Tonsing & Dada, 2016). Previous research has identified a number of factors that have a negative impact on the implementation of SGDs. These include: (i) SGD specific issues (e.g., technical problems, sun reflections, short battery time, heavy, and clumsy device); (ii) lack of vocabulary; (iii) insufficient support and training from professionals (McNaughton et al., 2008); (iv) the long time it can take to produce an SGD-mediated contribution (Dattilo et al., 2008; Howery, 2018; Therrien, 2019) and; (v) professionals’ lack the time, knowledge, and practical experience of SGD-mediated communication (Anderson, Balandin, & Stancliffe, 2014; Bailey, Stoner, Parette, & Angell, 2006; Batorowicz et al., 2014; Lindsay, 2010; Rackensperger, Krezman, McNaughton, Williams, & D’Silva, 2005).

Communication and language as action

Communication is an umbrella term that comprises social interaction between at least two participants, intrapersonal communication (i.e., thinking), and communication between an individual and an artefact (e.g., a computer, a newspaper, or a schedule) (Linell, 2009). Bakhtin (1981), who was a philosopher and a literary critic first coined the concept of dialogue. He argued that dialogues unfold as soon as an author introduces two characters in a novel. Monologues are individuals’ own thoughts and minds. According to Bakhtin
dialogues are essential for development because participants can challenge each other’s arguments. Thus, social interaction is always dialogical. However, in this thesis, social interaction will be divided into two perspectives: the more individualistic and the more dialogical and ethnomethodological perspectives of language as a resource for action and meaning making.

The individualistic perspective on social interaction and language

Within the classic individualistic perspective, communication is viewed as the transmission of linguistic information from one individual to another, from a sender to a receiver. This metaphor has been developed within the speech act theory tradition, for example Searle (1969), and has influenced research and professional practices that focus on children with communicative disabilities and their development of communicative abilities. The sender-receiver model in the form of early speech act theory comprises six components (i.e., sender, encoder, channel, noise, decoder, and receiver). This model describes how an information source produces a message that is transmitted by a suitable channel to a receiver who decodes the message (Searle, 1969). Conversations are viewed as chains of independent speech acts (i.e., verbal utterances with a grammatical structure), which carry out communicative functions. There are illocutionary speech acts (e.g., requests, suggestions, promises, or explanations) and perlocutionary speech acts. Perlocutionary speech acts affect the listener. For example, they can persuade, entertain, or frighten the recipient. The speech act theory provides a systematic framework, which can be used to identify unspoken assumptions and implications. The individualistic framework is also represented by for example behaviourism (Delprato & Midgley, 1992; Searle, 1969). Skinner argued that operant behaviour (i.e., behaviours that occur before an event) can be controlled and learned though the practice of reinforcement or punishment (Delprato & Midgley, 1992). Skinner’s categorisation of ‘mands’ (i.e., requests) and ‘tacts’ (i.e., comments) resembles Searle’s categorisation of speech acts.

Within this individualistic perspective, the idea of individuals’ communicative competence is relevant. The concept of communicative competence has been investigated in different disciplines. For example, Gumperz and Hymes (1972), researchers in anthropology and sociology, defined communicative competence as a native speaker’s ability to use language and to apply cultural norms rather than to produce grammatically correct sentences. Canale and Swain (1980), researchers in second language teaching, defined it as a speaker’s linguistic, sociocultural, discursive, and strategic competence. Further, Light and McNaughton (2014), SLPs and researchers in AAC, suggested that AAC-development depends on the non-speaking person’s linguistic, operational, social, and strategic skills, his or her motivation and confidence,
executive functions (e.g., selecting, planning, regulating and monitoring actions), attention, and memory. Lastly, Beukelman and Mirenda (2013), also researchers in AAC, added that the non-speaking person’s ability to interact with AAC depends on their communication partners’ adherence to supportive policy documents, their practical knowledge and skill in AAC, and their attitudes towards AAC-mediated interaction. In this thesis, the focus is on communication partners’ practices and experiences of SGD-mediated interaction, but their potential communicative competence and skill is not explored.

The dialogical perspective on social interaction and language

Researchers within the dialogical and ethnomethodological theoretical perspective have objected to the idea that social interaction can be measured and divided into the speaker’s and listener’s independent communicative competences. Instead, they claim that social interaction is participants’ use of shared methods to achieve meaning making (Linell, 2009). Barnes and Bloch (2019) argued that social interaction cannot be measured because it is local and collaborative (i.e., each event of social interaction is unique). Consequently, a participant could be assessed as possessing high communicative competence in a specific context, but that competence cannot be generalized to other contexts. Clarke and Wilkinson (2013) suggested that communicative competence is an interactively achieved process that depends on contextual, interpersonal, and multimodal aspects in which the lack of competence of a non-speaking person can be ameliorated by the speaking person’s ability to use scaffolding methods. The dialogical and ethnomethodological theoretical perspective is drawn from the theories of sociology (i.e., the systematic study of society, social institutions, and social relationships). One of the most influential sociologists was Erving Goffman.

Goffman and the interaction order

Goffman turned the research focus towards participants’ practices and processes of face-to-face interaction. According to Goffman (1955; 1967; 1983), spoken face-to-face interaction comprises an interactional order of unspoken routines, rituals, and performances that protect our self-images (i.e., our faces). He wrote that: “Social interaction can be identified narrowly as that which uniquely transpires in social situations, that is, environments in which two or more individuals are physically in one another's response presence.” (1983, p. 2). Goffman used metaphors to describe the order of social interaction. He compared social interaction to the performance on a theatre stage: there are actors (i.e., participants) who play different roles (e.g., being a teacher, a caregiver, or a student) in different situations (e.g., at school or at home) in front of an audience (e.g., teachers, caregivers, or students). Each role constitutes an idealised notion of who we want to be. Participants behave in particular ways to dramatize their identities in front of the audience to gain
support or legitimacy for their social identities, their social selves. The primary goal of interaction is to act in ways that save everyone’s ‘face’, which consists of the positive values a person lays claim to by acting, performing and dressing in a certain way (Goffman, 1955). Face is constantly negotiated, and participants deploy face-saving acts in a specific order to restore face. There is a moral obligation to maintain the set of meanings that are projected in the beginning of the interaction. If a participant does something out of line with the expressive order, i.e., cause someone to lose face, participants are embarrassed, they apologise, and try to restore the expressive order that was agreed upon. Participants are jointly committed to this moral idea of restoring the expressional order to avoid a situation where anyone might lose face. We all know that interaction is risky, that anyone can lose face and that the network of meanings can fall apart, resulting in misunderstandings, troubles, or humiliations. Goffman suggested that socially skilled participants demonstrate stronger moral commitment to maintaining the expressive order than less competent participants do.

Goffman divided the traditional roles of speaker and listener into multi-layered participant roles. First, he divided the production role into three roles. There is the animator who produces the words, the author who composes the words, and the principal who is officially accountable for the words said. In many, but not all instances, the speaker deploys all three roles. The speaking roles in SGD-mediated interaction are often mixed however. The communication partner is often the author of the AAC-mediated contribution (i.e., the one who has chosen the vocabulary that the non-speaking person can use) and the principal (i.e., the one who is accountable for the vocabulary). The non-speaking person and the speaking person often collaborate in being the animator: the non-speaking person produces the contribution which the speaking person then translates and interprets from graphic symbols and then voices via speech (Pilesjo & Rasmussen, 2011). Second, Goffman differentiated between the recipient roles. There are: (i) those who are officially addressed (addressees) and (ii) listeners who are present but remain unaddressed (bystanders or over-hearers). Goffman suggested that turn allocation is distributed through ratification: participants can be ratified (i.e., officially addressed addressees) or unratified (i.e., not included). Participants are sensitive to the ratification status of other participants. For example, ratified participants, but not unratified participants, have the right to the floor (i.e., right to speak).

**Ethnomethodology and social interaction**

Social interaction has also been investigated within Harold Garfinkel’s (1967) ideas about social order and human sociality during the 1950s and 1960s. Within the ethnomethodological tradition, social interaction is perceived as a temporally and sequentially organized activity where meaning, participation, and intersubjectivity is constructed with linguistic and embodied resources, artefacts as well as recognizable and shared methods of turn distribution and
Garfinkel argued that society is a social construction and that social order is an illusion created in our minds. The ‘real’ world is chaotic and participants orient themselves towards shared rules and social order. Consequently, nothing happens ad hoc. Participants strive to make sense of the world by formulating theories and by using common sense and cultural assumptions (Garfinkel, 1967). All contributions are both context-dependent, in the sense that they are understood in their local contexts, from their temporal position in the ongoing interaction and context-independent in that there are universal practices to deal with silences, turn allocation, repair etc. Participants are also reflexive, since they are in constant interaction with others and with the environment, seeking intersubjectivity (Garfinkel, 1967; vom Lehn, 2014).

The concept of intersubjectivity was first coined by Husserl (1973) who defined subjectivity as the self’s own cognition of the body (i.e., alter ego). Hence, intersubjectivity is our awareness of others people’s alter egos. Husserl claimed that an act of intersubjectivity is an act of empathy. Linell (2007, 2014) suggested that intersubjectivity is a consequence of our brain’s interactive and dialogical work-- people make meaning together, in direct or indirect participation, by ‘other-orientation’ (i.e., an ability to embrace the other person’s perspective), and ‘responsive understanding’ (i.e., participants’ need to understand each other and to adopt each other’s perspectives). Furthermore, Sidnell and Stivers (2014, p. 392) defined intersubjectivity as the participant’s ability to use his/her own mind as a model with which to imagine other people’s beliefs and desires, in order to predict and understand other people. Intersubjectivity is not a cognitive concept, but a joint achievement of sequentially organized actions. Intersubjectivity can emerge independently, irrespective of the participants’ perceptions. Social interaction, which is a co-constructive activity that presumes a feeling of social belonging, ‘other-orientation’, and a practice of shared routines and rituals can be analysed by using the methodology of Conversation Analysis (CA) (Linell, 2007; Mondada, 2011).

**Conversation Analysis and the organization of interaction**

CA was developed as an empirical and rigorous method within the ethnomethodological tradition to demonstrate how participants, in talk, create social order within the local organization of turns at talk (Sidnell & Stivers, 2010). Researchers, using recordings from naturally occurring talk-in interaction, found that the organization of social interaction differs depending on the number of participants and whether the interaction takes place in a mundane or an institutional setting (Drew & Heritage, 1992; Egbert, 1997; Heritage & Clayman, 2010; Sacks et al., 1974).

The number of participants affects turn allocation. In two-party interaction, ratification and recipiency is unmistakable but in interaction involving more
than two participants, next speakers must be selected. In three-party or multi-party interactions, one of the participants may be excluded (Sacks et al., 1974). Furthermore, in four-part or multipart interactions, side-sequences or schisming can develop (Egbert, 1997; Jefferson, 1972). A side-sequence is a sequence of turns that is not part of the main interaction. It is a break from the ongoing interaction, which is then resumed when the brake comes to an end (Jefferson, 1972). In schisming, an unratified recipient orients towards another recipient during the speaker’s talk and introduces a new topic (Egbert, 1997). The emerging parallel conversation that follows schisming does not compete for the same interactional floor because schisming constructs several floors. Regardless of the number of participants, an explicit way of ratifying and addressing another participant is the practice of combining summoning name, gaze orientation, and selecting the next speaker explicitly, for example by a question (Lerner, 2003).

Social interaction in mundane settings (e.g., in casual domestic contexts) differs from social interaction in institutional settings (e.g., at school, in court or in health care) (Heritage & Clayman, 2010). Institutional talk is characterized by more strict, ritualized rules when compared to mundane social interaction (Drew & Wootton, 1988). There are constrains on what can and should be said, by who, and to whom. Furthermore, there is often a mediator in the institutional setting (e.g., a teacher or a judge) who ratifies the next speaker. The participation roles in institutional talk are more formalized and stricter than in mundane talk and there is an overall structure of openings and endings. In summary, the organization of institutional talk establishes and maintains the participants’ interactional identities and roles.

A common way of organizing social interaction in mundane as well as in institutional settings is the practice of question-answer sequences (i.e., polar questions, interrogatives, and alternative questions) (Heritage & Clayman, 2010; Stivers, 2010). Polar questions can be responded by yes or no. Interrogative questions consist of interrogative words such as who, when, where, why, and how and alternative questions include, for example, interrogative or declarative syntax. In institutional settings, mediators have been found to produce two or more questions in a row, without the interference of recipients. These multi-unit questioning turns frame the agenda and establish the patient’s or client’s right to ask questions without trying to control the answers (Linell, Hofvendahl, & Lindholm, 2003). Furthermore, mediators in institutional settings also use follow-up questions if they are not satisfied with the answer that they receive (Clayman & Heritage, 2002). Multiparty classroom interaction is often organized in terms of teacher-initiated Initiative-Response-Evaluation/Feedback sequences (Mehan, 1979).

The sequential organization of classroom interaction

Classroom interaction is an area, which has been subject to extensive research (Hester & Francis, 2000; Mehan, 1979; Seedhouse, 2004). In the 1970s,
Mehan (1979), and Sinclair and Coulthard (1975) demonstrated that plenary sessions (i.e., teacher led sessions) are typically organized in Initiative Response Evaluation/Feedback sequences (IRE sequences). The regularity of IRE-sequences makes the practice predictable and understandable for those involved. Plenary sessions in classroom interaction are typically organised in dyads between the group of students and the teacher (Bunning & Ellis, 2010; Heritage & Clayman, 2010). The teacher directs the whole class before ratifying one student and provides two-second of wait-time on average (Rowe, 1986). These initiatives are typically produced in close-ended questions with pre-known answers and seldom in open-ended questions that call for reflection and analysis (Kathard, Pillay, & Pillay, 2015). The format of close-ended questions has at least three purposes: (i) to elicit a correct answer, (ii) to distribute public knowledge, and (iii) to enable students to demonstrate knowledge (Hester & Francis, 2000).

Tofade, Elsner, and Haines (2013) categorized teachers’ questions in terms of question type, cognitive dimension, and knowledge dimension. The question types used in education range from content questions with limited response alternatives to questions that start with a broad question and end with a focused question. The cognitive dimension of questions ranges from knowledge recall to synthetic (i.e., creating) responses. Lastly, the knowledge dimension of questions in classroom interaction ranges from content to meta-cognitive questions.

In his thesis, Sahlström (1999) investigated how students make recipiency visible in IRE sequences. He found that students displayed recipiency through a combination of linguistic resources (i.e., spoken turns) and embodied resources such as gaze orientation, body movements (e.g., hand raising), and silences.

**Communicative resources in social interaction**

Face-to-face interaction is, by definition, multimodal: linguistic resources cannot be separated from embodied resources (Streeck et al., 2011). They are temporally produced as entities (i.e., semiotic fields) and interpreted as significant combinations (Goodwin, 2000; Streeck et al., 2011, p. 9). However, even though semiotic fields are understood in juxtapositions and not as separate parts, the following two sections present linguistic and embodied resources separately.

**Linguistic resources and suprasegmental resources**

Linguistic resources, such as the lexicon, morphology, and syntax, and suprasegmental resources, such as prosody and voice quality, display essential interactional cues. For example, Stivers and Rossano (2010) found that interrogative syntax worked response mobilizing in question-answer sequences, and Ziken and Ogiermann (2011) found that caregivers’ use of declarative
syntax worked response mobilizing in domestic contexts. Furthermore, prosodic variations (i.e., pitch, volume, and tempo) can display attitude, emotions, degree of authority, and alignment, and it can signal a transition relevance place (Couper-Kuhnlen & Selting, 2018; Freese & Maynard, 1998). Åhlund and Aronsson (2015) found that teachers’ use of stylizations (i.e., stereotypical expressions, repetitions, and exaggerated prosody) and laughter in multiparty classroom interaction stimulated and encouraged students to continue participating in discussions and debates even though they had restricted spoken repertoire. The prosodic features of an experienced positive voice is characterized by high pitch, wide pitch range, loudness on key words, typical voice quality, and a fast speech rate (Freese & Maynard, 1998). Furthermore, the prosodic features of an experienced negative voice are characterized by low pitch level, narrow pitch range, more quiet key words, a breathy or creaky voice quality, and a slow speech rate. Interestingly, neuro images show higher brain activity when listening to voices produced at a high pitch or wide a pitch range and increased volume than listening to flatter pitch and lower volume (Johnstone, van Reekum, Oakes, & Davidson, 2006).

Embodied resources

Embodied resources such as deictic pointing gestures, body movements, facial expressions, and gaze behaviour, create meaning in juxtaposition with speech (Goodwin, 2003; Mondada, 2011; Ruusuvuori & Peräkylä, 2009). For example, deictic pointing gestures can orient a recipient towards relevant details (Goodwin, 2003). Such a directed orientation is often held beyond the end of the spoken part of the turn, until mutual understanding is achieved (Sikveland & Ogden, 2012). Mondada (2016) suggested that deictic pointing gestures are part of larger body movements and reorientations, called multimodal gestalts. These bodily gestalts can display alignment and disalignment with previous speaker in the same way as a spoken turn. Furthermore, facial expressions can display the speaker’s stance, attitude, and emotions (Ruusuvuori & Peräkylä, 2009), and gaze behaviour can display turn transfer, stance, and recipiency (Mondada, 2011).

There are two classic hypotheses regarding gaze behaviour (Goodwin, 1980; Kendon, 1967). First, Kendon (1967) suggested that gaze direction has three functions in social interaction: to regulate, to monitor, and to express feelings. The regulating function is three-fold: (1) the speaker looks away from the recipient before starting a long speech to signal that s/he ‘takes the floor’, (2) the speaker looks at the recipient at the end of speech to signal turn transfer, and (3) the speaker who looks at the recipient during speech indicates interest in feedback. The monitoring function is two-fold: (1) the speaker looks at the recipient during speech to monitor the recipient’s attention, and (2) the speaker looks at the recipient at the end of a long speech to check if the recipient is listening, and hence prepared to take the next turn. Second, Goodwin (1980) proposed two gaze rules. Gaze rule number 1: the speaker should
keep intermittent eye contact with the recipient during speech. In restarts and silences, the speaker should look at the recipient before continuing to speak. Gaze rule number 2: the recipient should look at the speaker at the beginning of speech.

Kendon’s and Goodwin’s hypotheses have been both confirmed and questioned in more recent research. For example, Bavelas, Coates, and Johnson (2002) confirmed Goodwin’s gaze rules. They found that there is a brief moment of mutual gaze before the speaker starts to talk. However, Rossano, Brown, and Levinson (2009) disproved the gaze rules. They found that gaze practices in question-answer sequences are not universal; there are differences between ‘low-gaze’ and ‘high-gaze’ cultures. Practices other than gaze behaviour can display turn transfer and recipiency. Furthermore, participants do not always look at each other during interaction. Instead, they may look at nothing in particular, follow a deictic gesture, or they might be involved in a competing activity such as eating dinner or doing a handicraft (Rossano et al., 2009).

The linguistic and embodied resources of non-speaking children with severe CP differ from typically developed children because of their involuntary and delayed movements. Instead of looking at the recipient, as occurs in ordinary conversation (Goodwin, 1980; Kendon, 1967), the child may look away because of an activated reflex. Some of these children might be able to initiate vocalization, but they are typically severely restricted in regulating pitch and volume, which are central resources for speaking communicators (Couper-Kuhlen & Selting, 2018). Consequently, body movements, gaze orientation, facial expressions, and vocalization may differ significantly from what participants are used to in typical face-to-face interaction, thus resulting in an increased risk of misunderstandings. This gives rise to the need for AAC, for example, an SGD. However, learning to use AAC can be challenging.

Communication partners’ scaffolding of children’s learning

Within the dialogical tradition of sociocultural theory, language and social interaction are viewed as key aspects of human learning and development. Children learn new performances, social norms, and culture within their zone of proximal development through language in social interaction with more skilled persons who can scaffold the learning process (Vygotsky, 1978). The zone of proximal development represents the area between what the child can do independently and what the child cannot do even with support. The skilled person can scaffold the process of learning and “enable(s) a child or novice to solve a problem, carry out a task or achieve a goal which would be beyond his unassisted efforts” (Wood, Bruner, & Ross, 1976, p. 90). Vygotsky (1962) argued that learning is a stepwise process in which the child’s cognition, thinking, reflection, and memory develops in interaction with others within social
contexts and cultural traditions. Scaffolding is a collaborative activity: teachers are responsive to children’s demonstrated competence (Koole & Elbers, 2014; Theobald, 2019).

Radford, Bosanquet, Webster and Blatchford (2015) found that teachers and teacher assistants in special education settings deployed supportive, repairing, and heuristic scaffolding roles. The supportive role served to encourage the child to continue by maintaining the child’s motivation and inspiration. By using the repair scaffolding role, the communication partner deployed a variety of practices that focused on guiding and correcting the child towards the goal. Heuristic scaffolding meant that the communication partner encouraged the child to use his/her own problem-solving and learning strategies.

Previous research (Romski & Sevcik, 1993; Tetzchner, Brekke, Sjøthun, & Grindheim, 2005) has discussed the additional challenges children with severe speech and language impairments may face. Unlike typically developed speaking children, who are surrounded by communication partners who use the same communication means as they are (i.e., speech), non-speaking children using an SGD need to convert the meaning of spoken words to the pictures and symbols of the SGD. In order to overcome this problem, communication partners can enable SGD-mediated interaction by means of using partner strategies or social practices.

Individualistic and dialogical perspective on AAC

Both the individualistic and the dialogical perspectives on social interaction have provided important knowledge on interaction including non-speaking participants relying on AAC (Binger, Kent-Walsh, Berens, del Campo, & Rivera, 2008; Clarke & Wilkinson, 2007; Clarke & Wilkinson, 2008; Kent-Walsh, Binger, & Hasham, 2010; Noren & Sigurd Pilesjo, 2016; Norén, Svensson, & Telford, 2013; Pilesjo & Rasmussen, 2011). On the one hand, the individualistic perspective has provided insight into causality between, for example, the use of partner strategies and children’s enhanced linguistic and social skills. On the other hand, the dialogical and ethnomethodological perspective has provided important knowledge on how communication board-mediated and SGD-mediated interaction is organized.

The next two sections aim to present an overview of partner strategies and social practices in SGD-mediated interaction. The first section covers the individualistic perspective of social interaction and language and the second section covers the dialogical and ethnomethodological perspective.
Enhancing children’s social and linguistic skills with partner strategies

A large body of experimental studies confirm the correlation between communication partners’ use of partner strategies and non-speaking children’s enhanced social and linguistic skills (Binger & Light, 2007; Carter & Grunsell, 2001; Choi, O’Reilly, Sigafoos, & Lancioni, 2010; Fey et al., 2006; Kaiser & Hancock, 2003). Eight such partner strategies are presented in the following section.

Responsive interaction

Responsive interaction implies that the communication partner responds contingently to the non-speaking child’s focus of attention by verbal mirroring (i.e., labelling the child’s actions and expressions) and expectant delay (i.e., assisting the child with an increased conversational pause that prolongs the response space). By using responsive interaction, the communication partner pays attention to both linguistic and embodied resources, and treats them as meaningful actions (Fey et al., 2006). Training programmes targeting caregivers of children with speech and language impairments such as the Hanen programme (“It Takes Two to Talk”) and the ComAlong programme, use video recordings to coach caregivers in responsive interaction (Jonsson, Kristoffersson, Ferm, & Thunberg, 2011; Pennington, Thomson, James, Martin, & McNally, 2009). The ComAlong programme includes the use of communication boards. The use of responsive interaction has been found to increase children’s social skills (Pennington et al., 2009).

Environmental arrangements

When environmental arrangements are employed, the communication partner explores the interests of the child and arranges communicatively appealing situations (Fey et al., 2006). The combination of responsive interaction and environmental arrangements can increase not only social skills but linguistic skills of non-speaking children (Fey, Yoder, Warren, & Bredin-Oja, 2013; Kaiser & Hancock, 2003; Pennington et al., 2009; Yoder & Warren, 1998). Furthermore, environmental arrangements are often used in the preparation phase of intervention studies. For example, Hunt, Alwell and Goetz (1991) and Soto and Clarke (2017) produced individualized photo books with topics of interest to the child, which were then used in the intervention.

Prompts and time delay

Prompts are used to guide and help the child without doing the action for him/her. There are gestural prompts (e.g., deictic pointing gestures), verbal prompts (e.g., spoken cues), and physical prompts (e.g., helping the child performing the action) (Choi et al., 2010). Many studies combine the use of prompts with time delay. Time delay implies that the instructor waits for a
pre-determined number of seconds before providing the child with the prompt (Halle, Baer, & Spradlin, 1981). Prompts and time delay can increase social and linguistic skills of non-speaking children (Bayes, Heath, Williams, & Ganz, 2013; Choi et al., 2010).

The behaviour chain interruption strategy
The behaviour chain interruption strategy is a multistep method than can be used to teach the child linguistic skills (e.g., to make requests) or actions (e.g., hand washing) (Bayes et al., 2013; Carter & Grunsell, 2001). The targeted behaviour is taught step-wise in naturally occurring routines. Hunt, Alwell and Goetz (Hunt et al., 1991) used the behaviour chain interruption strategy to teach non-speaking and limited-speaking children with ID to make requests. A review of the effect of the behaviour chain interruption strategy comprising 10 experimental studies (Carter & Grunsell, 2001) showed that the strategy was effective teaching children with ID to request.

Aided language modelling
Aided language modelling implies that the communication partner demonstrates AAC-mediated interaction by converting spoken words into for example graphic symbols on a communication board or by activating symbols on an SGD in direct connection with the spoken turns or actions (Binger & Light, 2007; Dada & Alant, 2009). The strategy was first described in a case study by Beukelman and Garrett (1988) and, later by Goossens (1989). A review of 17 experimental studies (Allen, Schlosser, Brock, & Shane, 2017) showed that aided language modelling can improve children’s linguistic skills (i.e., both comprehension and expression) when used on a communication board or an SGD. However, it should be noted that eye-gaze accessed SGDs were not included in these studies.

Open-ended questions and recasting
The strategy of asking open-ended questions emerges from a frequently cited study by Light, Collier, and Parnes (1985a) who found that mothers of non-speaking children aged of 4-6 years used polar questions and demands instead of making comments or asking open-ended questions in naturally occurring interaction. The authors described the interaction as highly asymmetric and disadvantageous for the child’s language development. When using recasting, the communication partner repeats something that the child said, but with more detailed and correct language (Clark, 2014). The combination of open-ended questions, recasting, and prompts can increase the non-speaking individual’s linguistic skills in SGD-mediated interaction (Ballin, Balandin, & Stancliffe, 2012; Soto & Clarke, 2017). For example, Soto and Clarke (2017, 2018) used open-ended questions, recasting, and verbal and gestural prompts to teach non-speaking and limited-speaking children to use verbs, pronouns, bound morphemes, and spontaneous clauses in SGD-mediated interaction.
Social practices in SGD-mediated interaction

Researchers who use the dialogical and ethnomethodology theoretical and methodological assumptions have contributed important knowledge about how participants actually organize interaction outside controlled experiments. This perspective is interested in understanding how participants collaborate with each other to create meaning in SGD-mediated interactions.

The production of an SGD-mediated contribution takes longer time than speech and the prolonged production time can disrupt the interactional progression. An SGD-mediated contribution can easily be temporally and sequentially dislocated in the ongoing interaction, or intra-turn silences may appear which can lead to extended repair actions and misunderstandings (Clarke & Wilkinson, 2009; Higginbotham & Wilkins, 1999). Communication partners may treat intra-turn silences as part of the non-speaking person’s turn or treat such silences as possible transition relevance places. In the former case, the communication partner will wait (Clarke & Wilkinson, 2007). In the latter case, the communication partner self-selects and gets involved in the production of the SGD-mediated contribution before it has been fully generated, which may either support or interrupt the progress of the emerging SGD-mediated turn (Clarke & Wilkinson, 2008; Norén et al., 2013).

In short, SGD-mediated interaction is challenging; all aspects of the interaction, such as turn taking, initiating, maintaining, and ending the interaction are affected (Clarke, Bloch, & Wilkinson, 2013). However, research has found that some social practices can actually facilitate SGD-mediated interaction. Six such social practices are presented in the following section.

First pair part of an adjacency pair

Clarke and Wilkinson (2007) found that the communication partner’s practice of first pair part of a question-answer sequence facilitated SGD-mediated interaction because it provided the SGD-mediated contribution an understandable response place (i.e., second pair part position). In addition, asking content questions with pre-known answers narrowed the response alternatives, which in turn facilitated interpretation and minimized the risk of misunderstandings.

Meta-interactional turns

The same study (Clarke & Wilkinson, 2007) also revealed that the communication partner’s practice of meta-interactional turns worked in the same way as the practice of providing first pair part; meta-interactional turns also provided an explicable response place. Meta-interactional turns were defined as talk that made suggestions for the development of the conversation in combination with a verbal or gestural action towards the SGD, thereby ratifying the non-speaking person to take the next turn.
Polar questions
Communication partners’ practice of asking polar questions (i.e., to provide guesses and interpretations) following single-word SGD-mediated contributions can establish the meaning if the non-speaking person can confirm or deny using embodied resources (Hörmeyer & Renner, 2013). Using embodied movements to display confirmation or rejection is often faster than producing an SGD-mediated contribution. In an interview study, seven out of eight children, using SGDs commented that they appreciated their communication partner’s practice of using polar questions because it speeded and facilitated the conversation (Midtlin, Naess, Taxt, & Karlsen, 2015).

Deictic pointing gesture
In their study, Pinto and Gardner (2014) found that the speaking communication partner pointed at symbols on the SGD during ongoing interaction to make reference and to enact the child’s turn. The practice of making reference was found to orient the non-speaking person towards the communication board.

Waiting in silence
Communication partners’ practice of waiting in silence during the SGD production time has been illustrated in extracts in several studies (Clarke & Wilkinson, 2008; Hörmeyer & Renner, 2013; Pilesjo & Rasmussen, 2011; Pinto & Gardner, 2014). Savolainen, Klippi, Tykkyläinen, Higginbotham and Launonen (2020) found that the process of composing an SGD-mediated contribution took up to 81 seconds. During the composing phase, the communication partner waited in silence or participated in a non-competing activity.

Sensitivity to embodied resources
Communication partners’ practice of interpreting not only SGD-mediated contributions as meaningful, but also gaze behaviour and body movements can facilitate SGD-mediated interaction (Clarke & Wilkinson, 2008; Engelke & Higginbotham, 2013; Pinto & Gardner, 2014). Savolainen, Klippi, Tykkyläinen, Higginbotham, and Launonen (2020) found that the non-speaking person’s gaze shift from the communication partner to the SGD was treated as a pre-beginner of the SGD-mediated contribution, a practice of taking the floor.

To summarize, even though research found that communication partners can use partner strategies and/or social practices to enable SGD-mediated interaction, communication partners reported on the challenges that are associated with SGD-mediated interaction and their need for additional support from professionals (Anderson et al., 2014; McNaughton et al., 2008). Consequently, professionals (e.g., SLPs) who provide SGD-interventions may not only need
to consider what partner strategies or social practices they should teach but how they should teach these.

Models of communication partners’ learning of strategies

Given that SGD-mediated interaction places additional and different demands on the speaking communication partners compared to spoken face-to-face interaction, communication partners may need to change the way they participate in social interactions or apply partner strategies. The transformative learning theory and the experiential learning theory (Kolb, 2015; Mezirow, 1997) will be used in this thesis to explore the mechanisms behind the change in communication partners’ behaviour.

Mezirow (1997) suggested, in his transformative learning theory, that adult learning is an abstract change in habits of mind and points of view. Hence, communication partners’ learning of SGD-mediated interaction is based on their cognitive, conative (i.e., needs) and emotional characteristics in combination with their habits of minds (i.e., their habitual way of acting, thinking, and feeling) and points of views (i.e., their feelings, beliefs and attitudes towards different groups of people). The process of learning is influenced by the learner’s motivation to solve a problem. One way to enhance motivation is the practice of goal setting (Kiresuk, Smith, & Cardillo, 1994; Schut & Stam, 1994). Adult learning is either a deepened understanding of an existing point of view or a change of an existing point of view or habits of mind. Changing habits of mind is difficult and requires awareness, critical reflection, and help from educators (Mezirow, 1997). In a study by Koski, Martikainen, Burakoff, and Launonen (2010), staffs’ thinking habits were examined. The staff, working at group homes for non-speaking adult residents with ID and severe physical impairments, participated in a communication programme. The programme used problems that the staff had experienced and the staffs’ video recordings of their interactions with the residents. The study showed that the staff changed their thinking habits during the programme; they began to reflect over and recognise that the residents’ embodied resources were an important part of the interaction.

Kolb (2015) aligned with the assumption that critical reflection is a key factor in adult learning. He proposed that learning is a reflexive circle; individuals experience concrete problems, make reflective observations in the light of their previous experiences and multiple points of views, reflect on alternative solutions (i.e., they make an abstract conceptualization) and try out their solutions in active experimentation, which form new concrete experiences. Communication partners experience concrete problems in SGD-mediated interaction, which they need to reflect on together with professionals (e.g., SLPs) so that they can come up with alternative solutions that can be tried and evaluated.
There are a few communication partner-training programmes that include teaching and training to use partner strategies in communication board-mediated interaction (Jonsson et al., 2011; Koski et al., 2010; Pennington et al., 2009). Kent-Walsh and McNaughton (2005) introduced an eight-step model that comprised a number of instructional approaches (i.e., verbal and written information, modelling, role play, direct feedback and feedback from video recordings, film of others in SGD-mediated interaction and practice to instruct someone else in the partner strategy) to teach communication partners to use partner strategies. A meta-analysis that comprised 17 studies showed that the eight-step model was effective in teaching partner strategies in both communication board-mediated interaction and in SGD-mediated interaction (Kent-Walsh, Murza, Malani, & Binger, 2015). There are also a few communication partner programmes that have used the CA methodology to coach communication partners to individuals with speech and language impairments (Lock et al., 2001; Samuelsson & Plejert, 2015). One of such programmes targeted communication partners to individuals with aphasia (i.e., acquired speech and language impairments) (Lock et al., 2001) and another one targeted caregivers of children with speech and language impairments (Samuelsson & Plejert, 2015). In addition, there is a programme that targeted professionals in institutional talk (Stokoe, 2014). The three programmes used video recordings of naturally occurring conversations and transcripts to help communication partners to become aware of patterns in conversations in general, and patterns in the targeted conversation in particular. All six communication partner programmes included feedback, which has been found to increase learning (Hattie & Timperley, 2007).
Rationale for this thesis

SGD-mediated interaction, for example using eye-gaze accessed technology, can provide non-speaking children who has severe physical impairments and intellectual disabilities with a voice and the possibility to participate in social interaction. However, there are challenges to overcome. For example, an SGD-mediated contribution takes longer time to produce than speech, which places extra and different demands on the speaking communication partners compared to typical spoken face-to-face interaction. Researchers who used experimental designs found that communication partners’ use of partner strategies can enhance non-speaking children’s social and linguistic skills. Yet, researchers who use microanalysis have found that communication partners use other, and sometimes contrasting social practices that contribute participation.

Caregivers, teachers, and assistants have called for more training in SGD-mediated interaction. In Sweden, SLPs are responsible for providing training. There is a lack of knowledge about whether SLPs teach partner strategies in SGD-mediated interaction, and what instructional approaches they apply. Furthermore, there is a lack of knowledge about whether communication partners use partner strategies in SGD-mediated interaction and what they experience as problematic. Lastly, there is a lack of knowledge about how eye-gaze accessed SGD-mediated interaction is organized in different contexts; for example, in multiparty classroom interaction and in interaction with a beginner-user of eye-gaze technology. What social practices are used?

The investigation of SGD-mediated interaction is important because of four main reasons. First, every child has the right to express their opinions and to take part in education (United Nations Human Rights, 1989; World Education Forum, 2016). Education presumes interaction between the student and the teacher and SGD-mediated interaction can be an important communication tool for these children. The possibility to participate in social interaction is a democratic right and it is important for every person’s wellbeing. These children are, like all children, citizens, which means that they should be assured their human rights, social security, and an opportunity to influence decision-makers and develop their own autonomy (Waldschmidt & Sépulchre, 2019). Second, teachers reported that they do not have enough training to implement SGDs in classrooms even though students could benefit from SGD-mediated interaction (Tonsing & Dada, 2016; Zilz & Pang, 2019). This shortage might be a reason for the low use of SGDs in classroom settings (Andzik et al.,
Third, caregivers of children with severe disabilities are a vulnerable group. They experience higher levels of physical and emotional distress and fatigue, compared to caregivers of typically developed children (Brehaut et al., 2004; Garip et al., 2017; Hassall, Rose, & McDonald, 2005; Raina et al., 2005; Skok, Harvey, & Reddihough, 2006). Furthermore, there is a correlation between parental stress in childhood and lower levels of participation in adolescents with CP (Dang et al., 2015). Consequently, it is important to develop effective communication programmes that can enhance caregivers’ ability to scaffold SGD-mediated interaction with their children. Fourth, children with significant disabilities are a natural part of the community. It is important from a societal perspective to include all citizens. Diversity and acceptance is important for all citizens.

The research questions in this thesis were investigated by observational exploratory studies on a macro- and micro level using questionnaires and ethnomethodological conversation analysis.
Aims

The overall aim of this thesis was to investigate SGD-mediated interaction including children with anarthria, severe physical impairments and intellectual disability due to cerebral palsy with focus on partner strategies and social practices. The specific aims and research questions were:

**Study I:** To examine SLPs’ practices and perceptions of communication partner training in relation to high-tech SGDs. In specific, which communication partner strategies are taught, which instructional approaches are used and to what extent are documents for goal setting used? How frequently are training sessions provided to communication partners versus children? What are the reasons for difficulties (if any) in achieving communication with high-technology SGDs?

**Study II:** To investigate important communication partners’ (caregivers, teachers, and assistants) use and learning of partner strategies in communication with children with severe physical, communicative, and cognitive impairments using high-tech SGDs. In specific, do communication partners use partner strategies when interacting with children who use high-tech SGDs? If so, which strategies (among those presented) do communication partners use? How have communication partners learned about partner strategies in SGD-mediated communication? Do differences exist in the use and learning of partner strategies in SGD-mediated communication between the home and school contexts?

**Study III:** To contribute to the field of eye-gaze accessed SGDs in classroom interaction by exploring how inclusive classroom interaction was organized when one of the students used an eye-gaze accessed SGD. In specific, which scaffolding and collaborative practices used by teachers, assistants, and classmates constructed a response space (i.e., time to produce an SGD-mediated utterance) for the production of an eye-gaze accessed SGD-mediated turn in multiparty classroom interaction?
Study IV: To identify and describe features of social actions that mobilize responses mediated with eye-gaze accessed SGD, used by children with anarthria, severe physical impairments, and ID due to CP, who are still learning to use their SGD in dyadic interaction.
Methods

Design

Both qualitative and quantitative research methods were used in this thesis. An overview of the study designs, participants, data collection, and data analysis is presented in Table 1.

Table 1. Study design, participants, data collection, and data analysis of Studies I-IV.

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participants</th>
<th>Data collection</th>
<th>Data analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Cross sectional study</td>
<td>SLPs (n=12)</td>
<td>Questionnaire</td>
<td>Descriptive statistics and directed content analysis</td>
</tr>
<tr>
<td>II</td>
<td>Cross sectional study</td>
<td>Caregivers (n=23) Teachers (n=14) Assistants (n=15)</td>
<td>Questionnaire</td>
<td>Descriptive statistics and directed content analysis</td>
</tr>
<tr>
<td>III</td>
<td>Qualitative design</td>
<td>Children (n=2) Teachers (n=3) Assistants (n=8) Classmates(n=10)</td>
<td>Video recordings</td>
<td>Ethnomethodological Conversation Analysis</td>
</tr>
<tr>
<td>IV</td>
<td>Qualitative design</td>
<td>Children (n=3) Communication partners (n=5)</td>
<td>Video recordings</td>
<td>Ethnomethodological Conversation Analysis</td>
</tr>
</tbody>
</table>

Setting

All four studies were conducted in Sweden. Study I and Study II covered participants in home, habilitation and educational environments, in all three parts of Sweden (i.e., the Southern, the Central, and the Northern parts). Study III and Study IV were conducted at four different schools and one pre-school in the Central part of Sweden.
**Swedish Laws and regulations**

SGD-interventions are regulated by Swedish laws and regulations (Socialstyrelsen, 2016). The process comprises six steps and most often a multi-professional SGD-team (e.g., an SLP, an occupational therapist, a physiotherapist, and a technician) carries out the intervention. Step 1: Assessment of the non-speaking person’s cognitive and physical abilities. Step 2: A try-out process of SGD vocabulary and access techniques. Step 3: Adaptations of the vocabulary and access techniques. Step 4: The provision of information to the non-speaking person and his/her communication partners and goal setting. Step 5: Training the non-speaking person and his/her communication partners. Step 6: Follow-up on the goals.

In Sweden, there is a nine-year compulsory school attendance system for children from seven years of age. Children with ID have the right to attend the compulsory school system that is specially provided for children with ID (Swedish National Agency for Education, 2017). In this school, the staff: child ratio is higher than in the mainstream school system, and the teachers have experience with AAC-interaction. There exists two curricula for children with ID aged 7-15 years. First, there is the compulsory school curriculum for pupils with severe learning impairments, which includes five subject blocks and no training in reading and writing. Second, there is the compulsory school curriculum for pupils with learning impairments, which includes twelve subject blocks and training in reading and writing. There are two types of programmes at the high school level that are offered to children with ID: (i) the national vocational programme and (ii) the individual programme.

**Participants**

**Study I and II**

There were 64 participants in Study I and Study II (Table 2). One SLP answered two questionnaires concerning two different children. Hence, there were thirteen responses from the twelve SLPs. The caregivers were characterised as Caregiver I and Caregiver II.
Table 2. Description of participants in Study I (n=12) and Study II (n=52).

<table>
<thead>
<tr>
<th></th>
<th>Study I</th>
<th>Study II</th>
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<tbody>
<tr>
<td>Gender</td>
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</tr>
<tr>
<td></td>
<td>Male: Female</td>
<td>10:42</td>
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<tr>
<td></td>
<td>Central part of Sweden</td>
<td>4</td>
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<tr>
<td></td>
<td>Northern part of Sweden</td>
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<tr>
<td></td>
<td>Central part of Sweden</td>
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</tr>
<tr>
<td></td>
<td>Central part of Sweden</td>
<td>19</td>
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<td></td>
<td>Central part of Sweden</td>
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<td>Profession</td>
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<td></td>
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<tr>
<td></td>
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<tr>
<td></td>
<td>Teacher</td>
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<tr>
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<td>2</td>
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<td></td>
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</tr>
<tr>
<td>Caregiver</td>
<td>Monolingual: Bilingual</td>
<td>1:10</td>
</tr>
</tbody>
</table>

Note¹ Swedish only. Note² Swedish and Arabic, Albanian, or Tigrinya.

The 64 participants responded to the questions concerning non-speaking children with severe physical impairments and ID due to CP (Table 3).

Table 3. Description of the children identified in Study I (n=13) and Study II (n=16).

<table>
<thead>
<tr>
<th></th>
<th>Study I</th>
<th>Study II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male: Female</td>
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<td>8:8</td>
</tr>
<tr>
<td>Monolingual (Swedish)</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Bilingual (Swedish and Arabic, Albanian, Tigrinya)</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>GMFCS¹ IV:V</td>
<td>7:6</td>
<td>8:8</td>
</tr>
<tr>
<td>MACS² III:IV:V</td>
<td>1:7:5</td>
<td>1:9:6</td>
</tr>
<tr>
<td>Eye-gaze technology: Other access methods</td>
<td>7:6</td>
<td>10:6</td>
</tr>
<tr>
<td>SGD 0-2 years’ experience</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>SGD 3-4 years’ experience</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>SGD 5 years’ experience or more</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>SGD experience missing value</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Note¹ the Gross Motor Classification System. Note² the Manual Ability Classification System.

**Study III and IV**

Two children known as Anna and Steve, their teachers, assistants and classmates participated in Study III. Three children known as Steve, Lucas, and Rosa, and their communication partners participated in Study IV. Steve participated in both Studies III and IV because he met the criteria for Study IV in the first round of data collection and the criteria of Study III in the second data collection.
Anna was a 14-year-old female with dyskinetic CP and ID who used her eye-gaze accessed SGD, a Tobii Dynavox I-12 with Communicator software, quite independently. According to the teachers and the assistant, Anna had typical hearing and vision. She had used her SGD for 3 years and 8 months at the time of the video recording. More than 400 picture communication symbols (PCS-symbols) were arranged in 20-24 symbols per page. The vocabulary was organized into general and context-specific categories. The synthetic voice comprised single words and pre-recorded phrases. Anna used gaze behaviour for confirmation/denial: she looked up for yes and down for no.

Anna attended the compulsory school for pupils with learning impairments, which meant that the curriculum included literacy education. However, Anna’s teacher in Swedish reported that Anna only recognized a few words, and that she did not use letters or words for social interaction.

Anna had known her personal assistant Sara for 6 months. She had known Jimmy, her teacher in sciences studies and mathematics, for two years and Margret, her teacher in Swedish and English, for 4 years. Neither Sara, Jimmy nor Margret had previous experience of eye-gaze accessed SGD-mediated interaction. Jimmy had previous experience with SGD-mediated interaction with other access techniques with one other student and Margret with seven other students. Sara had a high school qualification, Jimmy was a teacher and Margret was a special education teacher. Apart from Anna, there were six more students in the classroom. All students had ID. One of Anna’s classmates used an SGD for interaction and the other five students used speech. There were three more assistants apart from Sara in the classroom. Anna’s access to her SGD is shown in (Tables 4 and 5), and the data collection in (Table 7).

Steve was an 18-year-old male with spastic diplegia CP and ID who was recorded on two occasions, with three months in between. In the first round of collection, Steve was still training to use his eye-gaze accessed SGD, a tablet computer with PC Eye and Communicator software. In the second round of data collection, he used his SGD in multiparty classroom interaction. He had used his SGD for 3 months in the first round of data collection and for 6 months in the second round of data collection. According to the teachers and the assistant, Steve had typical hearing and vision.

The vocabulary of Steve’s SGD comprised about 200 PCS-symbols and photos that were arranged in context-specific categories. There were 6-14 graphic symbols per page with a maximum of three interlinked pages. The synthetic voice comprised single words and pre-recorded phrases. Steve used facial expressions and gaze behaviour to express confirmation or denial, but due to his severe physical impairments, it was difficult for the communication partners to perceive the small differences of confirmation/denial.

In the first round of data collection, Steve interacted with Marianne, a preschool teacher and occupational therapist, who he had known for 13 years and
Katarina, an occupational therapist, who he had known for 3 months. Marianne had 29 years’ experience of AAC-mediated interaction and Katarina had 16 years’ experience.

Three months later, in the second round of data collection, Steve participated in multiparty classroom interaction using his SGD. Steve attended one of the national vocational programmes at high school and there were four more students in the classroom, all with ID. Two classmates used speech, one used speech and sign language and one used speech and a communication board. There was the teacher, Thomas, whom Steve had known for about 1 year and there was his personal assistant Eva, whom he had known for 1 year and 4 months. In addition, there were three assistants in the classroom. Steve’s access to his SGD is shown in (Tables 4 and 5), and data collection in (Table 7).

Lucas was a five-year-old male with bilateral spastic CP and suspected intellectual delay who was still in pre-school. According to the preschool teacher and Lucas’ SLP, Lucas had typical hearing and vision. Lucas had used his eye-gaze accessed SGD, a Tobii Dynavox I-12 with Communicator software, for 1 year and five months at the time of data collection. The vocabulary comprised about 400 PCS-symbols arranged in general and context-specific categories resembling the Pragmatic Organization Dynamic Display organization (PODD) (Porter & Cafiero, 2009). There were 12-15 symbols per page and at the most five interlinked pages and the synthetic voice comprised single words and pre-recorded phrases. Lucas interacted with an SLP called Ellinor and a preschool teacher with special education in children with disabilities named Birgitta. Lucas did not know neither of them prior recording. Ellinor had 24 years’ experience of AAC-mediated interaction and Birgitta 20 years’ experience. Luke’s access to his SGD is shown in (Tables 4 and 5), and the data collected (Table 7).

Rosa was a seven-year-old female with an unspecified mixed type of CP and ID. According to her teacher, she had typical hearing but difficulties fixating and shifting her gaze. Rosa had been training to use her eye-gaze accessed SGD, a Tobii Dynavox I-12 with Communicator software, for 2 years and 2 months. The vocabulary comprised about 20 PCS-symbols and photos arranged in 1-8 symbols per page in three interlinked pages. Rosa interacted with Barbara, a preschool teacher, who had been working with children in need of AAC for 17 years. Rosa had known Barbara for about one year. Rosa’s access to her SGD is shown in (Tables 4 and 5), and the data collected (Table 7).
<table>
<thead>
<tr>
<th></th>
<th>Anna</th>
<th>Steve</th>
<th>Lucas</th>
<th>Rosa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning assembly</td>
<td>00:26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>00:42</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Break</td>
<td>00:16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science in whole class</td>
<td>00:16</td>
<td>00:43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science desk work</td>
<td></td>
<td></td>
<td>00:26</td>
<td></td>
</tr>
<tr>
<td>Maths in whole class</td>
<td>00:19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maths desk work</td>
<td>00:14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swedish in whole class</td>
<td>00:13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swedish desk wok</td>
<td>00:28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One classmate + assist</td>
<td></td>
<td></td>
<td>00:21</td>
<td></td>
</tr>
<tr>
<td>Meal</td>
<td>00:25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual training SGD</td>
<td>02:19</td>
<td>03:27</td>
<td>00:34</td>
<td></td>
</tr>
<tr>
<td><strong>Total (hours: minutes)</strong></td>
<td><strong>02:53</strong></td>
<td><strong>04:15</strong></td>
<td><strong>03:27</strong></td>
<td><strong>00:34</strong></td>
</tr>
</tbody>
</table>

Table 5. Activities during which the children *did not have access* to their SGDs reported in hours and minutes.

<table>
<thead>
<tr>
<th></th>
<th>Anna</th>
<th>Steve</th>
<th>Lucas</th>
<th>Rosa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning assembly</td>
<td></td>
<td>00:38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Music</td>
<td>00:42</td>
<td></td>
<td>00:19</td>
<td></td>
</tr>
<tr>
<td>Swedish in whole class</td>
<td></td>
<td>01:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meal</td>
<td></td>
<td></td>
<td>00:21</td>
<td></td>
</tr>
<tr>
<td>Break</td>
<td>00:12</td>
<td></td>
<td>00:06</td>
<td></td>
</tr>
<tr>
<td><strong>Total (hours: minutes)</strong></td>
<td><strong>01:54</strong></td>
<td></td>
<td></td>
<td><strong>01:24</strong></td>
</tr>
</tbody>
</table>

Note: 1 no formal AAC. Note: 2 communication board. Note: 3 battery driven SGDs direct accessed by finger pointing.

**Material and procedure**

**Study I and II**

*Recruitment*

The recruitment process for Study I and Study II was based on the children identified in the studies. There were no local or national registers available for the children. Instead, the follow-up surveillance programme for people with CP (CPUP, 2017) distributed a list with year of birth, gender and performance on the Gross Motor Classification System (GMFCS) Level IV-V (retrieved November 2014). According to the list, there were 711 Swedish children aged 7-18 who performed on GMFCS Level IV-V.
Inclusion criteria of the children were:

- 7-18 years.
- Prescribed an SGD with the possibility to use eye gaze technology.
- Performance on GMFCS Level IV-V and MACS Level III-V.
- Attending compulsory school for children with ID, which in Sweden presumes that the child has been diagnosed with ID by a psychologist.

Children who also had an additional diagnose of autism were excluded.

The recruitment process was carried out stepwise from October 2014 to June 2015. The managers of technical aid centres (n=52) received written information about the study and were asked to assign a contact person with access to the register of technical aids (e.g., SGDs). The contact persons (n=88) received written information about the study, identified children (n=39) and informed the caregivers of children (n=30). The caregivers of nine children were not informed because the contact persons did not want to intrude, the child was hospitalized or the child did not have an SLP contact. The contact persons obtained written informed consent from the caregivers of 16 children and forwarded these consents to one of the researchers who made contact with the caregivers. The researcher asked the caregivers about contact details for their child’s SLP, teacher/teachers and assistant/assistants and made contact with them.

**Questionnaires**

Four study-specific questionnaires were developed targeting SLPs, caregivers, teachers, and assistants respectively (Appendix 1). The questionnaires contained close-ended questions about demographic data, partner strategies, and instructional approaches in adult learning. There were 15 closed-ended questions targeting SLPs, 15 close-ended questions targeting caregivers, 16 close-ended questions targeting teachers and assistants. The close-ended questions were responded to with fixed answer options on 7-9 level Likert scales. There was the option to add comments to all question. The four questionnaires ended with the same open-ended question: “What are the reasons for difficulties (if any) in achieving communication with the SGD?” The questionnaires were tested in a pilot study with two SLPs, two caregivers, two teachers, two assistants and one representative of the Swedish National Association for Disabled Children and Young People (RBU). Small changes were made in accordance with their feedback.

Eight-one questionnaires were distrusted and with a response rate of 65 (Table 6). All participants could choose how to respond to the questionnaire: online, on paper, or on the telephone. Forty-nine questionnaires were responded to online, eight on paper, and eight on the telephone.
Table 6. Distribution of questionnaires and responses.

<table>
<thead>
<tr>
<th></th>
<th>SLPs</th>
<th>Caregivers</th>
<th>Teachers</th>
<th>Assistants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivered</td>
<td>16</td>
<td>30</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>Responded</td>
<td>13¹</td>
<td>23</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>Missing cases</td>
<td>3</td>
<td>7</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Note¹ One SLP responded to two questionnaires concerning two different children.

Study III and IV

Recruitment
The recruitment process for Study III and Study IV was carried out from April to November 2018. Professionals (e.g., SLPs and occupational therapists) at habilitation centres and special schools in one county council in the Southern part of Sweden (Skåne) and six county council areas in the Central part of Sweden (Uppsala, Stockholm, Östergötland, Västmanland, Gävleborg, and Värmland) were informed about the two studies and asked to identify children fulfilling the study specific criteria and inform their caregivers.

Inclusion criteria for the children were:
- 3-21 years.
- Prescribed an eye-gaze accessed SGD.
- Performance on GMFCS Level IV-V, MACS Level III-V, and Viking Scale Level III-IV (i.e., unintelligible speech).
- Intellectual disability or suspected developmental delay.
Children also diagnosed with autism were excluded.

In Study III, the children should use their SGDs several times per week in multiparty interaction. In Study IV, the children were still training to use their eye gaze accessed SGDs in dyads. Eleven children were identified. The caregivers of six children provided written consent and the caregivers of five children declined participation.

Video recordings
The researcher, the caregivers, and the teachers agreed on a suitable time for data collection. The video recordings took place at the child’s school or preschool. The researcher stayed in the classroom during the video recordings of multiparty classroom interaction because there was a need to adjust the cameras as the class proceeded. In the dyadic interaction, the participants were not moving around. Hence, the researcher arranged the cameras and left the room.

Two video cameras were used to capture the child and his/her communication partners and the SGD screen. The two video angles were compiled into one film. In total, the data collected comprised 15 hours and one minutes of compiled film (Table 7).
Table 7. Data collection reported in hours and minutes.

<table>
<thead>
<tr>
<th>Record (days)</th>
<th>Anna May (n=1)</th>
<th>Steve Aug (n=4)</th>
<th>Lucas Oct (n=3)</th>
<th>Rosa Oct (n=1)</th>
<th>In all</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiparty interaction</td>
<td>03:12</td>
<td>01:09</td>
<td>-</td>
<td>00:57</td>
<td></td>
</tr>
<tr>
<td>Other (e.g., brake)</td>
<td>01:35</td>
<td>00:47</td>
<td>-</td>
<td>01:01</td>
<td></td>
</tr>
<tr>
<td>Dyadic training</td>
<td>-</td>
<td>02:19</td>
<td>03:27</td>
<td>00:34</td>
<td></td>
</tr>
<tr>
<td><strong>Total (hr:min)</strong></td>
<td><strong>04:47</strong></td>
<td><strong>04:15</strong></td>
<td><strong>03:27</strong></td>
<td><strong>02:32</strong></td>
<td><strong>15:01</strong></td>
</tr>
</tbody>
</table>

Note: No access to the eye-gaze accessed SGD.

Data analysis

**Study I and Study II**

Data from the questionnaires were imported into the Statistical Package for the Social Sciences (SPSS) (version 22) (IBM Corporation, 2015) for descriptive statistics. The results from close-ended questions, responded on Likert scales were presented in merged groups. The seven-point Likert scale was merged into *often* (6–4), *seldom* (3–1) and *never* (0). The 8- and 9-point Likert scales were merged into three groups *once a day or more often* (6 times/day or more, 4-5 times/day, 2-3 times/day, or 1 time/day); *every second or third day* (every second day or every third day) and; *once a week or less often* (more seldom because other AAC is more effective, more seldom because there is a lack of vocabulary, or never). One SLP responded to two questionnaires that concerned two different children. To avoid duplication of data the responses concerning professional experiences were obtained from one of the two questionnaires.

In Study I, a directed content analysis (Hsieh & Shannon, 2005) using the components of ICF-CY (WHO, 2007) was applied to analyse the responses to the open-ended question. The process comprised four steps: (1) all comments were read through repeatedly. Responses that illustrated an attitude, a belief or an experience of the question were identified and meaning units were noticed; (2) the meaning units were condensed; (3) coded and; (4) then categorized according to their meaning. Comments on the close-ended questions were used to provide examples of the categories.

**Study III and Study IV**

Data from the video recordings were analysed using ethnomethodological conversation analysis (EMCA). EMCA is a branch of Conversation analysis (CA), which is an inductive analytical method that was developed in California during the 1960s and 1970s by Harvey Sacks, Emanuel Schegloff and Gail Jefferson. The methodology originates from Goffman’s work on interaction order and Garfinkel’s work on ethnomethodology. The difference between CA
and EMCA lies in the data: researcher who use CA analyse only linguistic resources while researchers using EMCA analyse all kind of human actions (i.e., linguistic as well as embodied resources). Both CA and EMCA reject the view that the researcher’s knowledge is superior to the knowledge of members of the society: they both strive to capture the emic perspective of the interaction. They are both bottom-up and data-driven methods.

*Ethnomethodological conversation analysis*

CA and EMCA comprise two assumptions. First, social interaction is a sequential, predictable and reflexive organization of participants’ practices of linguistic and embodied resources in turn-taking. Participants orient towards shared practices and methods when organizing the distribution of talk, silences, and the repair of troubles that arise during interaction (Sacks et al., 1974; Schegloff et al., 1977). Second, social interaction is context-free and context-dependent. Context-free implies that there are mutual interactional rules that work in the same way despite characteristics of the speaker (e.g., age, gender, or socio-economic background), and the context or the social action (e.g., shopping, mealtime or education), for example, how participants deal with silences, turn allocation and repair. However, contribution are also context-dependent: they are understood from their sequential position in the turn-taking sequence.

Turn-taking consists of independent turn construction units, which are built on intertwined linguistic resources (e.g., vocabulary, grammar, and prosody), embodied resources (e.g., gestures, pointing, gaze, and body orientation), and artefacts (e.g., communication boards and SGDs) (Nevile, 2015). There are transition relevance places at the end of each turn constructional unit where speaker exchange is possible but not obligatory. Participants orient towards each other’s contributions and towards the social norm of one speaker at a time. They search for syntactically, intonationally, pragmatically completed turn constructional units (Ford & Thompson, 1996, p. 154) and make recipiency understandable through gaze behaviour and a variety of other practices such as adjacency pairs and summoning the recipient’s name (Kendon, 1967; Lerner, 2003; Sacks et al., 1974). An adjacency pair (e.g., greeting-greeting, question-answer) is the simplest type of turn-taking sequence. It is highly ordered by participants: the first pair-part constrains what can be done in the normatively type-fitted second pair-part (Sacks et al., 1974).

Turn transition, carried out through next- or self-selection, is a coordinated procedure where participants orient themselves to minimize in-turn silences and gaps between turns as well as overlaps between turns (Sacks et al., 1974). The average gap between two participants’ turns is about 200 ms (Sidnell & Stivers, 2014). Turn transition can be organized in three ways. The current speaker can next-select next speaker by, for example, the practice of gaze orientation, summoning name and a question (Lerner, 2003). The current speaker
can also keep the turn by adding more turn constructional units without nominating a recipient. Lastly, a recipient can self-select at a possible transition relevance place and ‘the one who starts first gets the turn’.

Troubles and misunderstandings that arise during talk are commonly solved by a three-step action trajectory of repair (Schegloff et al., 1977). The first part is a retroactive identification of the trouble source; the second part is the initiation of repair by either the individual that produced the trouble source (self) or by someone else (other) and the third part is the effectuation of repair by either the self or the other. Research on ordinary talk-in-interaction showed that participants display a preference for self-initiated self-repair, which is effectuated without delay and in few words. Furthermore, they display a dis-preference for other-initiated other-repair by way of delays, explanations and accounting actions (Schegloff et al., 1977).

Finally, researchers in CA and EMCA use transcriptions, which are written notations of linguistic resources and silences in audio- or video-recorded data. In EMCA studies embodied resources are also transcribed. The purpose of transcriptions is to describe and fixate relevant details of a complex multi-layered interaction (Mondada, 2007). Transcripts are by necessity selective realities from one perspective of the social interaction; they can never be neutral or objective, they are always tied to their context and their purposes (Linell, 1994). Transcribing is an endless revision and reformatting of data: transcriptions may change as the transcriber listens and looks again. By using the methodology of CA/EMCA, detailed transcripts and systematic reviewing of data, researchers are forced to see things that would escape them in ordinary conversation: social interactional patterns are possible to identify (ten Have, 2007). The transcriptions in this thesis were created using the conventions developed by Jefferson (Jefferson, 2004), Mondada (Mondada, 2014) and a few notations for representing SGD-mediated phenomena (Appendix 2). Illustrations to the transcriptions were made in the application Graphics for iPad.

The selection process of extracts to Study III

First, all data was scanned to identify lessons in which the eye-gaze accessed SGD had been used. Second, these sequences were screened for conversational topics and SGD-mediated utterances. Third, the SGD-mediated sequences were transcribed verbatim, including silences and embodied actions. Fourth, the SGD-mediated sequences in which the teacher posed a question and the student provided an SGD-mediated response were identified. Forty-five teacher-initiated initiatives were responded on the SGD (Table 8). Fifth, extracts that illustrated the results were selected in consultation with the other researchers.
Table 8. Classroom interaction including gaze and SGD utterances (n).

<table>
<thead>
<tr>
<th>Initiative Type</th>
<th>Anna</th>
<th>Steve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher-initiated Initiative that the child responded on the SGD</td>
<td>27</td>
<td>5</td>
</tr>
<tr>
<td>Teacher-initiated Initiative that the child responded on the SGD with help from the assistant</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Teacher-initiated Initiative that the child responded with gaze behaviour</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Assistant-initiated Initiative that the child responded on the SGD</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Assistant-initiated Initiative that the child responded with gaze behaviour</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Child-initiated Initiative with SGD that the teacher responded to</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Child-initiated Initiative with SGD that the assistant responded to</td>
<td>0</td>
<td>19</td>
</tr>
</tbody>
</table>

The selection process of extracts to Study IV
First, all data was reviewed. Second, the first 30 minutes of every session was transcribed for conversational topics and SGD-mediated utterances. Third, sequences in which the communication partners’ initiatives were followed by children’s responses on the SGD were identified and transcribed verbatim, including silences and embodied actions. Fourth, extracts that illustrated the results were selected in consultation with the other researchers.

Ethical approval
The four studies were approved by the Regional Ethical Review Board in Uppsala (Reg. No. 2014/200 and Reg. No. 2018/087). The guidelines, ethics codes, and Codex (CODEX, 2018) were complied with. All participants received written information about the study purpose, the study procedure, and the contact details for the researchers. Caregivers in Study III and Study IV received symbols and photos to be used when informing their children and asking for their participation. The participants were informed that participation was voluntary and that they could withdraw from the study without explanation at any time. The participants in Study III and Study IV were reminded that participation was voluntary prior to the video recording. If the child looked uncomfortable during video recording, s/he was asked if s/he wanted to stop the video recording. Written consent was obtained prior to commencing the studies. Caregivers gave their written informed consent for their children to participate. All of the data was anonymised to protect the identity of the informants.
Results

Study I and Study II

The response rate to the questionnaires was 81.3% in Study I targeting SLPs and 80.0% in Study II targeting caregivers, teachers, and assistants.

Partner strategies in SGD-mediated interaction

The findings from Study I revealed that SLPs mainly learned about partner strategies in SGD-mediated interaction from the multi-professional specialist unit team at the regional paediatric habilitation centres and from their own clinical experience. Most commonly, they taught one of the caregivers about partner strategies in SGD-mediated interaction and they taught teachers and assistants slightly more often than they taught caregivers (Table 9). About half of the SLPs had provided at most one training session during the last 12 months with the caregiver, the teacher, the assistant, and the child. SLPs with additional years’ of experience in SGD-mediated interaction provided more training sessions compared to novice SLPs. Seven SLPs used the goal-attainment scaling (GAS) (Kiresuk et al., 1994) and one SLP used a self-made checklist for goal setting, and the rest did not use any goalsetting document.

Table 9. Numbers and percentages of answers (n=13) from the 12 SLPs who reported that they taught caregivers, teachers, and assistants how to use partner strategies in SGD-mediated interaction the last 12 months (Study I).

<table>
<thead>
<tr>
<th></th>
<th>Caregivers I n (%)</th>
<th>Caregivers II n (%)</th>
<th>Teachers n (%)</th>
<th>Assistants n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsive interaction</td>
<td>6 (46,2)</td>
<td>4 (33,3) a</td>
<td>7 (53,8)</td>
<td>8 (61,5)</td>
</tr>
<tr>
<td>Environmental arrangements</td>
<td>9 (69,2)</td>
<td>2 (16,7) a</td>
<td>8 (61,5)</td>
<td>10 (76,9)</td>
</tr>
<tr>
<td>Aided language modelling</td>
<td>7 (53,8)</td>
<td>4 (33,3) a</td>
<td>9 (69,2)</td>
<td>8 (61,5)</td>
</tr>
<tr>
<td>Open-ended questions</td>
<td>8 (61,5)</td>
<td>3 (25,0) a</td>
<td>9 (69,2)</td>
<td>9 (69,2)</td>
</tr>
</tbody>
</table>

a missing value (n=1)

The results from Study II found that caregivers, teachers, and assistants learned about partner strategies in SGD-mediated interaction mostly from the
child’s SLP. The teachers and assistants reported a higher use of partner strategies in SGD-mediated interaction compared to caregivers. Further, caregivers reported a higher use of partner strategies during weekends than during weekdays (Table 10). Not shown in the table, 39.1% of the caregivers, 42.9% of the teachers, and 46.7% of the assistants used the behaviour chain interruption strategy to teach the child SGD-mediated interaction at least one time.

Table 10. Daily use of partner strategies in SGD-mediated interaction during the last 12 months, reported by caregivers (n=23), teachers (n=14), and assistants (n=15) (Study II).

<table>
<thead>
<tr>
<th></th>
<th>Caregivers I&amp;II weekdays n (%)</th>
<th>Caregivers I&amp;II weekends n (%)</th>
<th>Teachers n (%)</th>
<th>Assistants n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsive</td>
<td>8 (36.3)a</td>
<td>10 (45.5)a</td>
<td>8 (61.5)a</td>
<td>10 (76.9)b</td>
</tr>
<tr>
<td>Environmental</td>
<td>5 (22.7)a</td>
<td>6 (28.6)b</td>
<td>9 (69.2)a</td>
<td>8 (66.7)c</td>
</tr>
<tr>
<td>Open-questions</td>
<td>10 (47.6)b</td>
<td>13 (59.1)a</td>
<td>10 (83.3)b</td>
<td>10 (76.9)b</td>
</tr>
<tr>
<td>Aided model</td>
<td>6 (27.3)a</td>
<td>8 (36.4)a</td>
<td>7 (53.8)a</td>
<td>8 (61.5)b</td>
</tr>
</tbody>
</table>

*a missing value (n=1), b missing value (n=2), c missing value (n=3)

Caregivers in Study II commented on the challenges of combining their own employment with all the duties that taking care of the child required; they lacked energy and drive.

“.. I am not an expert; I do not know how to create a system to promote language development of a girl with cerebral palsy... I am expected to do the panels for school and home... There is a constant stress and a feeling of guilt because I do not have time or the energy to do more” (caregiver 4).

Instructional approaches to teaching partner strategies in SGD-mediated interaction

The findings from Study I showed that SLPs used mostly verbal information and modelling to teach communication partners about partner strategies in SGD-mediated interaction. They seldom or never used feedback, videos of others in SGD-mediated interaction or role-play (Table 11).
Table 11. Numbers and percentages of answers (n=13) from the 12 SLPs who reported on their use of instructional approaches when teaching caregivers, teachers, and assistants how to use partner strategies in SGD-mediated interaction during the last 12 months (Study I).

<table>
<thead>
<tr>
<th>Instructional Approach</th>
<th>Often n (%)</th>
<th>Seldom n (%)</th>
<th>Never n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caregivers I</td>
<td>6 (46.2)</td>
<td>4 (30.8)</td>
<td>3 (23.1)</td>
</tr>
<tr>
<td>Caregivers II a</td>
<td>2 (16.7)</td>
<td>3 (25.0)</td>
<td>7 (58.3)</td>
</tr>
<tr>
<td>Teachers</td>
<td>7 (53.8)</td>
<td>3 (23.1)</td>
<td>3 (23.1)</td>
</tr>
<tr>
<td>Assistants</td>
<td>7 (53.8)</td>
<td>3 (23.1)</td>
<td>3 (23.1)</td>
</tr>
<tr>
<td>Written information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caregivers I</td>
<td>2 (15.4)</td>
<td>1 (7.7)</td>
<td>10 (76.9)</td>
</tr>
<tr>
<td>Caregivers II a</td>
<td>1 (8.3)</td>
<td>1 (8.3)</td>
<td>10 (83.3)</td>
</tr>
<tr>
<td>Teachers</td>
<td>1 (7.7)</td>
<td>2 (15.4)</td>
<td>10 (76.9)</td>
</tr>
<tr>
<td>Assistants</td>
<td>3 (23.1)</td>
<td>1 (7.7)</td>
<td>9 (69.2)</td>
</tr>
<tr>
<td>Modelling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caregivers I</td>
<td>3 (23.1)</td>
<td>2 (15.4)</td>
<td>8 (61.5)</td>
</tr>
<tr>
<td>Caregivers II a</td>
<td>2 (16.7)</td>
<td>-</td>
<td>10 (83.3)</td>
</tr>
<tr>
<td>Teachers</td>
<td>4 (30.8)</td>
<td>1 (7.7)</td>
<td>8 (61.5)</td>
</tr>
<tr>
<td>Assistants</td>
<td>6 (46.2)</td>
<td>2 (15.4)</td>
<td>5 (38.5)</td>
</tr>
<tr>
<td>Feedback in direct observation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caregivers I</td>
<td>2 (15.4)</td>
<td>2 (15.4)</td>
<td>9 (69.2)</td>
</tr>
<tr>
<td>Caregivers II a</td>
<td>2 (16.7)</td>
<td>-</td>
<td>10 (83.3)</td>
</tr>
<tr>
<td>Teachers</td>
<td>2 (15.4)</td>
<td>-</td>
<td>11 (84.6)</td>
</tr>
<tr>
<td>Assistants</td>
<td>3 (23.1)</td>
<td>2 (15.4)</td>
<td>8 (61.5)</td>
</tr>
<tr>
<td>Feedback from video recorded material</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caregivers I</td>
<td>1 (7.7)</td>
<td>2 (15.4)</td>
<td>10 (76.9)</td>
</tr>
<tr>
<td>Caregivers II a</td>
<td>-</td>
<td>1 (8.3)</td>
<td>11 (91.7)</td>
</tr>
<tr>
<td>Teachers</td>
<td>1 (7.7)</td>
<td>1 (7.7)</td>
<td>11 (84.6)</td>
</tr>
<tr>
<td>Assistants</td>
<td>1 (7.7)</td>
<td>-</td>
<td>12 (92.3)</td>
</tr>
<tr>
<td>Video of others</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caregivers I</td>
<td>-</td>
<td>3 (23.1)</td>
<td>10 (76.9)</td>
</tr>
<tr>
<td>Caregivers II a</td>
<td>1 (8.3)</td>
<td>2 (16.7)</td>
<td>10 (83.3)</td>
</tr>
<tr>
<td>Teachers</td>
<td>-</td>
<td>2 (15.4)</td>
<td>11 (84.6)</td>
</tr>
<tr>
<td>Assistants</td>
<td>2 (15.4)</td>
<td>1 (7.7)</td>
<td>10 (76.9)</td>
</tr>
<tr>
<td>Role play</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caregivers I</td>
<td>-</td>
<td>1 (7.7)</td>
<td>12 (92.3)</td>
</tr>
<tr>
<td>Caregivers II a</td>
<td>-</td>
<td>1 (8.3)</td>
<td>11 (91.7)</td>
</tr>
<tr>
<td>Teachers</td>
<td>-</td>
<td>1 (7.7)</td>
<td>12 (92.3)</td>
</tr>
<tr>
<td>Assistants</td>
<td>-</td>
<td>1 (7.7)</td>
<td>12 (92.3)</td>
</tr>
</tbody>
</table>

*missing value (n=1). Note 1 the responses on the 7-point Likert scale were merged into often (6–4), seldom (3–1) and never (0).

Caregivers, teachers, and assistants in Study II called for more help from the professionals.

“He [the child] would be able to communicate more and more articulately if we [the caregivers] received more help” (caregiver 3)

“The training [in communication with the SGD] was short. I did not have time to learn properly from it” (teacher 8)
Bilingual caregivers commented that they had difficulties understanding the information given by SLPs.

“I have received a lot of information from the speech and language pathologist but it was hard to understand” (caregiver 10)

Teachers and assistants commented that they used partner strategies in communication board-mediated interaction but not in SGD-mediated interaction.

“[We] do not use aided language modelling with the SGD because the child can use it [the SGD] independently. [We] use aided language modelling with the bliss board [the communication board] to model sentences” (teacher 4)

Use of the SGD

The results from Study II showed that the SGD was mostly used for choosing and to play games, but also for other purposes. Children used their SGDs more at school than at home and more during weekends than on weekdays at home (Table 12).

Table 12. Daily use of the SGD reported by caregivers (n=23), teachers (n=14), and assistants (n=15) (Study II).

<table>
<thead>
<tr>
<th></th>
<th>Caregivers I &amp; II weekdays n (%)</th>
<th>Caregivers I &amp; II weekends n (%)</th>
<th>Teachers n (%)</th>
<th>Assistants n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose activity</td>
<td>6 (26,1)</td>
<td>9 (40,9)</td>
<td>8 (66,7)</td>
<td>8 (61,5)</td>
</tr>
<tr>
<td>Answer questions</td>
<td>7 (33,3)</td>
<td>9 (39,1)</td>
<td>7 (58,3)</td>
<td>6 (50,0)</td>
</tr>
<tr>
<td>Ask questions</td>
<td>7 (30,4)</td>
<td>8 (34,8)</td>
<td>5 (41,7)</td>
<td>4 (33,3)</td>
</tr>
<tr>
<td>Explain if something is wrong</td>
<td>3 (13,6)</td>
<td>5 (21,7)</td>
<td>6 (50,0)</td>
<td>5 (45,5)</td>
</tr>
<tr>
<td>Tell something</td>
<td>5 (22,7)</td>
<td>7 (30,4)</td>
<td>5 (41,7)</td>
<td>7 (58,3)</td>
</tr>
<tr>
<td>Social phrases</td>
<td>3 (13,6)</td>
<td>5 (21,7)</td>
<td>5 (45,5)</td>
<td>3 (25,0)</td>
</tr>
<tr>
<td>Play games</td>
<td>10 (43,5)</td>
<td>14 (60,9)</td>
<td>7 (58,3)</td>
<td>6 (46,2)</td>
</tr>
</tbody>
</table>

*a missing value (n=1), b missing value (n=2), c missing value (n=3), d missing value (n=4).

Caregivers in Study II commented that they were grateful that their child could express previously unknown thoughts and ideas. The SGD contributed to independent communication and leisure activities for their child.

“We are extremely grateful to have access to Tobii [the SGD]” (caregiver 4)
“The iPad is her [the child’s] lung, her only possibility. It is a way to interact [with others]” (caregiver 20)

“He is so active telling us what he wants; we do not have to ask questions” (caregiver 2)

The teachers in Study II reported on SGD use at school.

Nine children attended the compulsory school for pupils with severe learning impairments that comprised five subject blocks. The SGD was mostly used in the subject ‘Communication’: five children used their SGDs at least once per lesson in ‘Communication’. Two children used their SGDs at least once per lesson in ‘Perception of reality’ and ‘Everyday activities’. One child used the SGD at least once per lesson in ‘Aesthetic activities’. No one used their SGD in ‘Motor skills’.

Four children attended the compulsory school for pupils with learning impairments that comprised twelve subject blocks. One of them used the SGD at least once per lesson in ‘English’, ‘Mathematics’, ‘Sciences studies’, and in ‘Swedish’. The other three children used their SGDs incidentally or never in education.

The remaining three children attended upper secondary school for pupils with (severe) learning impairments or preschool, in which there were no official timetables.

Teachers commented that communication boards were used instead of the SGD, but the goal was to use the SGD more in the learning environment. The majority of teachers and assistants experienced that the SGD facilitated learning (Table 13). Nevertheless, 10 teachers and 11 assistants commented that the SGD was used too little at school.

Table 13. Experience of SGD-mediated interaction in the classroom reported by teachers (n=14) and assistants (n=15)

<table>
<thead>
<tr>
<th>SGD-mediated interaction facilitate learning:</th>
<th>Teachers</th>
<th>Assistants</th>
</tr>
</thead>
<tbody>
<tr>
<td>To a large extent¹</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Medium¹</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>A little¹</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Not at all¹</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Note¹ the responses on the 7-point Likert scale were merged into (5-6) to large extent, (3-4) medium, (1-2) a little, and (0) not at all.
Reasons for difficulties

Eleven SLPs, 19 caregivers, 12 teachers, and 13 assistants provided a comment to the open-ended question “What are the reasons for difficulties (if any) in achieving communication with SGD?” In all, there were 96 meaning units: 27 from SLPs and 69 from caregivers, teachers, and assistants. There were 14 non-sortable comments, too short or too imprecise to be sorted, for example, “the picture is there” and “rather use Bliss”. One non-sortable comment was from the SLPs, the remaining 13 were from caregivers, teachers, and assistants. The 96 meaning units were sorted into the categories of ICF-CY: Body functions and structures (n=18), Activities and participation (n=8), and Environmental factors (n=70).

Body functions and Structures
Children’s fluctuating health status and their ability to sustain and divide attention affected their ability to use their SGDs. Visual impairments and difficulties fixating and shifting their gaze aggravated interaction with the eye-gaze accessed SGD. Uncertainties about the children’s comprehension also aggravated the SGD-mediated interaction.

Activities and participation
Communication partners commented that other communication partners’ low expectations of the child’s ability could lead to limited activity and participation at school. In addition, classmates’ difficulties understanding SGD-mediated interaction could restrict the use.

Environmental factors
The SGD was heavy and clumsy and there were repeated breakdowns and long periods for repairs. There was a lack of support. First, caregivers did not receive enough support from professionals at habilitation centres or from teachers at school. Second, vocabulary was missing in the SGD. SLPs, caregivers, and teachers commented on uncertainties about how to organise the vocabulary and there were time limits on programming the SGD. Third, some children who were learning to use their SGDs, needed support from two people when interacting with the SGD, which was difficult to provide. Fourth, disagreements about the use of the SGD among communication partners was problematic. Fifth, a high turnover among assistants and teachers made the intervention more difficult. Further, there were technically unexperienced communication partners who avoided SGD-mediated interaction. Consequently, they did not provide opportunities for SGD-mediated interaction. SLPs wanted to provide additional training with both the child and his/her communication partners, but they were short of time.
Study III

The analysis of Study III showed that the use of IRE-sequences with summoning name and content questions with pre-known answers or asking the same question in turns in combination with teachers and assistants contingent on-screen eye-gaze activities facilitated SGD-mediated interaction in multiparty classroom. Even though the social practices are understood in juxtapositions, not as separate elements, the following section presents the social practices separately.

IRE sequences, summoning name and content questions

Extract (1) is from a lesson in nature science at Anna’s school. The teacher (T) asked Anna (A) a question.

Extract (1) Can you say something about Venus Anna?

01 T Δ kan du kan du säga nåt Anna om Δ Venus
Δ can you say something about Venus Anna

02 A Δ gazes at the teacher----------------->Δ gazes SGD-->

03 A [#MERKURIUS #MERKUSIUS #VENUS]

04 T walks over to Anna to see the SGD screen

05 A #VENUS #VENUS Δ=

06 T "palms up and walks away"

07 A Δ gazes at the assistant----->

08 T ja ser att du säger Anna
I see that you say Anna

09 T men det kommer inget Δ ljud
but there is no Δ sound

10 A Δ##VENUS

11 (1,5)

12 A gazes at the teacher------>

13 (0,5)

14 A "Venus är en stenplanet"
"Venus is a rock planet"

15 T "precis"
The extract (1) illustrated how the organization of IRE-sequences facilitated SGD-mediated interaction because the highly ritualized practice of turn allocation made ratification unmistakable and it provided a recognizable response place for Anna’s SGD-mediated contribution. The teacher initiated the sequence. He ratified Anna by summoning her name and posed a polar question “can you say something about Venus Anna” (line 1) that called for more than a yes/no response. The practice of summoning Anna by name clarified recipiency not only for Anna, but also for the classmates and the assistants. Anna’s gaze orientation towards the SGD (line 2) was treated as a pre-beginner signal (Savolainen et al., 2020): no one of the classmates displayed recipiency and the teacher waited at the white board for a response.

Anna started to respond as she oriented towards the SGD (line 2, 3). The classmates respected Anna’s right to the floor and did not self-select or initiate side-sequences or schisming. After 7 s (line 4), the teacher walked over to Anna to see the SGD screen. He could see that Anna was trying to activate the symbol of Venus. He evaluated her attempts. He made a gesture of turning his palms up that contributed to make the SGD, and not Anna, accountable for the default response. He walked away but acknowledged her attempts by saying “I see Anna that you are saying but there is no sound” (line 8, 9). In an overlap, Anna finally succeeded in activating the symbol (line 10). She looked at the teacher (line 12) and responded “Venus is a rock planet” (line 14). Anna’s gaze orientation from the SGD to the teacher was a typical gaze practice providing a transition relevance place and next-selecting the teacher. The teacher evaluated and acknowledged Anna’s response “exactly” (line 15) “a rock planet” (line 17).

The next Extract (2) illustrated how the practice of IRE sequences with the same question to all students in turns facilitated SGD-mediated interaction in multiparty classroom. The extract is from a lesson in mathematics at Anna’s school. The teacher (T) asked Anna’s classmates (C1) and (C2) and Anna (A) the same question in turn.

Extract (2) Which got most hits?

01 T vicken du ska säger vicken har fått flest träffar. which would you say which got the most hits
02 (2.5)
03 T kan du sä kan du säga det Josef. can you tell me that Josef.
04 C1 (shows four fingers)
The organization of asking the same question in turn facilitated understanding: the structure of the lesson was understandable and predictable. When the teacher asked Anna “Anna which one would you say” (line 9), she had already moved to the page with digits in the SGD through several page turns. The extract illustrated how the students waited in silence when another student was ratified, which resembles the finding in Sahlström’s thesis (1999): students wait in silence, to listen, to be polite and to be ready to take a turn at a possible transition relevance place. In this sequence, they waited in silence be ready to take a turn when they were ratified by the teacher.

Supportive scaffolding

Most often, the practice of IRE-sequence, summoning name and content question was not enough to enable an SGD-mediated response in the multiparty interaction. In the majority of identified SGD-mediated response sequences, the teacher or the assistant displayed contingent on-screen practices that made the composing process public and understandable for all involved.
The next Extract (3) is drawn from the same lesson in nature science as Extract (1). The teacher (T) asked Anna (A) a question. Two classmates (C1) and (C2) sitting on either side of Anna looked at the SGD during the production time.

Extract (3) Can you say something on Uranus?

01 T  *kan du säga nånting Anna om *Uranus?  
  *can you say something Anna about *Uranus?  
  *walks to Anna-->

02 A  Δgazes at SGD-->

03 C1  *gazes at SGD-->

04 (2.0)

07 A  *#VENUS (3.5) #VENUS  
  #VENUS (3.5) #VENUS

06 T  *gazes at the SGD-->

07 T  *öden planeten (1.0) där Anna  
  *that planet (1.0) there Anna  
  *points at symbol on SGD--->

08 (2.0)

09 A  #NEPTUNUS #URANUS #SOLEN  
  #NEPTUNE #URANUS #THE SUN

10 T  *ödär  
  *there  
  --->

11 (1.5)

12 A  #URANUS #URANUS  
  #URANUS #URANUS

13 (2.0)

14 T  ja ser att du [försöker  
  I see that you are [try  

15 A  [#URANUS ##URANUS

16 C2  vill den inte Anna  
  does it not want to Anna

19 A  "Uranus e en gasplanet"  
  "Uranus is a gas planet"
The sequence, Extract (3), was preceded by the teacher who had asked Anna to tell something about each planet. Uranus was the seventh planet in order and Anna had showed some difficulties activating the right symbol in response to the previous questions. The planets were symbolized by circles in different colours with the name below. However, Anna was not literate and it was difficult for her to know which planet that was illustrated with what colour.

The teacher ratified Anna by summoning her name and asking her to say something about Uranus (line 1). There was an overlap at the end of the teacher’s Initiative (i.e., question): (i) the teacher started to walk over to Anna to see the process on the screen, and (ii) Anna and her classmate oriented themselves towards the SGD screen (line 2, 3). The teacher followed Anna’s attempts and after 5.5 s he produced a spoken indexical turn and pointed at the SGD (line 7, 10). The teacher’s body and gaze orientation towards the SGD screen explained for all involved who had been ratified and it prolonged the response space for Anna to compose her SGD-mediated response. The SGD-directed deictic gesture made reference to the symbol on the SGD, and the use of low volume “that planet there Anna” was a supportive scaffolding practice that signal intimacy.

Similar to Extract (1), the teacher acknowledged Anna’s attempts “I see that you try” (line 14). In addition, a classmate (C2) also commented, “does it not want to Anna” (line 16), which again made the SGD, and not Anna accountable for the missing response.

The classmates did not always wait in silence during the production time of the SGD-mediated contribution. Sometimes they self-selected during the non-speaking child’s turn. Extract (4) is from a lesson in nature science at Steve’s school. The teacher (T) asked Steve (S) a question but he was interrupted by two classmates (C1) and (C2). Steve’s assistant (Assist 1) and two another assistants (Assist 2, and Assist 3) were also participating in the interaction.

Extract (4) Where can you bend your body?
01 T   @Steve*
02 C2  @hand raising--------->
03 C1  ja
       YES
       *hand raising-->
04 T var kan du böja kroppen [nånstans where can you bend your body
05 C2 ------------------>
06 S [#FOT #FOT #FOT FOOT FOOT FOOT
07 T har du nån* do you have any
08 C1 ---------->*
09 C1 hama hama
10 Asst2. lays a hand on C1’s shoulder
11 Asst1. var kan du böja kroppen
where can you bend the body
12 S #FOT #FOOT
14 T har du nån* [nånstans på kroppen do you have [anywhere on the body
13 C2 @hand raising-------------------->
15 S [#empty square below foot
16 (2,5)
17 Asst1. har du nån [kroppsdel som du kan
do you have any [body part you can
18 S [#FOT #FOT #LUNGA FOOT FOOT FOOT LUNG
19 Asst1. böja på eller nån muskel bend or any muscle
21 C1 vâja vâja
21 Asst1. som du kan böja på that you can bend
22 (1.5)
23 Asst3. såja (. ) här e dom här böjbara there (.) here are the bendable parts
24 Asst1. du har helt rätt you are absolutely right
22 Asst1. [där om du säger @ dä right [there, if you say so
22 S [#FOT ##FOT
In this extract (4), two classmates self-selected after Steve had been addressed. The teacher and the two assistants adopted a range of scaffolding roles to deal with the upcoming problems. The teacher was standing in front of the class and could not see the SGD screen. The assistant was sitting on Steve’s left hand side. First, the teacher did not pay any attention to the classmates’ “doing being recipient” (line 2, 3) (Sahlström, 1999), he continued to address Steve by asking the question (line 4) and Steve started to respond (line 6). The follow-up question (line 7) prolonged the response space, but one of the classmates interrupted again (line 9). This time, the assistant sitting behind the student (C1) placed her hand on C1’s shoulder: an embodied repair scaffolding action. An adults’ touch can initiate, stop or monitor embodied actions in a child (Goodwin & Cekaite, 2018). In this extract, the touch stopped C1 from intruding during Steve’s turn for a while. The teacher and the assistant took turns in re-establishing the transition relevance place by repeating and re-formulating the question (line 11, 14, 17, and 21): supportive scaffolding actions. It was not until line 28, that the teacher addressed the whole group of students “we will just wait for Steve”.

In summary, the three Extracts (1, 3, and 4), showed the importance of either the teacher or the assistant (i.e., the facilitator) being close to the nonspeaking student to see the composing process on the SGD screen. By producing indexical turns, re-establishing the transition relevance place, practicing SGD-directed gaze and depicting gesture the facilitator notified the classmates and the adults in the classroom who could not see the SGD screen of the composing process. The sum of practices made the composition process recognisable and public and this contributed to enable SGD-mediated interaction in the multiparty classroom interaction.

Study IV

The analysis of Study IV found that the communication partner’s use of multi-unit turns with variation between recipient-tilted epistemic asymmetry and
stronger deontic constructions, the use of prosodic variations and voice stylizations, and SGD-directed gaze and deictic pointing gestures mobilized an SGD-mediated response when the child was a beginner user. Like in multiparty classroom interaction, the social practices should be understood in juxtapositions, not as separate elements. Nevertheless, the following section will present the social practices separately.

Multi-unit turns
The first Extract (5) is from a conversation between Steve (S) and Marianne (T).

Extract (5) Can you tell me something about your summer holiday?

01 T +.hhhh men ©du. (.) kan du berätta nått för mig=
+ .hhhh but ©you (.) can tell me something=
©looks at S---------------------------------->
02 S +looks at M-------------------------------->
03 T =va du har gjort i sommar +vilka du ha-(.)=
=what did you do this summer + who you hav-(.)=
04 S +looks at SGD----->
05 T =+om de en nån du har träffat då.
+=if there was someone you met then.
06 S =+looks at M--------------------->
07 (2.0)
08 T  "va::o,
"hu::o, h
09 (1.6)
10 T ©finns det nån här som du skulle
©is the anyone here that you
©looks at SGD--------------------->
11 T ©kunna (.) hhh berätta om.
©could (.) hhh tell about.
©looks at S--------------------->
12 (2.6)
13 T © $(0,2) titta på din karta här=© $(0,2) look at your board here=©
©looks at the SGD--------------------->
$points a circle in front of the SGD-->
14 T =får du © se=. + ©
=you will © see . + ©
©looks at S-->©looks at SGD----->
15 S +looks at SGD----->
16 (2.6)
The Extract (5) illustrated how multi-unit turn sequences could be organized with variation between recipient-tilted epistemic asymmetry and stronger deontic constructions. Marianne produced five turns before the SGD-mediated response. First, she asked Steve to tell her something (line 1), which she then specified (line 3, 5). This sequence illustrated a multi-unit questioning turn; there were two questioning turns without interference from Steve. Second, Marianne said “varför då” in a low voice (line 8), which required Steve to take the turn. The request was produced in a low voice that softened the demand. Third, Marianne produced a polar yes/no follow-up question that invited Steve as a knowing participant “is there anyone here that you could” (line 10, 11). Fourth, she proceeded with a turn in imperative syntax, demanding him to look at the screen (line 13, 14). The turns were not only upgraded in terms of syntax, but in adding embodied resources. In the first turns, which were produced in recipient-tilted epistemic asymmetry, Marianne looked at Steve. When she changed to the more demanding syntax, she oriented her gaze and deictic gesture towards the SGD screen (line 13, 17) which Steve followed (line 14) and started to respond (line 18). Fifth, she posed first part of a follow-up question “are there any” (line 17) and then finally, Steve responded on the SGD. However, Steve activated the symbol next to PERSONS.

In summary, Marianne provided a combination of supportive and heuristic scaffolding actions. She produced repeated turns that re-invited Steve, she
used SGD-directed gaze and deictic pointing gestures and prosodic stylizations, but she did not activate the symbol for Steve. The Extract (5) illustrated the pattern of multi-unit sequences that started with recipient-tilted epistemic asymmetry (i.e., positioning the child as a knowledgeable and competent participant) and ended with more deontic constructions (i.e., demanding that the child respond on the SGD). It also illustrated the practice of on-screen activities: the communication partner followed the non-speaking child’s gazings at the screen and the child followed the communication partner’s gazings and pointings at the screen.

Prosodic variation and voice quality
In general, communication partners' contributions were produced in rich prosodic variations (i.e., pitch, volume, stress, and tempo) and there were alteration in voice quality (e.g., breathy or happy voice quality). The prosodic variations and voice quality, in combination with the practice of multi-unit turns, SGD-directed gaze and pointings worked response mobilizing. The deontic constructions were softened by for example a low voice. Extract (5) “Can you tell me something about your summer holiday?” illustrated the practice of stress on content words and a breathy voice quality. The word stress contributed to frame the agenda and the breathy and low voice signalled intimacy. Extract (6) “Shall I show you then?” illustrated the practice of stress on content words, increased tempo and high-rise pitch contours that projected continuation of a navigation process.

SGD-directed gaze and deictic gestures
The communication partner’s gaze and deictic orientation towards the SGD in combination with prosodically styled spoken turns created semiotic fields (Goodwin, 2000) that mobilized an SGD-mediated response from the beginner child. The analysis of Study IV found four functions of the deictic gesture. They made reference, illustrated navigation, demonstrated the use of symbols, and enacted the child’s turn.

The practice of making reference was illustrated in Extract (5) (line 13, 18 and 20). The gesture worked to generate attention as the child oriented himself towards the SGD and started to respond.

Extract (6) exemplifies the practice of illustrating navigation through the SGD to a page with symbols corresponding to a content question with restricted response alternatives. Lucas (L) and Ellinor (T) were interacting.
Extract (6) Shall I show you then?

01 T © mm: (_.) ska jag $ vi:sa + dig rá.
© mm: (_.) shall I $ show + you then.
© looks at SGD----------------->
    $ points tw SGD

02 L + looks tw SGD->

03 T >$ kate[gorier]?
>$ cate[ories]?
$ ##KATEGORIER (##CATEGORIES) changes menu
04 ["kategorier" ("categories")

05 T $ blädd[ra]?
$ brow[se]?
$ ##BLÄDDRA (##BROWES) changes menu
06 ["bläddra" ("browes")

07 T $sak[er]?
$ thing[s]?
$ ##SAKER (##THINGS) changes menu
08 ["saker" ("things")

09 T >$verk[tyg]<ok>e:j. ©
>$ too[k] okay†. ©
$##VERKTYG (##TOOLS) changes menu
["verktyg" ("tools")
-------------© looks at L-->

10 T >kategor[ier] bläddra saker=©
> categor[ies] browse things= ©
-------------©

11 L [##BORR (##DRILL)
12 T © =>verktyg.<
© =>tools.<
© looks at SGD------>

13 T .hh ["va ska © vi ha för verktyg"
   .hh ["which tool shall we get"

14 L [##BORR (##DRILL)
15 T © looks at toy tools-->
16 T © du får välja nåt å (.)["bygga meo"
© you can choose something (. ) to ["build with"
© looks at SGD------>
17 L ["borr" ("drill")
Ellinor and Lucas were playing together with some toy cars and figures. When the Extract (6) started, Lucas had been searching for the page with symbols of tools for 1 minute and 16 seconds. Ellinor summarized “mm, shall I show you then” (line 1). She navigated through the system by pressing four symbols (i.e., categories, browse, things, and tools). Each press changed the menu: Ellinor finally ended up with the menu of tools and summarized the four steps in an increased tempo (line 10, 12). Lucas immediately started to respond (line 11) in overlap to Ellinor’s summary. Ellinor’s actions could be described as an other-initiated other-repair: Lucas had tried to find the page but failed and Ellinor showed him the navigation path. Her repair scaffolding actions supported him to respond by offering the page with the corresponding vocabulary.

The practice of demonstrating the use of a symbol is demonstrated in Extract (7) “I have a question”. The extract is from the same play session at Lucas’ preschool as Extract (6). Lucas (L) and Ellinor (T) were interacting.

Extract (7) I have a question
01 T  © + ja $har en [frå:ga här.
©+  I $ have a  [question here.
©looks at SGD---------------->
02 L  +looks at SGD---------------->
    $$$JAG UNDRAR (I WONDER)changes menu
    ["jag undrar" ("I wonder")

In Extract (7), Ellinor stated that she had a question (line 1). She then pressed the symbol on the SGD and activated the synthetic voice “I wonder” in overlap with her own spoken turn. By doing this, she demonstrated how to use the symbol. Lucas looked at the screen during the whole demonstration.

The practice of enacting the child’s turn is showed in the following Extract (8). The analysis of Study IV showed how communication partners displayed responsiveness towards children’s body movements, gaze orientation and sounds of discontent. If the child had difficulties activating the symbol, the communication partner could offer the child help and enact the child’s turn. Extract (8) is a conversation between Rosa (R) and Barbara (T).
Rosa had been trying to activate the symbol on the eye-gaze accessed SGD for several seconds. She had demonstrated discontent by sounds and body movements when Barbara said, “I will press it for you on Dadda” (line 1). The enacting action displayed Ellinor’s responsiveness to Rosa’s embodied resources and it prolonged the training session as Rosa took the next turn (line 4). The practice was a repair scaffolding action.
Discussion

The overall aim of this thesis was to investigate SGD-mediated interaction including children with anarthria, severe physical impairment and intellectual disability due to cerebral palsy with focus on partner strategies and social practices. Two theoretical frameworks (one more individualistically and one more dialogically oriented) were used in the analysis. The discussion has four sections: use of partner strategies in SGD-mediated interaction, communication partners’ learning of SGD-mediated interaction, social practices in SGD-mediated interaction, and possible reasons why the SGD was not used more often in multiparty classroom interaction. Each section begins with a summary of the main findings, which are subsequently discussed in relation to previous research and theories.

In the first section, children’s prerequisites for individual development are discussed in relation to communication partners’ use of partner strategies. In the second section, communication partners’ prerequisites for individual development using partner strategies are discussed in relation to SLPs use of instructional approaches in adult learning. In the third section, SGD-mediated interaction in multiparty and dyadic interaction is discussed using a dialogical and ethnomethodological theoretical perspective. In the last section, plausible reasons for the limited use of eye-gaze accessed SGD-mediated interaction in multiparty classroom interaction is discussed from the child’s perspective and from the speaking communication partners’ perspective.

Use of partner strategies in SGD-mediated interaction

The most frequently used partner strategy was open-ended questions and the least used was aided language modelling. Teachers and assistants reported a higher use of partner strategies than caregivers did. More than half of the teachers and assistants used partner strategies in SGD-mediated interaction daily. Caregivers reported a higher use on weekends than on weekdays.

Interestingly, communication partners’ comments that aided language modelling was easier to use on a communication board than on the SGD features in the findings of Holmqvist, Thunberg, and Dahlstrand (2017). They found that communication partners used aided language modelling on the communication board, and not on the SGD, when an eye-gaze accessed SGD
was introduced. The majority of the children in Study II used eye-gaze technology to access their SGDs. The reasons why communication partners experienced that it was easier to use aided language modelling on communication boards compared to SGD can only be speculated on. However, using two access techniques, direct pointing and eye-gaze technology could have caused confusion and it could have been unclear which access technique had actually activated the symbol. The child may have incidentally activate a symbol during the communication partner’s aided modelling action just by observing the communication partner. Hence, the purpose of the strategy would then have become blurred.

The reported moderate to low use of partner strategies could be problematic for two reasons. First, the use of partner strategies can improve both social and linguistic skills in non-speaking children (Allen et al., 2017; Fey et al., 2006; Gevarter & Zamora, 2018; Muharib, Alzayer, Wood, & Voggt, 2019; Romano & Woods, 2018; Soto & Clarke, 2017). All children, irrespective of whether they have speech and language impairments or not (United Nations Human Rights, 1989; World Education Forum, 2016), should get optimal opportunities to improve their linguistic skills because language is important both in social interaction and in education. AAC-mediated interaction is essential for developing and maintaining relationships for non-speaking persons (Caron & Light, 2016; Hynan, Murray, & Goldbart, 2014; McNaughton, Bryen, Blackstone, Williams, & Kennedy, 2011; Therrien, 2019) and relationships are important for well-being. McNaughton and Bryen (2007) found in their study that non-speaking persons using AAC often left school with limited academic and workplace skills. Education is central in order to understand how society works and to get employment. Furthermore, inclusive and equitable education to promote lifelong learning is a goal of UNESCO (2016). Having a means of obtaining and demonstrating knowledge could enhance the non-speaking person’s possibilities for education. In addition, good social and linguistic skills could increase non-speaking children’s possibilities to deal with emerging trouble sources such as misunderstandings in SGD-mediated contributions, which in turn could lead to decreased frustration. Second, there is a correlation between language impairments and behavioural, emotional, and social difficulties (St Clair, Pickles, Durkin, & Conti-Ramsden, 2011). Even though behavioural difficulties typically decrease from childhood to adolescence, emotional and social difficulties often remains. Furthermore, Dickinson et al. (2007) examined the well-being of 818 children with CP 8-12 years. The researchers found that children with CP and ID had more emotional difficulties compared to children with CP without ID. Moreover, children with CP and speech difficulties had more social difficulties than children with CP without speech difficulties. Non-speaking children, who use SGDs, depend greatly on communication partners’ abilities to use partner strategies and social practices that facilitates SGD-mediated interactions (Batorowicz et al., 2014).
In summary, it is important to ensure that non-speaking children with severe physical impairments and ID get optimal opportunities to develop linguistic, operational, social, and strategic competence to facilitate SGD-mediated interaction in multiple contexts with close friends, family, and acquaintances (Light & McNaughton, 2014). The use of open-ended questions, recastings, aided language modelling, and the behaviour chain interruption strategy can help to enhance the social and linguistic skills of these children (Allen et al., 2017; Gevarter & Zamora, 2018; Soto & Clarke, 2017). Research on the effect of responsive interaction and environmental arrangement have included infants and toddlers (Fey et al., 2006; Romano & Woods, 2018), but these strategies have been used in the preparation phase of intervention studies targeting older children and adolescents (Soto & Clarke, 2017, 2018). Responsive interaction seems to be fundamental to interaction that include persons with speech and language impairments irrespective of age or cause of impairment. For example, Harmon, Jacks, Haley, and Bailliar (2019) found that communication partners’ restricted use of responsive interaction was associated with increased stress and decreased speech by individuals with aphasia.

Given that partner strategies are important in skill-training and that caregivers, teachers, and assistants in Study II requested more and enhanced training from SLPs, which instructional approaches did SLP in Study I use in teaching adults partner strategies?

Communication partners’ learning of SGD-mediated interaction

Study I showed that SLPs typically used verbal information and modelling and seldom feedback, video of others in SGD-mediated interaction, or role-play when teaching partner strategies. About half of the SLPs: (i) provided communication partners with at most one training session in SGD-mediated interaction in the last 12 months and (ii) taught caregivers, teachers, and assistants to use partner strategies in SGD-mediated interaction. A third of the SLPs did not use goal setting documents in SGD-mediated interactions. There was a noteworthy, but small predominance of SLPs teaching teachers and assistants more than teaching caregivers. In addition, SLPs learned about partner strategies in SGD-mediated interaction and instructional approaches in adult learning mostly from the multi-professional specialist unit team at the regional paediatric habilitation centres and from clinical experiences. Study II discovered that caregivers, teachers, and assistants most commonly learned to use partner strategies in SGD-mediated interaction from the child’s SLP. Bilinguial caregivers had difficulties understanding the instructions given by the SLPs. Overall, communication partners requested more and better training. They commented that insufficient training could be a reason why the SGD
was not used more frequently. The comments about inadequate support and training in SGD-mediated interaction correspond to previous research (Anderson et al., 2014; Iacono & Cameron, 2009; McNaughton et al., 2008). However, previous research, which has investigated communication partners’ experiences and opinions about SGD-mediated interaction, did not focus solely on partner strategies. Consequently, the participants in those studies commented on all sorts of shortcomings in SGD-interventions.

SLPs report that they learned about partner strategies and instructional approaches in SGD-interventions from clinical experience and from colleagues should be discussed from two points of view. First, learning from trial and error with a patient could have negative effects on the patient and his/her communication partners and, in the worst case; it could even jeopardise the patient’s well-being. Caregivers in a study by Anderson, Balandin, and Stancliffe (2014) expressed frustration over novice SLPs who lacked experience and knowledge of SGD-mediated interaction. The lack of experience and knowledge resulted in insufficient coaching, which in turn reduced caregivers’ ability to scaffold SGD-mediated interaction with their children. Consequently, the children’s ability to have a voice was restricted. Second, the SLPs’ response that they learned from colleagues may suggest that some kind of formal or informal peer-learning occurred (i.e., learning in interaction with persons with equal knowledge and skill) (Melén Fäldt, 2019). Peer learning, for example, a ‘community of practice’ can have positive effects provided that critical reflections and discussions take place (Herbers, Antelo, Ettling, & Buck, 2011). The ideas of a community of practice are drawn from Mezirow’s transformative learning theory, which suggests that learning is a transformation of an individual in interaction with the society. A community of practice implies that people who share ways of doing things, ways of thinking etc. can learn from each other through critical reflection and discussions.

The fact that a third of the SLPs did not use goal-setting documents in the SGD-mediated intervention should also be discussed because it might reflect a lack of identification of experienced problems when working with the communication partners. The identification of an experienced problem and goal setting that involves the participation of caregivers’ or other important communication partners’ is essential (Bloch, 2013; Granlund, BJORCK-AKesson, Wilder, & Ylven, 2008; Rombouts, Maes, & Zink, 2017). Without specific, measurable, achievable, realistic and time bound goals (Hersh, Worrall, Howe, Sherratt, & Davidson, 2012), it is not possible to evaluate the effectiveness of the SGD intervention and it is not possible to provide targeted feedback. Articulating SGD-related goals clarifies the purpose of the SGD-intervention. For example, is the purpose with the SGD-intervention skill-training of the individual child or is it enhanced participation in dyadic or multiparty interactions? If the purpose is skill training, maybe partner strategies should be used in dyadic training and if the purpose is participation, maybe
social practices that enable SGD-mediated interaction in multiparty interaction should be used. The content of the SGD-related goals in this thesis was not known because it was not part of the data collection. However, previous research found that AAC-related goals are typically skill-training goals and seldom related to participation and social interaction (Borgestig, Sandqvist, Ahlsten, Falkmer, & Hemmingsson, 2017; Klang et al., 2016).

Both Mezirow (1997) and Kolb (2015) suggested that critical reflection is a key factor in adult learning. Critical reflection on SGD-mediated interaction could be facilitated in role-play or in feedback with video-recorded material. Mezirow argued that adult learning occurs when: (1) a deeper understanding of an existing point of view is achieved; (2) a new point of view is established by focusing on shortcomings; (3) a change in point of view occurs through awareness and critical reflection; or (4) a change in habits of mind occurs through awareness and critical reflection. Learning by adding knowledge to already obtained knowledge or skill is easiest and changing habits of minds (i.e., acting, thinking and feeling) is hardest. However, when an SGD is introduced, communication partners seldom have previous experience and knowledge of SGD-mediated interaction. They have experience and practices of spoken face-to-face interaction. Consequently, they cannot just add knowledge, which would have been the easiest way to learn. Instead, they need to make a change in their habits of mind and for this they need constructive feedback from professionals with knowledge about how SGD-mediated interaction is organised and what practices than may be used for skill-training.

Kolb (2015) postulated that learning presumes the identification of an experienced problem: without an experienced problem, participants are not motivated to learn new practices. Furthermore, solving a problem that you experience yourself is often more motivating than solving other peoples’ problems. According to Kolb’s learning circle, communication partners need opportunities to reflect on the self-experienced SGD-mediated interactional problems, make abstract conceptualizations (i.e., come up with possible solutions), and try out them in active experimentation. I suggest that active experimentation with feedback is important in SGD-mediated interaction because SGD-mediated interaction may be more of a practical than a theoretical skill. Communication partners need practice with feedback, role-play, and time for reflection together with professionals, for example SLPs.

SGD-mediated interaction can be very difficult to capture and talk about without transcripts of video recordings. Temporal and sequential organisation is almost impossible to capture and discuss without transcripts (Garfinkel, 1967; ten Have, 2007). Thanks to transcripts and repeated viewing of video recording, communication partners can be made aware of unconscious but significant practices in social interaction. Bloch (2013) suggested that SLPs working with participants with speech and language impairments could use video data and transcripts to guide participants in their conversation. By using video recordings and transcripts of naturally occurring conversations, SLPs
could more easily talk about the interaction in terms of turns and sequences, topic change, repair actions and scaffolding roles. There are a few communication partner programmes that use CA methodology (Lock et al., 2001; Samuelsson & Plejert, 2015) but neither of them have been used to teach and coach communication partners in eye-gaze accessed SGD-mediated interaction. There is a need to improve SGD-interventions and maybe such a programme or the eight-step model (Kent-Walsh & McNaughton, 2005) could be used.

Social practices in SGD-mediated interaction

Study III and Study IV illustrated how participants organized eye-gaze accessed SGD-mediated interaction in two institutional settings: in multiparty classroom interaction and in dyadic interaction focusing on SGD-mediated training. The study of multiparty classroom interaction found that an IRE-sequence with summoning name, content questions or repetition of the same question, prosodic variations and laughter, SGD-directed gaze and deictic gesture, and supportive, repair or heuristic scaffolding actions made SGD-mediated interaction possible. The study of dyadic interaction including children who were still training to use the eye-gaze accessed SGD discovered that multi-unit turn organization, SGD-directed gaze, SGD-directed deictic gestures, prosodic stylization, recipient-tilted epistemic asymmetric organisation and deontic constructions worked response mobilizing. The sum total of these practices enabled the child to respond on the SGD.

The results from the two studies will be discussed in the following three sections: turn-taking organisation, turn construction, and SGD-directed gaze and deictic gestures.

Turn-taking organisation

IRE-sequences in classroom interaction

Multiparty interaction places additional demands on participants because the next-speaker is not obvious, and side-sequences or schisming can develop (Egbert, 1997; Jefferson, 1972; Sacks et al., 1974). By using content questions and summoning name in IRE-sequences, the risk of uncertainties in ratification was prevented and the risk of emerging side-sequences or schisming was minimized. The conversational floor was clearly distributed and ratification was made confident, which mirror previous research (Lerner, 2003). Furthermore, the practice of IRE-sequences provided a sequentially unmistakable second turn position for the SGD-mediated response. Clarke and Wilkinson (2007) showed in their study that the communication partner’s practice of producing a first pair part of an adjacency pair or a meta-interactional prompt
worked in the same way: the practices positioned the SGD-mediated contribution in second turn position that facilitated understanding. Hester and Francis (Hester & Francis, 2000) suggested that the practice of close-ended questions had three purposes: to elicit a correct answer, to distribute public knowledge and to enable students to demonstrate knowledge. I suggest that close-ended questions had an additional purpose in SGD-mediated interaction: it placed the SGD-mediated response in an unmistakable second turn position, which facilitated understanding and participation.

Even though research on classroom interaction is broad (Hester & Francis, 2000; Mehan, 1979; Seedhouse, 2004; Sinclair & Coulthard, 1975), it has mostly investigated settings involving typically developed children. There are a few studies that included students with disabilities (Evaldsson & Melander, 2017; Gustavsson, Kittelsaa, & Tøssebro, 2017; Radford et al., 2015) but none of them included non-speaking children using SGDs for interaction. Therefore, the result will be discussed in relation to research on typically developed children.

Extract (4) “Where can you bend your body?” showed that classmates raised their hands during the non-speaking child’s turn, which is an uncommon practice in multiparty classroom interaction that includes typically developed students (Sahlström, 1999). Sahlström (1999) found that hand-raising did not necessarily mean self-selection, but it also signalled willingness to answer, to take a public turn (Sahlström, 1999). The teacher in Extract (4) ignored the two hand-raising students and oriented his attention towards Steve. By doing this, he resigned from publicly correcting the interrupting students and displayed a supportive scaffolding role towards Steve. The practice worked to direct attention towards Steve (the interrupting students lowered their hands) and it motivated Steve to continue (he kept on trying to respond on the SGD). The practice of taking a supportive scaffolding role resembled that found in previous research (Radford et al., 2015).

In summary, the practice of the highly ritualized and recognizable turn-taking organization of IRE-sequences enabled eye-gaze accessed SGD-mediated interaction because it clarified the participation roles: what could be said by whom (Heritage & Clayman, 2010); it spell out next-selection and it prolonged the typical wait time of 2 seconds (Rowe, 1986) to more than 10 seconds. The prolonged wait time was essential for the child to compose his/her SGD-mediated contribution.

**Multi-unit turn sequences in dyadic training**

The organization of multi-unit turns in Study IV resembled the organization of multi-unit questioning turns described by Linell, Hofvendahl, and Lindholm (Linell et al., 2003). However, while multi-unit questioning turns comprise turns produced in for example interrogative syntax, the multi-unit turns in Study IV comprised interrogative as well as declarative and imperative turns and there were embodied responses from the child in between the turns.
They resembled multi-unit questioning turns in that they were used in institutional talk and that they framed the agenda and provided a recognisable transition relevance place. The practice of multi-unit turns also resembled preschool teachers’ use of a pre-formulated content question followed by specific questions (French & MacLure, 1981). The pre-formulated content question framed the agenda and the follow-up questions oriented the children towards a set of response alternatives.

The multi-unit turns were responsively produced in alteration between recipient-tilted epistemic asymmetry and deontic constructions demanding SGD-mediated responses. Most commonly, they started in recipient-tilted epistemic asymmetric organization (i.e., positioning the child as the knowledgeable person) and ended in more deontic constructions (i.e., demanding that the child perform an action). The finding that deontic constructions worked response mobilizing mirrors previous research. Antaki and Kent (2012) and Zinken and Ogiermann (2011) found that staffs’ and caregivers’ practice of deontic constructions with imperative syntax mobilized actions from individuals with ID and from children without insulting the person.

**Turn construction**

**Question design in classroom interaction**

The teachers in Study III asked non-speaking children to recall low cognitive content questions with pre-known answers. The practice of asking content questions with known answers resembled previous research on SGD-mediated interaction which found that polar questions, first-pair parts of an adjacency pair, and meta-interactional prompts facilitated the understanding of an SGD-mediated contribution because the practices narrow the response alternatives and position the SGD-mediated contribution in a recognisable second turn position (Clarke & Wilkinson, 2007; Hörmeyer & Renner, 2013). Lee (2006) suggested that content questions could be effective in language acquisition even though they do not provide students with genuine opportunities for language use. It is not possible to evaluate whether the use of content questions in this context contributed to improved language acquisition or not. What is known is that the practice enabled participation.

**Prosodic features**

Teachers’ and assistants’ (Study III) and communication partners’ (Study IV) rich prosodic variations (i.e., pitch, volume and tempo), laughter, and variation of voice quality contributed to mobilize SGD-mediated responses and it softened the corrections of self-selecting intruding classmates. Prosody is an important resource in social interaction (Couper-Kuhlen & Selting, 2018; Åhlund & Aronsson, 2015). For example, low volume and laughter may create intimacy, while high pitch or a wide pitch range and stress on content words
may increase children’s attention. The results resembled previous research, which found that teachers’ exaggerated prosody and repetitions of the student’s contributions encouraged students to continue participating in the multiparty interaction (Skidmore & Murakami, 2010; Theobald, 2019; Åhlund & Aronsson, 2015). Furthermore, the fact that prosodic variations increase brain activity (Johnstone et al., 2006) is interesting because the majority of children with CP have impairments of sustained and divided attention (Bottcher, 2010; Bottcher et al., 2010). Could communication partners’ practice of prosodic variations be an important component in the process? Could it contribute to increased or sustained attention of the non-speaking children?

SGD-directed gaze orientation

The practice of treating the non-speaking children’s gaze orientation as an important resource resembles previous research on dyadic or triadic communication board-mediated and SGD-mediated interaction (Engelke & Higginbotham, 2013; Hörmeyer & Renner, 2013; Pilesjö & Norén, 2017; Savolainen et al., 2020). In line with Engelke and Higginbotham (2013) and Savolainen, Klippi, Tykkyläinen, Higginbotham and Launonen (2020), the communication partners in Study III and Study IV treated the non-speaking child’s gaze orientation from the communication partner to the SGD as a pre-beginner signal to start composing the SGD-mediated contribution, a practice of claiming and holding the floor. In Study III, it was often the assistant who was sitting next to the non-speaking student who acknowledged the child’s pre-beginner signal. The teachers were typically busy with the whole class and attended only to the child’s gaze orientation when addressing the child. Bigger body movements such as hand-raising for doing reciprocity (Sahlström, 1999) was more obvious and therefore easier for the teachers to observe and respond to. Communication partners in both Study III and Study IV followed the child’s eye-gaze movements on the screen during the composition process. They encouraged the child to continue, they commented if the child was on the symbol but did not activate it and they asked clarifying questions. All this assumed that the communication partner was close to the child and could see the screen.

The practice of treating gaze orientation as relevant was reciprocal: non-speaking children followed their communication partners’ gaze orientation towards the SGD as well. For example, teachers’ gaze orientation and deictic gestures towards the SGD and their verbal turns with prosodic variations and laughter during problematic SGD production turns created semiotic fields (Goodwin, 2000, 2003; Mondada, 2011) that contributed to maintain focus of the child during the phase of composing the SGD-mediated turn. One could argue that Goodwin’s gaze rules of spoken face-to-face interaction were violated in both Study III and Study IV because there was a minimum of mutual gazing during SGD-production time. However, the emerging research on gaze
practices in SGD-mediated interaction (Engelke & Higginbotham, 2013; Savolainen et al., 2020) might suggest that there are different rules that apply in SGD-mediated interaction than in spoken face-to-face interaction. Maybe gaze orientation at the SGD has more of a regulating nature (Kendon, 1967), meaning that the non-speaking child’s gaze orientation and the communication partner’s gaze orientation at the SGD may regulate each other’s behaviour.

**SGD-directed deictic gestures**

Communication partners in Study III and Study IV also used deictic pointing gestures towards the SGD, which the non-speaking children followed. The gesture made reference to, demonstrated, navigated, or enacted the child’s turn. There are only a few studies that have used EMCA to investigate pointing gestures in AAC-mediated interaction (Noren & Sigurd Pilesjö, 2016; Pilesjö & Norén, 2017; Pinto & Gardner, 2014). Pilesjö and Norén (2017) and Pinto (Pinto & Gardner, 2014) showed how the speaking communication partner’s tapping on symbols worked attention generating and made reference. The practice of making reference resembles previous research on spoken face-to-face interaction (Goodwin, 2003; Mondada, 2011, 2013). Deictic pointing gestures are important details to speech because they orient the participant towards important details. The deictic gesture towards the SGD was not understood in isolation but in coordination with the verbal contribution, gaze and body orientation, which mirrors the work of Ferm, Claesson, Ottesjö, and Ericsson (2015). The practice of navigation helped the child in his/her search for vocabulary. By showing and labelling the navigation path to the requested vocabulary, the communication partner adopted a combination of repair and supportive scaffolding practices (Radford et al., 2015). The practice of enacting the child’s turn displayed the communication partner’s responsiveness to the children. The practice was used after the child had tried to activate the symbol but failed and after displaying sounds and movements of discontent. Pinto and Gardner (2014) described the practice of enacting a child’s turn when the child did not have any independent access technique to the SGD. Like the practice of navigation, the practice of enacting the child’s turn was a supportive scaffolding practice (Radford et al., 2015).

**Possible reasons why the SGD was not used more often in multiparty classroom interaction**

Even though the teachers and assistants in Study II believed that the children could benefit from SGD-mediated interaction in education, only a few children used their SGDs in their multiparty interaction. Further, data collection
in Study III confirmed that only a few children used their SGDs in multiparty classroom interaction. These findings mirror previous research, which found that teachers provided few opportunities for AAC-mediated interaction in education (Andzik et al., 2016; Tonsing & Dada, 2016). How can we understand this? I suggest that there are at least four plausible reasons.

First, multiparty interaction is more challenging than dyadic interaction partly because *ratification of the next speaker is not as obvious* as in dyadic interaction (Sacks et al., 1974). Without the practice of explicit teacher-initiated next-selection, the non-speaking child using the SGD may not have the opportunity to participate in the interaction. The data collection in Study III showed that only a few child-initiated Initiatives resulted in response from the teacher.

Second, *composing an SGD-mediated contribution* takes longer time than producing speech, which enhances the risk that the SGD-mediated contribution receives a temporally and sequentially misplacement in the ongoing multiparty interaction (Howery, 2018). Study III showed that either the teacher or the assistant needed to see the SGD screen during the composing process to be able to make the process public and understandable for the rest of the participants in the classroom.

Third, *children with severe CP often have associated impairments* such as hearing or vision impairment and impairments in attention (Bax et al., 2005; Bottcher et al., 2010). Using an SGD in a noisy environment requires sustained attention and the responders in Study I and Study II commented on children’s fluctuating ability to sustain and divide attention. Too much noise and disturbing actions in the classroom may be a reason why some children could not use their SGDs in multiparty classroom.

Fourth, maybe the limited use of the SGD in multiparty classroom interaction could be understood as an *action of avoiding*. Goffman (1967, p. 15) suggested that “*the surest way for a person to prevent threats to his face is to avoid contacts in which these threats are likely to occur*”. SGD-mediated interaction in multiparty classroom interaction requires additional face-work from all involved and there is a risk of losing face. For example, the teacher’s self-image of being knowledgeable, pedagogical, and fair may be threatened if the non-speaking child produces a single-word SGD-mediated contribution that cannot be understood from the context despite immense repair actions. Further, the non-speaking child’s self-image of being knowledgeable and social may be threatened if s/he fails to activate the symbol, if the contribution is not listened to or understood or if s/he does not get any support. Lastly, the classmates’ self-image of being knowledgeable and social may be threatened if they do not understand what is happening during the composing process and if they do not comprehend the synthetic voice. The teachers in Study II commented that classmates did not always understand the synthetic voice.
Methodological discussion

Rigor, which is exactness, carefulness, accuracy, systematic methodology, and thoroughness, is extremely important in both quantitative and qualitative research. There was a risk that my presumptions and beliefs on SGD-mediated interaction could have endangered trustworthiness of the studies. Hence, research reflexivity was extremely important to address in both the studies that used quantitative and qualitative research. The methodological issues in these studies will be discussed in two sections: Studies I and Study II will be discussed in the first section and Study III and Study IV will be discussed in the second section.

Study I and Study II

There are four methodological issues that should be discussed: the choice of data collection method, the recruitment process, the choice of data analysis to analyse the close-ended and open-ended questions and the use of the components of ICF-CY.

The data collection method, questionnaire, was chosen because of calculations based on data from the county council in Uppsala and data from the follow-up surveillance programme for people with CP (CPUP). Had it been known in advance that only 39 children would be identified another data collection method for example interviews or ethnological observations would have been considered. Using interviews could have provided richer data, because the researcher could have asked follow-up questions. However, there is a risk of recall bias when using both questionnaires and interviews. Ethnographic observations, which implies observation of the participants in real-life settings, field notes and video recordings, would probably also have contributed with richer information. Yet, ethnographic observation was not possible due to time and financial constraints.

At the time of recruitment, the chosen recruitment procedure was considered the best at hand to obtain nationwide data. There were no local or national registers available on the children identified for inclusion in these studies. Data obtained from CPUP provided information on the number of Swedish children in the specific age groups and their performances on the GMFCS and MACS scales. However, the CPUP did not contain information on ID or the
prescription of an SGD. During springtime 2014, contact details for the managers of technical aid centres was obtained from the former Swedish Institute of Assistive Technology (Hjälpmedelsinsitutet) now called The Swedish agency for participation (Myndigheten för delaktighet). Because the prescription of SGD is registered with technical aid centres, it seemed the best option to contact the managers of technical aid centres. Other alternative recruiting procedures such as social media or contacting all managers of local or regional habilitation centres were discussed but rejected.

Descriptive statistics were used to analyse data from the close-ended questions. Comparative non-parametric statistic were considered but rejected because of the small number of participants. A directed content analysis was chosen to analyse data from the open-ended questions because of the limited amount of data and the components of ICF-CY were chosen because the biopsychosocial model of disability integrates social, environmental, and medical components in the same model. The component Personal factors was not used in the analysis because the classification would have implied interpretations (Simeonsson et al., 2014).

To ensure the trustworthiness of the open-ended question, credibility, transferability, dependability and confirmability were considered (Graneheim & Lundman, 2004; Shenton, 2004). The open-ended question addressed only one perspective of the overall aim, which was the perceived challenges and experienced barriers to SGD-mediated interaction.

To assure dependability, reliability and face validity, the questionnaires were piloted by SLPs, caregivers, teachers, assistants, and a representative of a user organization. Changes were made in accordance with their feedback. Questionnaires are by nature retrospective which enhances the risk of recollection bias (Salisbury, Cambray-Engstrom, & Woods, 2012). To minimise the risk of recollection bias, the participants were asked to recall the last 12 months of their experience of SGD-mediated interaction. Bilingual caregivers were included in the study, which was considered a strength. All participants were given three options to respond the questionnaires: online, on paper and on the telephone. The majority of the bilingual caregivers chose to respond to the questions on the telephone using an interpreter. To prevent misunderstanding, the questions were explained to the interpreter prior to data collection. The interpreter made notes in the questionnaire for recall. Dependability could have been strengthened if the telephone calls had been recorded and translated or if the questionnaires had been translated and read aloud.

To assure credibility, the process of recruitment was presented in detail. The questionnaires are presented in full versions as supplementary material in the Appendix 1 of the thesis, and the well-established conceptual model ICF-CY was used in the analysis of the open-ended question.

Transferability and external validity need to be discussed because only 41% of the identified children’s caregivers consented to participate. Consequently, it was not known if the sample was representative regarding to age
and socio-economic aspects or not. It is possible that those who did not participated would have provided other responses. However, the sample was heterogeneous. The sample comprised participants living in the Southern, the Central, and the Northern parts of Sweden, in rural and urban areas, there were men and women, and there were Swedish speaking participants and participants who were bilingual and bicultural. Consequently, the ecological validity of the results may be considered to be relative high.

Study III and Study IV

There are five methodological issues that should be discussed: the choice of analytic method, the data collection, the amount of data being transcribed, the representativeness of the transcript and extract selection.

The choice of analytic method was twofold. First, an explorative qualitative research method was chosen instead of an experimental quantitative research method because the research areas of eye-gaze accessed SGD-mediated interaction and SGD-mediated interaction in multiparty interaction are still very limited. By using a qualitative research method, it was possible to explore the data, to reveal underlying or unseen phenomena in a systematic way with the purpose of gaining deeper and more detailed understanding of eye-gaze accessed SGD-mediated interaction. Identified phenomena may be investigated in future studies using quantitative research methods. Second, the inductive research method EMCA was chosen instead of a deductive method because deductive methods have predefined categories. There is a risk that SGD-mediated single words or pre-recorded phrases without prosodic cues could have been misinterpreted if predefined categories had been used. CA/EMCA has been used in previous research to investigate interaction including individual with ID, individuals with speech and language impairments and interaction in classroom interaction (Antaki & Kent, 2012; Bloch, Saldert, & Ferm, 2015; Clarke & Wilkinson, 2007; Noren & Sigurd Pilesjö, 2016; Sahlström, 1999; Samuelsson & Plejert, 2015)

To assure credibility, data was presented in data sessions with researchers and PhD students knowledgeable in CA/EMCA. The process of the data sessions followed the typically four-part process described by ten Have (2007). First, one of the researchers prepared a fragment of data to be analysed more closely. Second, all researchers watched and listened to the video recording and the transcription repeatedly. Third, all researchers reflected on their own for 10 minutes. Fourth, a general discussion in which all researchers provided an observation or analysis ended the data session.

Mondada (2006) argued that researchers using video data need to be aware that the chosen video angle reflects their subjective choice. Even though researchers try to capture the emic perspective, it is inevitable that the video captures the perspective of the researcher. In Study III, one of the cameras
captured the SGD screen and the other one captured the non-speaking child and his or her communication partners. Neither of these cameras captured the whole classroom setting. One reason was that there were classmates who did not participate in the study and should not to be recorded. Another reason was that moving the cameras would have disturbed the classroom interaction. A possible way of capturing the emic perspective, if all classmates had participated, could have been to use a GoRro® (i.e., a small camera attached on the participants’ heads). To ensure transferability background data on the medical diagnosis was included for example even though this is not required in research using EMCA. I believe that using EMCA can strengthen the ecological validity of findings from experimental studies.

The process of data collection was by necessity restricted: it was not possible to record the children for several days or weeks at a time, and it was not possible to record the whole class because of non-participating classmates. Additional field notes and photos could have added useful information. Because of time constraints, the amount of data transcribed was restricted. All data comprising multiparty classroom interaction (Study III) and dyadic interaction (Study IV) was reviewed repeatedly and comprehensively transcribed. The chosen extracts were carefully transcribed in terms of turn construction distribution and in terms of pauses, overlaps, embodied resources, and linguistic features. Transcribing and analysing prosodic features and voice quality was challenging. Using an acoustic analysis programme such as PRAAT that illustrates frequency (i.e., pitch), intensity (i.e., volume) and time (i.e., speed) in a spectrogram would have contributed to more transparency and objectivity. However, because of time constraints, this was not possible.

There is always a risk that important information was not observed. Transcripts can never represent the recordings in their full details and they are by necessity selective. However, the representativeness of the transcript was checked by me, my supervisors and in data sessions together with researchers and PhD students knowledgeable in EMCA/CA. The extracts were systematically worked through and searched for CA phenomena such as repair, adjacency pairs (ten Have, 2007) (page 122). Choosing representative extracts requires accuracy and discussions with other researchers. The process of choosing the extracts comprised two steps: (1) I transcribed a number of interactions that illustrated one phenomenon; (2) the transcriptions and the video recording were shared with the supervisors. The choice of extracts was a joint decision between me and my supervisors.

The benefits of using EMCA to analyse eye-gaze accessed SGD-mediated interaction was that small-scaled linguistic, suprasegmental, and embodied features and interactional patterns that had not been described previously were revealed.
Conclusions

The overall aim of this thesis was to investigate SGD-mediated interaction including children with anarthria, severe physical impairment and intellectual disability due to cerebral palsy with focus on partner strategies and social practices. The summary (italic) and conclusions (plain text) are presented in four bullet points, one for each study.

Study I: **SLPs commented that SGDs were used too seldom. They provided caregivers, teachers, and assistants with few training sessions. They used mostly verbal instructions, and used goalsetting document only moderately.** Difficulties creating a user-friendly SGD design and time limits hindered the SGD-intervention. They learn about partner strategies and instructional approaches from colleagues and in clinic. The results suggest that SGD-interventions could improve if SLPs used additional instructional approaches and goalsetting together with caregivers, teachers, and assistants and if they could provide caregivers, teachers, and assistants with additional training sessions. The results also indicate that undergraduate studies of SLPs could improve.

Study II: **Caregivers, teachers, and assistants learned about SGD-mediated interaction mostly from SLPs who used verbal instructions. They commented that the SGD was used too little both at home and at school. They considered that SGD-mediated interaction could be challenging and they called for more support from the SLPs. Thanks to the technology could children express thought that were previously unknown.** The results indicate that caregivers, teachers, and assistants need more support from SLPs to scaffold SGD-mediated interaction both at home and at school.

Study III: **It was found that multiparty classroom interaction including an eye-gaze accessed SGD can be facilitated by using a combination of traditional classroom interaction practices, SGD-related scaffolding practices by staff and collaborative practices by classmates.** The results indicate that multiparty classroom interaction presumes that either the teacher or the assistant can see the SD screen during the composing process to support the non-speaking child and to make the composing process understandable and public for the classmates. Non-speaking children can be part of social and educational activities
in multiparty classroom interaction provided that teachers and assistants use scaffolding practices.

Study IV: In order to mobilize responses from children who are beginner users of eye-gaze accessed SGDs, communication partners may need to use contingent on-screen gaze and deictic practices. Furthermore, they may also need to produce repeated turn transition relevance places and be prepared that beginner users of SGDs need long-term support and training. The results indicate that communication partners to non-speaking children who are beginner users of eye-gaze accessed SGDs need to position themselves so that they can use the SGD screen and use SGD-directed gaze and deictic gestures. In addition, they need to provide the beginner child with multiple opportunities to respond on the SGD. It is plausible that they need additional support from SLPs during the training period.

Implications

The work in this thesis was motivated by questions about why non-speaking children did not use their SGDs more frequently and if the support to communication partners could be improved. The findings suggest a number of clinical and educational implications for SGD-mediated interaction including non-speaking children with CP and ID. It seems to be highly relevant to distinguish between skill-training that is the use of partner strategies which can enhance children’s social and linguistic skills and participation that is the use of social practices which position the SGD-mediated contribution in a recognizable position in the ongoing interaction.

Study III and Study IV showed that partner strategies such as open-ended questions were seldom used in multiparty interaction meanwhile content questions with pre-known answers were frequently used. This finding resembles previous research (Clarke & Wilkinson, 2007): participant organize SGD-mediated interaction in more ritualized turn-taking practices that enable understanding of the SGD-mediated contribution. Consequently, skill-training and participation should be separated. In order to do this, SLPs may need knowledge in the dialogical and ethnomethodological perspective on social interaction. However, in Sweden, undergraduate studies of SLPs have a medical and a biopsychosocial perspective and SLP students are rarely presented with the dialogical and ethnomethodological perspective on social interaction. Consequently, they receive only training in the individualistic theoretical framework for example partner strategies. This thesis highlights the importance of both perspectives. Education providers may need to consider either adding the dialogical and ethnomethodological perspective into current undergraduate studies or providing registered SLPs with a university course
in dialogical and ethnomethodological methodology including training in transcribing data.

Future research
This thesis sough to contribute with knowledge about SGD-mediated interaction that included non-speaking children with severe physical impairments and ID due to CP. The results from the four studies suggest further research in at least five areas described below. A broader knowledge could be obtained by including additional research methods such as single case experimental design and interviews. In addition, EMCA could be used to investigate new questions of the phenomenon.

First, the effects of partner strategies, for example aided language modelling or the behaviour chain interruption strategy used on eye-gaze accessed SGDs would add important knowledge to the research area. Single case experimental design could be used to investigate the effect of the partner strategies in children’s outcome, for example the development of children’s linguistic skills using the SGD.

Second, SGD-mediated interaction in multiparty classroom interaction that includes non-speaking students with ID is sparsely investigated. Teachers’ and assistants’ experience could be obtained by using interviews. How do they perceive and manage multiparty classroom interaction that includes non-speaking students with ID and what are their opinions and experience of skill-training versus participation in multiparty classroom interaction? Study III focused on teacher-initiated questions, and further research could use EMCA to investigate how non-speaking children with ID using SGDs initiate interaction in multiparty classroom interaction and how they interact with other students with ID in lessons and during breaks. Non-speaking children’s experiences and opinions on SGD-mediated interaction could be obtained by using the interview method Talking Mats (Murphy, 1998).

Third, Study I showed that goal setting in SGD intervention was only moderately used. The content of SGD-related goals could be examined by using content analysis of existing goal setting documents. Interviews could be used to obtain knowledge on how experienced problems have been identified.

Fourth, Studies I and II revealed that SLPs, who are important providers in the SGD intervention, seldom use anything other than verbal instructions when teaching communication partners SGD-mediated interaction. The effects of using role-play, feedback, video recordings and transcripts (Lock et al., 2001; Samuelsson & Plejert, 2015; Stokoe, 2014) could be examined be using single
case experimental design with outcome measure on children’s and/or communication partners’ variables. Interviews could be used to obtain knowledge about communication partners’ opinions on the use of role-play, feedback, video recordings and transcripts. EMCA could be used to investigate in detail how SGD-mediated interaction is organized following such a communication programme.

Fifth, Study III and Study IV illustrated communication partners’ prosodic variations in interaction with non-speaking children using eye-gaze accessed SGDs. The phenomenon needs to be investigated with additional participants and additional communication means such as SGDs accessed by other techniques and communication boards. PRAAT could be used to illustrate frequency, intensity, and time in a spectrogram. EMCA could be used analyse how children respond to prosodic variations. A single-case experimental design could be used to examine the difference between rich prosodic variations and flat prosody.
Bakgrund
Barn som saknar tal och har omfattande motorisk funktionsnedsättning och utvecklingsstörning pga. cerebral pares (CP) kan kommunicera med stöd av en samtalsapparat. Den vanligaste orsaken till motorisk funktionsnedsättning i barndomen är CP, vilket är en skada på den omogna hjärnan som påverkar rörelseförmågan. Prevalensen för CP är 2-2,5 per 1000 födda barn och ungefär hälften av alla barn med CP har nedsatt tal, språk och/eller kommunikationsförmåga.


Man har i experimentella studier visat att kommunikationspartners t.ex. vårdnadshavare, lärare och assistenter kan använda olika strategier för att barn som saknar tal ska lära sig att kommunicera med stöd av sina samtalsapparater och att utveckla sina språkliga förmågor. Mikroanalyser av videodata har visat att kommunikationspartners använder sig av sociala praktiker som underlättar samtalsapparatmediert interaktion i vardagssituationer. Dessa strategier och sociala praktiker överensstämmer inte alltid.

När ett barn får en samtalsapparat ingår det att hen och hens kommunikationspartners får träning i hur samtalsapparaten kan användas för att barnet ska kunna uttrycka åsikter, be om saker eller delta i sociala sammanhang. Vanligtvis är det en logoped som ansvarar för denna träning. Logopeden kan använda
 olika metoder för att lära kommunikationspartners samtalsapparatmedierad interaktion. Exempelvis kan logopeden använda muntliga instruktioner, skriftliga instruktioner, direkt feedback eller feedback med videofilm, videofilm av andra som kommuniserar med stöd av en samtalsapparat, eller rollspel.

Syfte
Det övergripande syftet med avhandlingen var att undersöka samtalsapparatmedierad interaktion som inkluderar icke-talande barn, omfattande motorisk funktionsnedsättning och utvecklingsstörning pga. CP med fokus på partner strategier och sociala praktiker.

Metod
Avhandlingen omfattar fyra delarbeten. Samtliga studier var observationsstudier. I studie I och II användes enkätdata som analyserades med deskriptiv statistik och deduktiv innehållsanalys. I studie III och IV användes videoinspelningar som analyserades med etnometodologisk konversationsanalys (EMCA).

Studie I och II var nationella studier som undersökte: (1) användning av partner strategier i samtalsapparatmedierad kommunikation, (2) instruktionsapprocher för att lära partner strategier i samtalsapparatmedierad kommunikation, (3) kommunikativa funktioner uttryckta med samtalsapparaten, (4) användning av samtalsapparaten i undervisning, samt (5) en öppen fråga ”om det har varit svårt att kommunicera med stöd av samtalsapparaten, vad tror du att det beror på?”

Sammanlagt utformades fyra studiespecifika frågeformulär: ett till logopeder, ett till vårdnadshavare, ett till lärare, och ett till assistenter. I studie I besvärade 12 logopeder (svarsfrekvens 81.3 %) frågeformuläret och i studie II besvarade 23 vårdnadshavare, 14 lärare och 15 assistenter (svarsfrekvens 80.0 %) frågeformulären.

tonhöjdsvariationer) transkriberades. Ett urval av transkriptioner användes för att exemplifiera resultatet.

I studie IV undersöktes hur interaktionen organiseras när en vuxen med erfarenhet av ögonstyrd samtalsapparatemedierad interaktion och ett barn som är nybörjare i användning av en ögonstyrd samtalsapparat interagerade. Tre barn och fem kommunikationspartners videofilmsades. Datainsamlingen skedde på barnets förskola eller särskola. De första 30 minuterna av varje session transkriberades. På samma sätt som i studie III valdes att antal transkriptioner för att exemplifiera resultatet.


Resultat

**Delstudie I – Frågeformulär till logopeder**


**Delstudie II – Frågeformulär till vårdnadshavare, lärare och assistenter**

Delstudie III – Kommunikation med ögonstyrd samtalsapparat i helklass

Lärare organiserade klassrumsinteraktionen i IRE sekvenser med namngivning av eleven och innehållsförfråga med kända svar. Antingen placerade sig lärraren eller assistenten så att hen såg skärmen och kunde följa processen. Genom en kombination av tal, blick och pekning mot samtalsapparat blev processen att producera ett samtalsapparatmedierat yttrande publik och förståelig för klasskamrater och andra vuxna i klassen. Kombinationen av praktiker tydliggjorde och förlängde svarsutrymmet för det icke talande barnet att hinna svara med samtalsapparaten.

Delstudie IV – Nybörjare att använda en ögonstyrd samtalsapparat


Konklusion

Studie I: Resultatet indikerar att samtalsapparatinterventioner kan förbättras. Logopeder kan använda fler instruktionsapproacher såsom t.ex. feedback och rollspel. De skulle även i större utsträckning kunna formulera mål tillsammans med kommunikationspartners samt erbjuda fler träningstillfällen med kommunikationspartners. Resultatet indikerar även att utbildning till logopeder skulle kunna förbättras.

Studie II: Resultatet visar att vårdnadshavare, lärare och assistenter behöver mer stöd från logopeder i samtalsapparatinterventioner för att de ska kunna möjliggöra interaktion både i skolan och i hemmet.

Studie III: Resultatet pekar på att icke-talande barn som kommunicerar med stöd av en ögonstyrd samtalsapparat kan delta i flerpartssamtal givet att lärraren använder tydliga och förståeliga praktiker för att ge eleven ordet samt att antingen lärraren eller assistenten kan se skärmen för att kunna stöttande barnet under produktionen av det samtalsapparatmedierande yttrandet.
Studie IV: Resultatet indikerar att kommunikationspartners till barn som är nybörjare att använda en ögonstyrd samtalsapparat behöver se både skärmen och barnets ansikte. De behöver ofta formulera sig i flera turer och använda pekning och blick mot skärmen innan barnet svarar med samtalsapparaten.
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Appendix 1

Questionnaire to speech and language pathologists
Experience of communication with high-technology speech generating devices (SGDs)
(Questionnaire to SLPs)

1. Sex:
   - Female
   - Male

2. Where do you work?
   - South of Sweden
   - Central of Sweden
   - North of Sweden

3. Experience (in years) with low technology AAC (i.e. single pictures or pictures arranged pragmatically, categorically or in situations on paperboards)
   - 0-5 years
   - 6-10 years
   - 11-15 years
   - 16-20 years
   - 21-25 years
   - 26-30 years
   - More than 30 years

4. For how many children (0-20 years of age) have you prescribed a high technology speech generating device (SGD) e.g. Tobii, Rolltalk, Tellus, computer or iPad with software e.g. Communicator, Rolltalk Design, Mind Express, the Grid and access with eye-gaze, joystick or head contact? ...

5. When a child gets a SGD to what extent do you usually assess the following persons:

<table>
<thead>
<tr>
<th></th>
<th>6 to a large extent</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0 not at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child</td>
<td></td>
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Comments

6. To what extent do you commonly use any of the following instrument for goal setting in interventions with SGD?

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Comments

7. How many sessions with the purpose "communication with SGD" did you provide during the last year with:

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During the last year, to what extent have you instructed PERSONAL ASSISTANT about communication with SGD by:

- Verbal information
- Written information
- Modelling with the SGD
- Role play
- Film of others communicating with SGD
- Caregiver practices to instruct someone else
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Comments

10. Has the child used the SGD together with a skilled user, i.e. another child or adult?
- Yes, 1-5 times
- Yes, more than 6 times
- No
- I do not know

Making a choice with the SGD often means that several symbols must be touched. For example, the child might touch five interlinked pages to express that he/she wants to listen to Eurovision contest: “activity”, “school”, “free time”, “listen to music”, “Eurovision music contest”. These five steps are called separate teaching units.

11. How many times have you altogether:

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- Analysed which teaching units e.g. making a choice consists of
- Analysed how many teaching e.g. making a choice consists of
- Used this analysis for planning how to teach the child
- Used this plan when teaching the child in a systematic and structured way one teaching unit at a time

Comments

12. My opinion is that the child communicates:
- Too seldom with the SGD at school
- Sufficiently with the SGD at school
- Too often with the SGD at school

13. My opinion is that the child communicates:
- Too seldom with the SGD at home
- Sufficiently with the SGD at home
- Too often with the SGD at home
14. To what extent have you learned about communication partner strategies such as responsive interaction style, environmental arrangements, expectant delay etc. from:

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15. To what extent have you learned about adult learning from:

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Comments

16. What are the reasons for difficulties (if any) in achieving communication with SGD?
Questionnaire to caregivers
Experience with high-technology speech generating device (SGD)  
(Questionnaire to caregivers)

1. Sex?  
   - Female  
   - Male

2. Where do you live?  
   - South of Sweden  
   - Central of Sweden  
   - North of Sweden

3. What is the hardware of your child’s SGD?  
   - Tobii  
   - Rolltalk  
   - Dator  
   - Tellus  
   - Other, namely

4. Which software is it in the SGD?  
   - Communicator  
   - Rolltalk design  
   - The Grid  
   - Mind Express  
   - Other, namely

5. How does your child get access to the SGD?  
   - Joystic  
   - Contacts  
   - Eye-gaze  
   - Other, namely

6. For how long has your child used the SGD?  
   - Less than 1 year  
   - 1-2 years  
   - 3-4 years  
   - 5-6 years  
   - More than 7 years

7. How often does your child use the SGD a weekday at home before or after school to:  

<table>
<thead>
<tr>
<th>Activity</th>
<th>6 times/day or more</th>
<th>4-5 times/day</th>
<th>2-3 times/day</th>
<th>I time/day</th>
<th>Every second day</th>
<th>Every third day</th>
<th>More seldom, other AAC is more effective</th>
<th>More seldom, there is a lack in vocabulary</th>
<th>Never</th>
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<tbody>
<tr>
<td>Choose activity</td>
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<td>Express social phrases</td>
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<td>Games and play</td>
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Comment

100
8. **How often does your child use the SGD in weekends at home to:**

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<tr>
<th></th>
<th>6 times/day or more</th>
<th>4-5 times/day</th>
<th>2-3 times/day</th>
<th>1 time/day</th>
<th>Every second day</th>
<th>Every third day</th>
<th>More seldom, other AAC is more effective</th>
<th>More seldom, there is a lack in vocabulary</th>
<th>Never</th>
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<tr>
<td>- Choose activity</td>
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**Comment**

9. **In order to support your child’s communication with the SGD you might have to adjust your communication. A weekday before or after school, how often:**

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<th></th>
<th>6 times/day or more</th>
<th>4-5 times/day</th>
<th>2-3 times/day</th>
<th>1 time/day</th>
<th>Every second day</th>
<th>Every third day</th>
<th>More seldom, other AAC is more effective</th>
<th>More seldom, there is a lack in vocabulary</th>
<th>Never</th>
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</thead>
<tbody>
<tr>
<td>- Are you responsive, i.e. you except, wait and confirm your child’s communication with the SGD?</td>
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<td>- Do you arrange communicative appealing situations with the SGD?</td>
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<tr>
<td>- Do you “point-talk”, i.e. point at symbols on the SGD during ongoing speech in order to show how to make choices, narrative etc. with the SGD?</td>
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<tr>
<td>- Do you “point-talk”, i.e. point at symbols on the paperboard during ongoing speech in order to show how to make choices, narrative etc. with the SGD?</td>
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<td>- Do you ask open ended questions, for example “what do you want to do?”</td>
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<td>- Do you ask questions that you do not know the answer?</td>
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**Comments**
10. To support your child to communicate with the SGD you might have to adapt your communication. A weekend day, how often:

<table>
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<tr>
<th>6 times/day or more</th>
<th>4-5 times/day</th>
<th>2-3 times/day</th>
<th>1 time/day</th>
<th>Every second day</th>
<th>Every third day</th>
<th>More seldom</th>
<th>Never</th>
</tr>
</thead>
</table>
- Are you responsive, i.e. you except, wait and confirm your child´s communication with the SGD?  
- Do you arrange communicative appealing situations with the SGD?  
- Do you “point-talk”, i.e. point at symbols on the SGD during ongoing speech in order to show how to make choices, narrative etc. with the SGD?  
- Do you “point-talk”, i.e. point at symbols on the paperboard during ongoing speech in order to show how to make choices, narrative etc. with the SGD?  
- Do you ask open ended questions, for example “what do you want to do?”  
- Do you ask questions that you do not know the answer?  

Comments

11. Making a choice with the SGD often implies several pressures to reach the right page with the sight symbol. For example, the child presses five interlinked pages to express that he/she wants to listen to Eurovision contest: “activity”, “school”, free time”, listen to music”, Eurovision music contest”. These five steps can be called separate teaching units. How many times have you altogether?

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<tr>
<th>6 times or more</th>
<th>5 times</th>
<th>4 times</th>
<th>3 times</th>
<th>2 times</th>
<th>1 time</th>
<th>0 times</th>
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</thead>
</table>
- Analysed which teaching units a choice, to narrative etc. consists of?  
- Analysed how many teaching units a choice, to narrative etc. consists of?  
- Used this analysis when planning how to teach the child?  
- Used this analysis to teach the child in a systematic and structured way one teaching unit at a time?  

Comments
<table>
<thead>
<tr>
<th>12. To what extent have you learned about communication with the SGD by:</th>
<th>6 Very much</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0 Not at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Your child’s speech and language pathologist</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
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<td>- Other personnel at the local habilitation centre</td>
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<td>- Your child’s teacher</td>
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<td>- Your child’s assistant</td>
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<td>- Other children communicating with high-tech SGD</td>
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<td>- Caregivers to children communicating with high-tech SGD</td>
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<td>- Adults communicating with high-tech SGD</td>
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<td>- Personnel at regional habilitation centres</td>
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<td>- ComAlong parental education course</td>
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<td>- Hanen parental education course</td>
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<td>- Other education, namely…</td>
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<td>- Websites, namely …</td>
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<td>- Conferences, namely…</td>
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<td>- Literature: books or journals, namely…</td>
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<td>- Film of others communicating with high-tech SGD</td>
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<td>- User organization for example RBU, FUB</td>
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<table>
<thead>
<tr>
<th>13. To what extent does the speech and language instruct you about communication with high-tech SGD in the following way:</th>
<th>6 Very much</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0 Not at all</th>
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<tbody>
<tr>
<td>- Verbal information</td>
<td>6</td>
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<td>- Written information</td>
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<td>- Modelling by the SLP</td>
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<td>- Practice in role play</td>
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<td>- Film of others</td>
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<td>- Practice by teaching someone else</td>
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<td>- Direct feedback from the SLP</td>
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<td>- Feedback from taped material from the SLP</td>
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</table>
14. I belief that my child communicates:
   - Too seldom with the SGD at school
   - Adequately with the SGD at school
   - Too often with the SGD at school

15. I belief that my child communicates:
   - Too seldom with the SGD at home
   - Adequately with the SGD at home
   - Too often with the SGD at home

16. What are the reasons for difficulties (if any) in achieving communication with SGD?
Questionnaires to teachers and assistants
Experience with high-tech speech generating device (SGD)
(Questionnaires to teachers and assistants)

1. Sex:
   - Female
   - Male

2. Where do you work?
   - South of Sweden
   - Central of Sweden
   - North of Sweden

3. What is your profession? (Questionnaire to assistants)
   - Pre-school teacher
   - Leisure-time pedagogue
   - Child-care worker
   - Other, namely

   What is your profession? (Questionnaire to teachers)
   - Teacher with diploma of Education
   - Special education teacher
   - Pre-school teacher
   - Leisure-time pedagogue
   - Child-care worker
   - Other, namely

4. For how many years have you been working with low technology AAC (i.e. single pictures or pictures arranged pragmatically, categorically or in situations on paperboards)
   - 0-5 years
   - 6-10 years
   - 11-15 years
   - 16-20 years
   - 21-25 years
   - 26-30 years
   - More than 30 years

5. How many children in compulsory school for pupils with learning impairments using high-tech SGD e.g. Tobii, Rolltalk, Tellus, computer or iPad with software e.g. Communicator, Rolltalk Design, Mind Express, the Grid and access with eye-gaze, joystick or head contact have you worked with?

6. Which curriculum does the child participate in?
   - Compulsory school for pupils with learning impairments
   - Compulsory school for children with severe learning impairments
   - Upper secondary school for pupils with (severe) learning impairments

Compulsory school for children with severe learning impairments:

<table>
<thead>
<tr>
<th>7. How often does the child use the SGD in:</th>
<th>6 times/ class or more</th>
<th>4-5 times/ class</th>
<th>2-3 times/ class</th>
<th>1 time/ class</th>
<th>Every second class</th>
<th>Every third class</th>
<th>More seldom, other AAC is more effective</th>
<th>More seldom, there is a lack in vocabulary</th>
<th>Never</th>
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<tbody>
<tr>
<td>- Aesthetic activities</td>
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<td>- Motor skills</td>
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<td>- Perception of reality</td>
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Comments

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## Compulsory school for pupils with learning impairments:

<table>
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<tr>
<th>How often does the child use the SGD in:</th>
<th>6 times/class or more</th>
<th>4-5 times/class</th>
<th>2-3 times/class</th>
<th>1 time/class</th>
<th>Every second class</th>
<th>Every third class</th>
<th>More seldom, other AAC is more effective</th>
<th>More seldom, there is a lack in vocabulary</th>
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<td>- Craft</td>
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<td>- Swedish as a second language</td>
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**Comments**

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<tr>
<th>8. How often does the child use the SGD at school to:</th>
<th>6 times/day or more</th>
<th>4-5 times/day</th>
<th>2-3 times/day</th>
<th>1 time/day</th>
<th>Every second day</th>
<th>Every third day</th>
<th>More seldom, other AAC is more effective</th>
<th>More seldom, there is a lack in vocabulary</th>
<th>Never</th>
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<tbody>
<tr>
<td>- Choose activity</td>
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<td>- Answer questions</td>
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<td>- Explain that something is wrong</td>
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<tr>
<td>- Express social phrases</td>
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<tr>
<td>- Games and play</td>
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</tbody>
</table>

**Comments**
9. In order to support the child’s communication with SGD you might have to adjust your communication. How often:

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Never</th>
<th>More seldom</th>
<th>Every third day</th>
<th>Every second day</th>
<th>1 time/day</th>
<th>2-3 times/day</th>
<th>4-5 times/day</th>
<th>6 times/day or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Are you responsive, i.e. you except, wait and confirm your child’s communication with SGD?</td>
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<tr>
<td>- Do you arrange communicative appealing situations with the SGD?</td>
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<tr>
<td>- Do you “point talk”; i.e. point at symbols in your child’s SGD during ongoing speech in order to show how to make choices, narrative etc. with the SGD?</td>
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<tr>
<td>- Do you “point talk”; i.e. point at symbols in your child’s paperboard AAC?</td>
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<tr>
<td>- Do you ask open ended questions, for example “what do you want to do?”</td>
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<tr>
<td>- Do you ask questions that you do not know the answer?</td>
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</tbody>
</table>

Comments

10. Making a choice with the SGD often means that the child has to press several symbols to get to the right page. For example, the child presses five interlinked pages to express that he/she wants to listen to Eurovision contest; “activity”, “school”, “free time”, “listen to music”, “Eurovision music contest”. These five steps are called separate teaching units. How many times have you altogether?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Never</th>
<th>1 time</th>
<th>2 times</th>
<th>3 times</th>
<th>4 times</th>
<th>5 times</th>
<th>6 times or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Analysed which teaching units a choice, to narrative etc. consists of</td>
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<tr>
<td>- Analysed how many teaching units a choice, to narrative etc. consists of</td>
<td></td>
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<tr>
<td>- Used this analysis when planning how to teach the child.</td>
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<tr>
<td>- Used this analysis to teach the child in a systematic and structured way one teaching unit at a time</td>
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</tbody>
</table>

Comments
11. To what extent does the SGD enhance the child’s possibility to participate in education

<table>
<thead>
<tr>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>To a large extent</td>
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</tbody>
</table>

12. Headmaster understands how much time it takes to support communication with SGD

- Agree totally
- Agree partly
- Do not agree

Comments

13. School has enough recourse to support communication with SGD

- Agree totally
- Agree partly
- Do not agree

Comments

14. I believe that my child communicates:

- Too seldom with the SGD at school
- Adequately with the SGD at school
- Too often with the SGD at school

15. To what extent have you learnt about communication with SGD from:

<table>
<thead>
<tr>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>To a large extent</td>
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</tbody>
</table>

- Another assistant
- The teacher
- The caregiver
- Another child using high-tech SGD
- An adult using high-tech SGD
- The SLP
- Personnel at habilitation, other than the SLP
- Personnel at local authorities
- Personnel at the National agency for special needs education and schools (government)
- Regional habilitation centres i.e. FBH, DART, DaKo, DAHM, StoCKK
- Education, namely…
- Websites, namely…
- National conferences, namely…
- International conferences, namely…
- Literature, namely…
- Film of others communicating with SGD

Comments
16. To what extent did the SLP use following way to instruct you about communication with SGD:

<table>
<thead>
<tr>
<th>Method</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal information</td>
<td></td>
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<td></td>
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<tr>
<td>Written information</td>
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<tr>
<td>Modelling communication with the SGD</td>
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<tr>
<td>Role play, i.e. you got to practice with the SGD</td>
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<tr>
<td>Film of others communicating with the SGD</td>
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<tr>
<td>Verbal rehearsal, you taught someone else communication with the SGD</td>
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<tr>
<td>Feedback during communication with the SGD</td>
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<tr>
<td>Feedback from taped material of communication with the SGD</td>
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</table>

Comments

17. What are the reasons for difficulties (if any) in achieving communication with SGD?
Appendix 2

Transcription convention

- *hello* Naturally spoken turns are italicized.
- *hello:::* A colon indicates an extension of the syllable or sound it follows. The number of colons marks the length of the duration.
- *hello,* A comma indicates a slight rise at the end of a prosodic unit.
- *hello?* A question mark indicates a high rise at the end of a prosodic unit.
- *xxx↑xxx↓xxx* Up or down pointing arrows indicate rises and falls in a turn’s pitch contour, immediately prior to the pitch change.
- °*hello°* Degree signs indicate talk at a lower volume than surrounding talk.
- °°*hello°°* Double degree signs indicate whispering.
- >*hello< °*hello>°* Signs for more than (>) and less than (<) indicate speech that is faster or slower than surrounding speech.
- *do you mean hello* Underlining of words or parts of words indicate emphasis.
- *.hh* A full stop preceding the letter h indicates an inhalé
- *( )* Empty parentheses indicate speech that is inaudible for the transcriber.
- **“hello”** Synthetically spoken turns are italicized and placed in quotation marks.
- HELLO Italic capital letters indicate a symbol on the SGD.
- #HELLO One hash symbol before a word in capital letters indicates an unsuccessful attempt at eye-gaze clicking on a symbol.
- ##RETURN Two hash symbols before a word in capital letters indicates a successful eye-gaze-click that activates the synthetic voice or changing page.
(0.5) Parentheses surrounding a number indicate (in tenths of a second) the duration of a longer pause during or between turns.

* + $ © All participants have an individual symbol that defines their actions (gaze or deictic gestures).

*---> The beginning of an action that continuous over several lines.

----->* The end of an action.

xxx[xxx Left-hand brackets indicate the onset of simultaneous talk or embodied action, at the point where it begins.

xxx] Right-hand brackets indicate where simultaneous actions end.
References


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Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Medicine 1639

Editor: The Dean of the Faculty of Medicine

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