Investigating the Use of Coreboards by Children with Developmental Disabilities and Teachers in a School Environment.

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Abstract

Coreboards have become popular as an aid for individuals with disorders, such as Autism Spectrum Disorder (ASD), who may have issues with speech-language production, but who also often lack more fundamental functional communication skills. The aims of this study were to explore the extent coreboards as an Augmentative and Alternative Communication (AAC) were a useful tool for children with developmental disabilities and their teachers to communicate independently and functionally, if they were used effectively in the school environment, if they were used for their intended purpose, and if they were used to facilitate functional communication skills for children with developmental disabilities. The research in this project involved data collection on student and teacher communicative behaviour. The participants in this study were three children aged 9 to 10 with developmental disabilities and their teacher and learning support assistants. The study is a mixed-methods descriptive design and data was collected by direct observations being recorded on a data sheet. The main findings are the student participants did use the coreboard for independent communication as they each individually initiated with the coreboard less than 3% of the time and two of the student participants purpose of initiating use of the coreboard was unknown over half the time. Furthermore, if the adult participants are unable to determine what the purpose of the coreboard use is from the student participants, then the communication act will not be successful as the adult participant will not be able to respond appropriately to the student participant and the lack of success will discourage the student participants from initiating in the future.

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I am thankful to my supervisor, Associate Professor Angelika Anderson, for the valuable advice and guidance throughout this project. I would also like to express my deepest gratitude to the participants who took part in this study as well as their families and school as without them this thesis would not have been possible. Lastly, a special thank you to Terry and the team at Accessibility Support Services for all their support throughout my thesis.

Table of Contents

List of Tables

List of Figures

Investigating the Use of Coreboards by Children with Developmental Disabilities and Teachers in a School Environment

Communication is an important process for humans to be able to share knowledge, form bonds, and interact with other people. People that have issues with communicating can struggle to participate in these activities and are at a disadvantage, when it can also lead to further difficulties, such as difficulty with relationships or maintaining employment. From a Verbal Behaviour perspective, people use communication to functionally interact with other people and the environment to obtain outcomes they desire (Skinner, 1957). Being able to use communication functionally, or to functionally communicate, is necessary for people to get their needs or wants met through the response of another person, such as requesting a glass of water when thirsty. If an individual is unable to spontaneously or independently initiate functional communication, then they will never be able to actively engage with others to obtain outcomes they desire.

Functional communication is a skill that some autistic people have not acquired or they do not know they can functionally communicate, and they require interventions to teach them how to functionally communicate (Paul, 2008). Some evidence-based interventions to address functional communication problems with autistic people are: the Picture Exchange Communication System (PECS), Pivotal Response Training (PRT), and Applied Behaviour Analysis (ABA) approaches (Brodhead et al., 2017). In recent years, a device referred to as a coreboard, which is a type of communication board, has become increasingly popular to use with autistic students to assist with their communication (Andrews, 2016; Thomas & Winter, 2018, October 8). However, the current published literature is limited on communication boards and their impact on communication with autistic people, and the term coreboard was not used. Therefore, given their widespread and public use, I aim to explore the extent to which coreboards, and Augmentative and Alternative Communication (AAC) are a useful tool for children with developmental disabilities and their teachers to communicate independently and functionally, if they were used effectively in the school

environment, if they were used for their intended purpose, and if they were used to facilitate functional communication skills for children with developmental disabilities.

Literature Review

Autism

Autism Spectrum Disorder (ASD) encompasses a variety of neurological conditions in which a person ranges in the spectrum of a combination of most, or all, issues relating to pragmatic language, social awareness, fixated interests or activities, hyper- or hyporeactivity to sensory input, and repetitive behaviours (Kerig & Ludlow, 2015). An autistic person can vary in each of these categories which makes every autistic individual different from one another, but still on the autism spectrum, even if they present themselves in different ways. In the most recent DSM-V update, ASD is now a single category that encompasses the previous subtypes which were autistic disorder, asperger's disorder, and pervasive developmental disorders not otherwise specified (PDD-NOS; Kerig & Ludlow, 2015). Also in the added update is a new coding system to specify the level of support needed for those with ASD in relation to social communication and a degree of restricted and repetitive behaviour (Kerig & Ludlow, 2015). The support markers are classified as requiring support, requiring substantial support, and requiring very substantial support (Kerig & Ludlow, 2015). In this review, the focus will be on autistic individuals who require a marker of support for social communication, with relevance to functional communication.

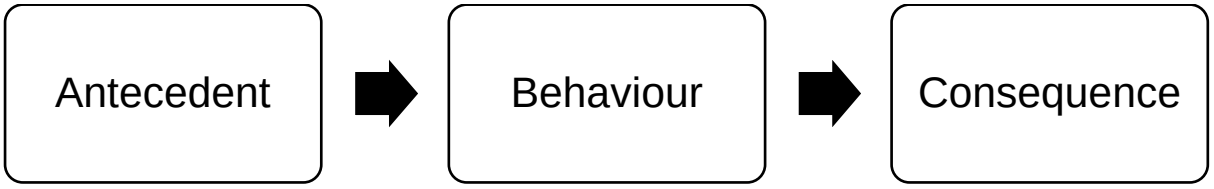
Communication

In this review, those with the capacity to speak will be called vocal instead of verbal. Similarly, the term non-vocal (i.e., able to communicate with text or facial expressions) will be used when someone does not have the capacity to speak. In addition, the term verbal response relates to verbal behaviour rather than being vocal. Non-communicative speech is when someone has language and is vocal, but is not able to functionally communicate.

Communication is the process of a speaker encoding information into a message and sharing it through a system with the listener (Beattie & Ellis, 2017). The listener also needs to be able to decode the message of the speaker and respond appropriately (Beattie & Ellis, 2017). An example of communication is when someone sees a friend and asks vocally “How are you?” and the friend responds vocally “I’m good”. This interaction follows the three-term contingency, also known as the ABC contingency. Here the friend is the antecedent stimulus, asking the friend how they are is the behaviour, and the friend responding is the consequence (Fantino & Stolarz-Fantino, 2012).

Figure 1

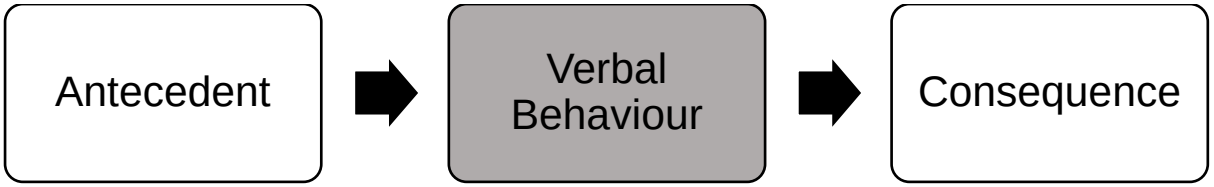
Diagram of ABC Contingency with Behaviour



On the other hand, functional communication is the behaviour of someone communicating to another person for a purpose and the outcome is socially mediated (Cooper et al., 2014; Skinner, 1957). Socially mediated reinforcement is when “the consequence results from the action of another person” (Cooper et al., 2014, p.315). An example of functional communication is: someone feels the room is too warm and because of this, they vocally ask their colleague to open a window and their verbal behaviour is then socially mediated by the colleague when the colleague does open a window. This example is demonstrative of the ABC contingency, but with verbal behaviour instead of behaviour (see Figure 2). The antecedent stimulus is the person feeling too warm, the verbal behaviour is vocally asking the colleague to open a window, and the consequence is the colleague opening the window.

Figure 2

Diagram of ABC Contingency with Verbal Behaviour



Verbal Behaviour

Verbal behaviour is a term developed by Skinner (1957) who defined it as a behaviour that is "reinforced through the mediation of other persons" (p. 2) through the role of the speaker or listener. He determined that verbal behaviour can be both vocal and non-vocal, and he also detailed the role of the speaker as being to indirectly act on the environment, while the role of the listener is to act on the environment and to reinforce the speaker (Skinner, 1957). It is also needed that the speaker and listener be part of the same verbal community, such as knowing the same language (Skinner, 1957). Language is a system made up of symbols and rules where ideas are encoded and then expressed through that system (Beattie & Ellis, 2017; Harley, 2013). Language is also made up of formal and functional properties, with formal properties consisting of the topography (i.e., form, structure) of the verbal response and functional properties consisting of the causes of the response (Cooper, et al., 2014).

For example, speech, written symbols, and sign language are different forms of a language as well as nouns, verbs, prepositions, and adjectives. B.F. Skinner (1957) determined that language is a learned behaviour that is under the control of environmental variables and principles which control nonlanguage behaviour, and he focused on the function rather than the form.

In his seminal book, *Verbal Behaviour*, he discussed the elementary verbal operants: mand, tact, echoic, textual, intraverbal, and transcription and their functions.

A mand is a verbal response that is controlled by the motivation of wanting something or wanting something removed, and the response is then reinforced by an environmental change or event (Skinner, 1957). A behaviour or response is reinforced when consequences strengthen or increase their frequency and is also known as reinforcement and the

reinforcement is a character consequence mediated by the listener (Law & Martin, 2020b). An example of a mand would be a child saying “cookie” when they are hungry and them receiving a cookie. Other variations are that they could point to where the cookies are, alongside saying “cookie” before receiving it, or just point to where the cookies are and receiving it. Following the ABC contingency, the antecedent is the motivation of wanting something or something removed, the verbal behaviour is the mand, and the consequence is specific reinforcement. The mand is based on the function and not the form, and the same form of behaviour can serve different functions (Skinner, 1957). For example, a child saying “cookie” when they are hungry and want to eat a cookie or a child saying “cookie” because they see some cookies and are commenting on the environment. The child saying “cookie” because they are hungry and want to eat one serves the function as a mand whereas the child saying “cookie” because they are commenting on what they see serves the function as a tact.

A tact is a verbal response to a non-vocal object or event, or a property of an object or event (Skinner, 1957). The verbal response can be vocal or non-vocal and it is not a requirement for the tact to be reinforced. An example of a tact would be an adult asking a child “what is this?” when referring to a cookie, and the child responding “cookie”. The response does not have to be correct for it to be a tact. If the child responded “chips” instead, it would still be a tact and the response would presumably be corrected by the adult. Following the ABC contingency, the antecedent is a nonverbal object, or event, or a property of an object or event, the verbal behaviour is the tact, and the consequence is generalised reinforcement.

Echoic behaviour is a vocal-verbal response controlled by a prior auditory vocal-verbal stimulus to which the response and stimulus match one another and have formal similarity (Skinner, 1957). An example of echoic behaviour is a child saying “cookie” after hearing an adult say “cookie”. If the child said “food” after hearing an adult say “cookie”, or if they said “cookie” with a different inflexion or pitch than the adult, it is not echoic behaviour.

Following the ABC contingency, the antecedent is an auditory vocal-verbal stimulus with a match, the verbal behaviour is the echoic, and the consequence is generalised reinforcement. Although echoic behaviour is under the functional control of auditory vocal-verbal stimulus, the form of the response needs to match stimulus and have formal similarity, or it would not be echoic behaviour.

Textual behaviour is a vocal-verbal response controlled by a prior visual-verbal stimulus to which the response and stimulus match one another (Skinner, 1957). An example of textual behaviour is a child seeing the word “cookie” in a book and then saying “cookie”. In addition, the word and the response do not have to hold meaning for it to be textual behaviour. An example of this is a child seeing “YAL” in a book and then saying “YAL”. Following the ABC contingency, the antecedent is a visual-verbal stimulus, the verbal behaviour is the textual behaviour, and the consequence is generalised reinforcement.

An intraverbal behaviour is a verbal response to a prior controlling variable that is a verbal stimulus to which the verbal response does not match the verbal stimulus (Skinner, 1957). An example of an intraverbal stimulus is when the child hears or sees “what is two plus two” and they say or write “four”. Following the ABC contingency, the antecedent is an auditory-verbal stimulus without a match, the verbal behaviour is the intraverbal, and the consequence is generalised reinforcement. Common issues for some autistic children learn simple intraverbal behaviour, such as the example above, but fail to acquire more complex intraverbal repertoires, such as when asked to complete the sentence “we sleep in a…” (Sundberg & Sundberg, 2011).

Transcription is a verbal behaviour where the response is in writing to a prior vocal-verbal behaviour or prior written material, and the response matches the prior stimuli (Skinner, 1957). An example of transcription is hearing someone say “cookie” and then the child writing “cookie” in some form (i.e., typing). Following the ABC contingency, the antecedent being a vocal-verbal behaviour or prior written material, the verbal behaviour is the transcription, and the consequence is generalised reinforcement.

Communication Issues

Common communication issues for autistic people are echolalia, idiosyncratic speech, and literal and pedantic speech (Brodhead et al., 2017; Kerig et al., 2012). Some autistic individuals can be vocal and have language and yet not be able to use their words to achieve desired outcomes or in communicative speech because they cannot use speech and language skills to functionally communicate (Kerig et al., 2012; McDougle, 2016). This is particularly relevant to echolalia, which is the repetition of exact words or phrases heard, without using the words or phrases with their associated meaning or purpose (Kerig et al., 2012). Echolalia can be immediate or delayed and can serve specific functions for an individual (Prizant, 1983). It is also relevant to idiosyncratic speech, which is the irrelevant utterances of phrases or sentences in a situation (Kerig et al., 2012). Communication issues can arise between autistic individuals and other individuals with literal and pedantic speech, as the meaning of what some people say can be misunderstood for a different purpose (Kerig et al., 2012). An example of this is a neurotypical person asking for the autistic individual's hand and the autistic person understanding it as literally to remove their hand and give to the other person, rather than it being a request for assistance (Kerig et al., 2012). Furthermore, many individuals with ASD have communication issues ranging from mutism to non-communicative speech (Kerig, Ludlow, & Wenar, 2012). However, they can still have language and the ability to speak but not be able to functionally communicate.

In relation to verbal behaviour, it is common for autistic children to be unable to mand, but still have extensive tact and receptive repertoires (Cooper et al., 2014). If an individual fails to develop the ability to mand, then they would not be able to establish themselves as a speaker, rather than a listener, which is needed to give them some control of the social environment (Cooper et al., 2014). If someone is unable to act as a speaker, they cannot use verbal behaviour, and therefore functional communication. Instead of manding, some autistic individuals will often hold someone's hand and lead them towards an object or an activity thus using that person functionally, rather than being able to

communicate functionally themselves (Gómez, 2015). Furthermore, if an autistic individual mands do not develop in a typical manner and they fail to develop a proper relationship between their response and the motivation of what they want, then out of anxiety or frustration challenging behaviours will serve the mand's function (Cooper et al., 2014). It is also common for autistic children to be unable to emit echoic behaviour and to suffer from defective or non-existent intraverbal repertoires, even if they can emit hundreds of mands, tacts, and receptive responses (Cooper, et al., 2014).

Communication issues not specific to autism include aphasia, dysarthria, and apraxia of speech. Dysarthria and apraxia of speech (AOS) impair a person's capability to speak, with dysarthria being due to abnormalities caused by one or more sensorimotor problems of speech production, and AOS being an impairment to plan or programme sensorimotor commands necessary for normal speech (American Speech-Language-Hearing Association, 2021, March 20a, 2021, March 20e). Aphasia is an acquired condition where someone has varying degrees of impairment with spoken language expression and comprehension, written expression, and reading comprehension, but this does not affect their intelligence (American Speech-Language-Hearing Association, 2021, March 20b; Health Navigator New Zealand, 2021, March 25). Aphasia, dysarthria, and AOS all can be acquired, but only dysarthria and AOS can be congenital, with congenital AOS being called Childhood Apraxia of Speech (CAS; (American Speech-Language-Hearing Association, 2021, March 20a, 2021, March 20b, 2021, March 20d, 2021, March 20e).

Although people with aphasia, dysarthria, and apraxia of speech have issues with communication, they still have the understanding they can functionally communicate. This is shown by the treatment options for people with dysarthria and AOS/CAS as they are on improving or restoring impaired abilities, compensating for deficits, eliminating barriers, and preserving or maintaining the function of their speech which is all for treating the sensorimotor problems rather than teaching functional communication skills (American Speech-Language-Hearing Association, 2021, March 20a, 2021, March 20d). Furthermore,

people with aphasia who have a better ability to speak or write are able to functionally communicate easier than those that have limited or no ability which shows that some people with aphasia can functionally communicate (Olsson et al., 2019). AAC is another treatment option for AOS to provide functional communication options and strategies for CAS and dysarthria (American Speech-Language-Hearing Association, 2021, March 20a, 2021, March 20d).

The American Speech-Language-Hearing Association (ASHA) define AACs as “an area of clinical practice that addresses the needs of individuals with significant and complex communication disabilities characterized by impairments in speech-language production and/or comprehension, including spoken and written modes of communication” (Beukelman et al., 2012), p. 4). This definition suggests that AACs aim to address problems with speech-language production rather than teaching functional communication skills. AAC is prominently used for autistic individuals who have communication issues (Ogletree & Harn, 2001). Aided AAC appears to be more effective than unaided AAC in providing a system to communicate (Ganz, 2015). Aided AAC consists of picture communication, line drawings, or speech-generating devices while unaided AAC consists of manual signs, gestures, and fingerspelling (American Speech-Language-Hearing Association, 2021, March 20c).

An examination of the published literature has shown that the term communication board is used rather than the term coreboard. Communication boards and coreboards are both under the category of a visual display AAC (American Speech-Language-Hearing Association, 2021, March 20c). The design of communication boards is diverse across the studies in the published literature, depending on who they are for and what the purpose of needing a communication board for the individual is. The design of a coreboard consists of core vocabulary which is colour-coded into categories (such as nouns etc.) and fringe words which can be altered to include core vocabulary to meet an individual’s needs (Zangari, 2013, May 4). Overall, the published literature on communication boards only includes three studies that do or could fit the description of a coreboard (Jonsson et al., 2011; Lesser &

Ebert, 2020; Naidoo & Singh, 2020). Furthermore, much of the published literature on communication boards does not investigate facilitating functional communication.

Acquired Impairment

In the studies conducted by Calculator and Luchko (1983) and Priana et al. (2018), communication boards were used to help with communication for people that acquired an impairment after a stroke or an accident in a medical setting. Also in a medical setting, Hosseini et al. (2018) and Patak et al. (2006) investigated the use of communication boards on reducing anxiety and frustration for patients receiving mechanical ventilation which rendered them unable to talk. All of these studies did not focus on whether the communication board facilitated functional communication skills but rather for communication boards to provide a system of communication (Calculator & Luchko, 1983; Hosseini et al., 2018; Patak et al., 2006; Priana et al., 2018). The findings from Calculator and Lachko's (1983) study are the revised communication board is an effective device for communication for the participant, from Priana et.al (2018) study are the participants are more satisfied with the bigger communication board device rather than the smaller ones, from Hosseini and Feizi (2018) study are the use of communication boards led to ease of communication and reduced patients' anxiety, and from Patak, et al. (2006) study are the patients thought their frustration in communicating their needs would be significantly lower if the communication board had been offered and that the communication board may be effective in facilitating communication. The designs of the communication boards are specific to these studies and are not a similar design to coreboards (Priana, et al., 2018; Calculator, & Luchko, 1983; Hosseini, & Feizi, 2018; Patak, et al., 2006).

These studies are not relevant to my research as it is not researching coreboards or participants with developmental disabilities. They do indicate, however, that communication boards could be a useful and effective device for people rendered temporarily unable to talk and people that acquired an impairment after a stroke or an accident.

Non-acquired impairment, disability, or disorder

Cerebral Palsy

Communication boards were implemented as a device that replaces speech for individuals with cerebral palsy and individuals rather than providing them with a system so they can functionally communicate (McDonald & Schultz, 1973; Watson, 1995).

For cases with cerebral palsy, the layout of the communication board for the study by McDonald and Schultz (1973) had a removable tray attached to a wheelchair with pictures and symbols of different items, needs, places, and concepts whereas the study by Watson (1995) adapted and implemented nouns, verbs, places, and aspects of the school day onto the board. These designs are similar to the first communication board, and not a coreboard, which was developed for an individual with cerebral palsy and consisted of a letter and word-based design (Vanderheiden, 2002). A communication board was the first portable communication aid for an individual with cerebral palsy where “the user had the freedom to change their own vocabulary and rearrange the letters, words, and phrases on the aids to meet their needs” (Vanderheiden, 2002, p. 43). There was no functional communication training to use the communication boards for McDonald and Schultz (1973) and Watson (1995), only modelling on how to use the board for the participant in McDonald and Schultz’s (1973) study. In Watson’s (1995) study the participant did not go through any training to learn how to use the board, the clinician just made sure he was familiar with the pictures and concepts, but he was taught basic new words and sentences sequences. The findings from McDonald and Schultz (1973) and Watson (1995) are that the communication boards were an effective system of communication.

Cerebral palsy is an umbrella term for several neurological conditions that affect movement and coordination (Dean, 2017). The issues with communication that individuals with cerebral palsy have are with speech production as it relies on underlying processes such as respiration, phonation, and articulation along with coordination and movement for speech (Pennington, 2012). The studies conducted by McDonald and Schultz (1973) and

Watson (1995) used communication boards as a system to replace speech, which is what individuals with cerebral palsy have issues with, and to provide a way to communicate the formal properties of language rather than functional properties. Although these did not use coreboards, they did require their participants to have prerequisites to use the communication board which also may be necessary to use coreboards. McDonald and Schultz (1973) outlined the prerequisites as sufficient physical abilities and being able to identify pictures of common objects, recognising and reading simple printed word/ phrases, skills in or the potential of recognising words not in vocabulary by using word-analysis techniques, and reading and language. The prerequisite for utilising a communication board for Watson (1995) was correctly identifying picture vocabulary.

Intellectual or Physical Disability or Impairment

The studies with participants with intellectual or physical disabilities or impairments are mixed. The studies by Calculator and Dollaghan (1982) and Heller, Allgood, Ware, et al. (1996) that had participants with intellectual and/or physical impairments had a focus on functional communication. The studies by Reichle and Yoder (1985) and Stephenson and Linfoot (1995) suggest that communication needs to be taught with the social aspect for communication boards as the participants were not able to communicate in a manner that was functional.

The participant's in the study conducted by Reichle and Yoder (1985) were severely handicapped children where they were taught how to point to words on a communication board and concluded that a prerequisite for using the communication board may be the ability to seek another person's attention as the participants were never specifically taught to request for items or produce the vocabulary in the absence of a verbal cue. They associated the life objects with the symbols they represent but did not attempt to communicate with other people to obtain these objects and only tried to obtain them themselves. This indicates the need for teaching consequences being socially mediated rather than just matching to sample to teach the social aspect of communication. They also found that three of the four

children acquired the discrimination between providing information and requesting through discrimination training and most to least prompting which was eventually faded. This suggests for some people training may be needed to discriminate between the purposes of communication and how to request items using a communication board which is needed to functionally communicate.

Another study that used prompting is Heller, Allgood, Davis, et al. (1996) and they used least to most prompts of signalling, modelling, and physical guidance to teach using the dual vocabulary communication board, which are two of the same communication board where one is used for the user and the other for another person to use to communicate with the user. All of the participants in Heller et al. (1994), Heller and Allgood (1996), Heller, Allgood, Davis, et al. (1996) were either visually and hearing impaired or had an intellectual disability with hearing loss and/or visual impairments, the communication boards in each of these studies were found to be an effective means for promoting appropriate communication. These studies have little to no relevance to my research as the communication boards were not similar to a coreboard and did not focus on the functional aspects of communication. The study by Heller, Allgood, Ware, et al. (1996) is relevant to my research as the participants with intellectual disability and sensory impairments were taught to initiate requests with their dual communication board system that was not similar to a coreboard. The participants were taught to point to the "I need" symbol to indicate the function of the communication. They were able to use an “I need” symbol on a dual communication board and a second symbol or gesture to successfully initiate requests which are needed to be able to functionally communicate.

The study by Calculator and Dollaghan (1982) did not describe the layout of the communication board and only stated it was a “Blissymbol” (p.47) communication board. They researched the communicative interactions between seven nonspeaking intellectually disabled or physically handicapped participants and their teachers. They found the participants rarely used their boards in spontaneous classroom interactions, the use of the

board did not increase the likelihood of the student message success, and the use of the board did not decrease the ambiguity of the message. Also, the participants were more successful in responding than initiating. As such Calculator and Dollaghan (1982) stated that because of the lack of success in the initiator role they did not initiate messages with the board. This is relevant to my research as communication boards or coreboards not having a way to differentiate between the different functions of communication could lead to the initiator, or speaker, not having their communication act reinforced through social mediation of the listener because the message of the communication is ambiguous. This study conveys the importance of the function of communication needing to be clear and understood by the listener for the speaker to continue to use these devices to communicate.

The study by Stephenson and Linfoot (1995) did not have any relevant or conclusive findings on using a communication board with a 10-yeard old boy with a severe intellectual disability who had no spoken language and poor verbal comprehension. The intervention procedure of this study was to use choice-making within regular activities to teach the first stages of communication board use. During the intervention verbal cues, blocking of incorrect responses, physical prompts, and corrections were used to get the participant to touch the symbol which the participant acquired rapidly, however, the participant was unable to match symbol to identical symbol or symbol to object. The participant seemed to learn to discriminate between item and symbols but it may have been because of the position of the symbols on the board. Overall, this study does not have any conclusive findings on the communication board being an effective device for the participant to communicate. This supports the idea that teaching communication with the social aspect of social mediation is needed for them to be able to communicate in a meaningful way, such as the function.

Autism

Two of the studies used communication boards that fit the description of a coreboard but were studies based on user report from adults rather than on observing how the children use the communication boards (Jonsson et al., 2011; Naidoo & Singh, 2020). Only the

studies conducted by Lesser and Ebert (2020) and Reichle and Brown (1986) focused on the functional aspects of communication.

One of the studies in the literature that has an autistic participant use communication boards but researched the effect of aided language modelling (ALM) on symbol comprehension and expression rather than the boards themselves (Drager et al., 2006). This study is not relevant to my research and the limitations of having no safeguards to prevent experimenter bias, not being able to generalise the results to the general population of autistic children, and having a potential influence of personal history on the results make it so nothing can be concluded from it.

A study by Reichle and Brown (1986) found that their adult autistic participant was able to request and provide information as well as request spontaneously after they were taught to locate symbols on the communication board, discriminate between requesting and providing information, and to produce specific two-symbol requests. They also mentioned that the participant may have acquired the rule that the correct choice was always in front of them and the participant failed to use spontaneous comments. This supports that teaching to differentiate between the functions of communication can allow the individual to functionally communicate.

Two of the studies in the literature for the cases with autism researched the adult users self-report of the boards rather than focusing on the children using the boards for communication (Jonsson et al., 2011; Naidoo & Singh, 2020). The communication boards used in these studies were specific to the study and Jonsson et al. (2011) referred to their boards as ComAlong communication boards. The layout of the communication board from Jonsson et al. (2011) is 10 activity-based boards rather than one general board compared to Naidoo and Singh (2020) where they created a communication board by selecting 5 PCS symbols for the 74 validated and approved selected dental terms. Both of these studies depicted the boards as having the symbols or vocabulary colour-coded and grouped into

categories that fits the description of a coreboard (Jonsson et al., 2011; Naidoo & Singh, 2020).

Overall, most of the parents in the study by Jonsson et al. (2011) expressed that the children showed interest in the boards and used them to functionally communicate in some cases, described them to be valuable and instructive, and around 60% of them reported positive changes in communication while the rest were divided into those who saw no change or did not use the boards. They only reported in detail on 4 out of the 65 parents who participated in the study and the three children they were associated with. Two of the parents of an autistic child felt the boards helped their child to better understand the purpose and meaning of communication while another parent with an autistic child believed the child understood the pictures to help her message to be clearer. Another parent of a child with cerebral palsy and the two parents of an autistic child believed to some extent the communication board supported their child's language comprehension. This study is on the parent's opinions of the communication board instead of observing how communication boards impact the children's communication. These parents feel that communication boards are useful in providing a system of communication and in some case the children use them for functional communication, but self-report is not always reliable in describing the situation as aspects of events or situations can be missed or mistaken. In relevance to functional communication, this study does not provide any findings on communication boards and their impact on autistic children's communication.

The focus group of adult participants in Naidoo and Singh (2020) study underwent training to use the dental communication board in a clinical setting and consisted of dentists, dental therapists, and oral hygienists. 70% of the participants reported the child used the board to communicate with professional and 80% reported the communication board was helpful in explaining the treatment to the patient. The adult participants thought the weaknesses of the communication board were the patients not being able to effectively communicate their message and they could not understand some terms which lead them to

report that training was needed for the children to understand the terms and expressions of the communication board. The participants thought the strengths of the board were patients feeling comfortable because of the board and the board helped the patients to express themselves. This study expresses the need for the user to be able to understand the terms on the communication board and the function of these terms would need to be taught as well if they do not understand what their functions are. As this study is also a user report these finding should be considered with caution.

Two studies used naturalistic strategies, with Nunes and Hanline (2007) naturalistic teaching strategies in an intervention and Lesser and Ebert (2020) naturalistic play-based activities in a one-on-one therapeutic setting. The purpose and the findings of Nunes and Hanline (2007) study centred around the effects of a parent implementing a naturalistic intervention on the communication outcomes of the participant rather than researching the effects of the communication board on the participant's communication which is what Lesser and Ebert (2020) investigated. The participant's from Nunes and Hanline (2007) is a non-vocal four-year-old autistic boy and their parent who was trained to apply naturalistic teaching strategies during four routines. In the play routines, the child's responses to using the communication board increased in the intervention and began to decline near the end of the intervention. Limitations of this study are the parent preferred to place the communication board above the kitchen sink in the handwashing routine and therefore was not available for the child participant to use for that routine as well as baseline data was not stable for the caregiving routine before entering the intervention. These limitations make it hard to conclude anything from the study about the impact communication boards have on their child participant.

Nunes and Hanline (2007) did not mention prerequisites needed for a communication board but Lesser and Ebert (2020) required the participant to have the understanding that an image can be symbolic. The participant from Lesser and Ebert (2020) study is a 3-year-old with fewer than 3 spoken words which were inconsistent at the study's onset. They use an

A-B-A-B single-subject design to examine the effects of a communication board on the rate of communicative acts and the range of communicative functions. The communication board was introduced to the participant through EMT with JASPER (Enhanced Milieu Teaching; Joint Attention, Symbolic Play, Engagement, and Regulation). The findings are that the participant independently searched for the board to request and the frequency of communication quickly increased with the board being acquired as a means of communication. With a focus on the functions of communication, this suggests that communication boards could be useful when used for functional communication.

The literature on communication boards for individuals with autism is limited and some needed to be interpreted with caution because of their limitations. Jonsson et al. (2011), Naidoo and Singh (2020), and Lesser and Ebert (2020) are the only studies in the literature with communication boards having the layout of a coreboard which shows there is a gap in research on boards with a coreboard design. The term coreboard is not used in any literature, but it is used commonly on public websites where they are advertised to be easy to use communicative devices and training is not needed by the parents or adults to use them (Speech in a sec, 2019, August 12; Zangari, 2019, August 8).

Public information on Communication boards

Searching for communication board or coreboard on the internet yields a diversity of results discussing what they are, how to use one, how to make one, and what they are for (Speech in a sec, 2019, August 12; Thomas & Winter, 2018, October 8; Zangari, 2016, July 11). The definition of what a communication board or coreboard has differed from each result with some being:

- a form of AAC that helps a person understand or be understood (Speech in a sec, 2019, August 12).
- an organized and strategic visual representation of language and that is to help children better visualise and understand language (Madel, 2018, October 9).

- a tool to increase the modelling students are exposed to as well as to help the language be visual (Thomas & Winter, 2018, October 8).

These definitions do not require the board to be used for functional communication as two of the definitions focus on visualising language and the other focuses on clarifying communications. Modelling use of the board was discussed by all of these people and prerequisites for communication boards are only mentioned by one (Law & Martin, 2020a). Modelling is the action of demonstrating a behaviour for another person to imitate. Rachel Madel, a board-certified paediatric speech-language pathologist, stated that there are no prerequisite skills needed to start using high-tech devices for communication, however, communication boards can be low-tech as well (American Speech-Language-Hearing Association, 2021, March 20c; Rachel Madel SLP, 2017, July 20). She also states that introducing a device with AAC helps build comprehension of language and if communication is made easy children will be motivated to do it (Rachel Madel SLP, 2017, July 20). Rachel Madel SLP (2017, July 20) focuses on a system of communication rather than the ability to communicate. Most neurotypical children will progress through pre-listener, listener, and speaker stages to acquire functional communication without needing to be taught extensively how to functionally communicate. Therefore, most people, including professionals, can make the assumption that autistic children already have the skills to functionally communicate (Casey & Bicard, 2009; Greer & Keohane, 2005). In addition, prerequisites are outlined by Zangari (2018, June 11) for communication boards with them being: understanding and using the symbols for different types of messages, the capability to look and touch the symbol, and the ability to make a choice. The first prerequisite although vague can fall under functional communication by “using symbols for different types of messages”. Zangari (2019, August 8) also discussed modelling communication and gave tips on how to model. There is an abundance of public resources on how to make or structure communication boards (Devin, 2016, March 10; Zangari, 2016, July 11).

A common and expansive website that is available to the public is Wikipedia. Interestingly, there is no Wikipedia page for communication boards even though there are for AAC, Picture communication symbols (PCS), and PECS. There are however multiple mentions of communication boards within these Wikipedia pages. In the “Augmentative and alternative communication” (2020, December 31) Wikipedia page, communication boards are under the low-tech label of AAC and are defined as simple communication aids that do not need batteries or electronics to function and where the user selects letters, words, phrases, pictures, and/or symbols to communicate a message. This definition fits in with ASHA’s definition of what AAC is and is representative of the communication boards used in the literature (American Speech-Language-Hearing Association, 2021, March 20c; Augmentative and alternative communication, 2020, December 31).

As the information on coreboards on public websites is varied and there is limited research in the literature on coreboards for autistic individuals, it is important to explore some evidence-based interventions on communication for autistic people.

Evidence based interventions for communication in ASD

Reichow and Volkmar (2010) reported on the best evidence synthesis of interventions to increase social behaviour for autistic individuals and found Applied Behaviour Analysis (ABA) is the most common intervention type utilized by the studies in this synthesis. They also mentioned ABA is often used to augment other types of interventions. Within ABA, evidence-based practices that have improved communication skills for children with ASD include modelling, prompting, and reinforcement (Reichow & Volkmar, 2010; Watkins et al., 2017). Prompting is a technique where a person's movement is physically assisted or verbally instructed to perform a behaviour that can be reinforced (Concise Medical Dictionary, 2010).

Naturalistic approaches are another evidenced-based practice that was often combined with other approaches, most frequently parent training (Reichow & Volkmar, 2010). Naturalistic interventions are a collection of practices or techniques based on ABA

principles in more natural environments instead of controlled environments and are about teaching imitation or joint attention behaviours as well as providing structure to parent-child interactions (Paul, 2008; Reichow & Volkmar, 2010). Parent training and peer training interventions are about getting peers or family members to deliver treatment to the individual with ASD and with peer training the peers were taught to provide pivotal response treatment (PRT), visual supports, and prompting training (Reichow & Volkmar, 2010).

PRT and visual supports are also evidenced-based interventions in communication for autistic people. PRT consists of improving language, behaviour, and social outcomes by targeting pivotal behaviours (behaviours from which other behaviours originate), related motivation, responsivity to multiple cues, self-management, and self-initiations (Brodhead et al., 2017). Visual support interventions are for “enhancing social understanding and structuring social interactions or communication” for autistic children (Reichow & Volkmar, 2010, p.161). Communication boards, coreboards, and PECS would be considered visual support and are all AAC. PECS uses behavioural strategies as well as training phases to teach the use of graphic symbol cards for spontaneous communication and functional communication as it is developed from Verbal Behaviour (Brodhead et al., 2017; Pyramid Educational Consultants, n.d). Communication boards as an AAC are devices to assist an alternate way of communicating for people who have difficulty communicating via speech or in writing, but it does not have any method to teach functional communication (Beukelman et al., 2012).

The first communication board was developed for an individual with cerebral palsy and consisted of a letter and word-based design (Vanderheiden, 2002). It was the first portable communication aid where “the user had the freedom to change their own vocabulary and rearrange the letters, words, and phrases on the aids to meet their needs” (Vanderheiden, 2002, p. 43). Cerebral palsy is an umbrella term for several neurological conditions that affect movement and coordination (Dean, 2017). The issues with communication that individuals with cerebral palsy have are with speech production as it

relies on underlying processes such as respiration, phonation, residents, and articulation along with coordination and movement for speech (Pennington, 2012). They have difficulties as the speaker or listener of messages and, in relation to communication, it equates to them not being able to respond appropriately or not being able to share a message (Beattie & Ellis, 2017; Pennington, 2008). The interventions to promote the development of communication for children with cerebral palsy are on sending and receiving messages and this then would be presumably what communication boards would promote (Pennington, 2008).

Overall, the literature on communication board use is very limited and only includes three studies that have a communication board that would resemble a coreboard. As it is common for individuals with ASD to not know they can communicate functionally there would need to be a methodology in place to ensure they know how to functionally communicate or to teach them how to functionally communicate (Reed, 2015; Zangari et al., 1994). In addition, being able to initiate a request for a desirable outcome or item is an essential part of communication and those with ASD have deficits in initiating requests spontaneously (Duffy & Healy, 2011). It is unknown if coreboards are being used with teachings of functional communication and to initiate a request in practical school environments.

Gaps in the Literature

Communication boards have been researched on a variety of disabilities and impairments. The literature for cases with cerebral palsy, visual and hearing impairments, and an acquired impairment indicates that communication boards are effective as a communication device for them (Calculator & Luchko, 1983; Heller et al., 1994; Heller, Allgood, Davis, et al., 1996; Heller & Allgood, 1996; Heller, Allgood, Ware, et al., 1996; Hosseini et al., 2018; McDonald & Schultz, 1973; Patak et al., 2006; Priana et al., 2018; Watson, 1995). The few studies in the literature with autistic individuals on communication boards are limited and some of the studies need to be interpreted with caution because of their limitations (Drager et al., 2006; Jonsson et al., 2011; Lesser & Ebert, 2020; Naidoo &

Singh, 2020; Reichle & Brown, 1986). For this reason, a gap in the literature is the use of communication boards with autistic individuals and there is a major gap regarding coreboards as they are not well investigated (Jonsson et al., 2011; Lesser & Ebert, 2020; Naidoo & Singh, 2020). Areas that need more research on coreboards are whether they provide a means to functionally communicate, are useful in facilitating functional communication skills, and how they are being used practically in school environments.

Current study

Upon research into coreboards, there does not seem to be substantial evidence to support them as evidence-based interventions for individuals with ASD. The popularity and use of communication boards may also stop therapists and teachers from exploring more appropriate evidence-based alternatives such as PECS (Andrews, 2016; Kerig et al., 2012) or Verbal Behaviour approaches (DeSouza et al., 2017). Therefore, this study aims to explore the extent coreboards as an AAC are a useful tool for children with developmental disabilities and their teachers to communicate independently and functionally, if they were used effectively in the school environment, if they were used for their intended purpose, and if they were used to facilitate functional communication skills for children with developmental disabilities.

Method

Participants

The participants were three male children, three adult female learning support assistants, and one adult female teacher. The learning support assistants were coded as H, K, and N and the teacher as P. All of them together are referred to as the adult participants. The children, or student, participants all attended the same primary school and were in the same class run by the teacher participant. The criteria for the student participants included them being encouraged or taught to use coreboards, having opportunities to use them at school, and having a developmental disability, ideally autism. The criteria for the adult

participants were to be the teachers or learning support assistants of the child participants. The ages of the student participants ranged from 9 to 10. Participant one (S1) is autistic and has echolalia. Participant two (S2) has down syndrome and is non-vocal. Participant three (S3) is autistic and is non-vocal. The student participants were recruited by being volunteered by their teacher to participate in this study.

Independent and dependent variables

Independent variable

The independent variable was the use of the coreboard. The use of the coreboard is separated into three categories: teacher initiation, teacher prompt, and student initiation. Teacher initiation was defined as the teacher or a learning support assistant bringing the coreboard to the attention of a student communicative partner and pointing to core vocabulary on the coreboard. Teacher prompt was defined as the teacher or a learning support assistant bringing the coreboard to the attention of a student communicative partner and physically prompting the student to point to core vocabulary on the coreboard. Student initiation was defined as the student participant bringing the coreboard to the attention of a teacher or a learning support assistant communicative partner and pointing to core vocabulary on the coreboard.

Dependent variables

The dependent variables was the purpose of coreboard use and the outcomes for the coreboard use which was separated into the quality of coreboard use.

Table 1
Purposes of Coreboard Use and their Operational Definition

Purpose of Coreboard Use	Operational definition
Instruct (mand)	Any instance where the participant tells another participant to do or cease an action/activity, or

	request an item. For example, “Choose one. Yes or no” or “I want fork”.
Share information (Tact, intraverbals)	Any instance where a participant shares information in a formal manner about routines or preparing for an event, or labels objects in the environment. For example, “Today is Tuesday. Tomorrow is Wednesday.”
Conversation (Intraverbals)	Any instance where a participant converses in an informal or recreational manner that is not a question. For example, “Oh no, that’s silly”.
Praise	Any instance where a participant expressed approval to the student or their actions. For example, “Good job”
Ask	Any instance where a participant states a question to engage with what another participant thinks or wants. This does not include mands or instructions. For example, “What colour do you want?”

Table 2

Quality of Coreboard Use and their Operational Definition

Quality of coreboard use	Operational definition
Looking at the coreboard yes (Y) or no (N)	Any instance where the participant looked at the coreboard as a result of an initiation or prompt

Opportunity or need to communicate for adult or student participants	The coreboard use was either for: • the teacher to communicate (T; e.g. Instruct); • the student to communicate (S); • the teacher to give the student an opportunity to communicate (S; e.g. Ask); or • the student to give the teacher an opportunity to communicate (T).
Latency	Time between an initiation and the response by the communication partner. Time sampling method with 3 categories: less than five seconds, five to ten seconds, or no response (<5, 5-10, NR)
Response: appropriate (AP)	A response that does not have to be vocal or correct but is relevant to the context or is a no response to *praise* or *share information* for the purpose of the coreboard use. For example, answering dog when asked ‘what animal is this?’ or asking ‘you want a hug?’ after a participant taps hug on coreboard.
Response: inappropriate (IN)	A response that is irrelevant to the context or is a no response to *instruct*, *conversation*, or *ask* for the purpose of the coreboard use. For example, answering dog when asked ‘how many days left of term?’ or instructing a participant to do an activity

	that was not relevant to the purpose of what they initiated on the coreboard.
Response: no opportunity (O)	The participant was not given the opportunity to respond. For example, the teacher helped the student get up right after instructing them to go to the toilet or the student blocked the teacher's response of coreboard use. It is not a no opportunity to respond if the interaction was interrupted by an external factor, e.g. an announcement from the speakers.

Materials

Data collection forms

A data collection form was created for the purpose of this study to record the date, time, and context of the observations as well as which participants and teachers were present during the observations. The form also included all of the independent and dependent variables above (see Tables 1 and 2). The revised form included whether the participant looked at the board or not (yes or no) and the notes moved from the end of the form to beside each event (Appendix G).

Coreboard

The apparatus used was a teacher coreboard that was 27.5cm in width and 29cm in length that had a strap so it could be carried easily and a class coreboard that was 49.5cm in width and 49.5cm in length that always stayed at the front of the class. They both consisted of the same layout and vocabulary of core words, which were colour coded into groups (such as nouns etc.), as well as the fringe words. The main core vocabulary had a total of seven rows and eleven columns with an extra row of eight symbols at the bottom of the board.

The teacher and learning support assistants used a standard coreboard that added in core vocabulary on the board and the fringe words specific to the school and school environment. These coreboards were already in use for at least one year prior to this study. The appearance of these coreboards had been changed within one year before this study. The coreboards were used in differing classroom contexts such as morning circle and mealtimes as well as outside the classroom such as at recess.

Research Design

This study is a mixed-method descriptive design with quantitative and qualitative data being recorded from direct observations.

Ethical Approval

The University of Waikato Human Research and Ethics Committee granted ethical approval for this research project to be conducted (2020#15). Permission to conduct research on coreboards was provided by the school and consent to work with the participants was provided by the adult participants and the parents of the student participants.

Procedure

Participant recruitment

Participants for this project were recruited from a satellite school in Hamilton, Aotearoa, New Zealand. I gained permission via email from the principal of the main school and the staff at the school to nominate potential participants while providing them with the appropriate information sheet and consent forms (Appendix A, B, C, D, and F).

I had a face-to-face interview with the teacher about coreboards and times to observe the child participants. I began my direct observations after the interview with the teacher and after I gained consent from the teacher and the children’s parents. For the learning support assistants, consent was gained after the direct observations were finished as an oversight on my part was not including the learning support assistants as participants

and not giving them the needed forms and gaining their consent before beginning my observations (Appendix E).

Data collection

The research project occurred over a 4-week period, which resulted in 7 sessions of data collection, with myself directly observing the interactions and video recording a percentage of them for interobserver agreement (IOA). S2 was away for sessions 1, 2, and 4 and S3 was away for sessions 1, 2, and 5. S1 was present for all the sessions. The direct observations differed in time length and time of day throughout the 7 sessions. The length for session 1 was two hours and twenty minutes, for session 2 was one hour and thirty minutes, for session 3 five hours and twenty minutes, for session 4 two hours and forty minutes, for session 5 two hours and twenty minutes, for session 6 two hours and ten minutes, and for session 7 two hours. Sessions 1, 3, and 6 all were on a Tuesday. Sessions 2, 4, 5, and 7 were on a Thursday. Sessions 1, 4, 5, 6, and 7 were all in the morning. Session 2 was in the afternoon. Session 3 was throughout the school day. The teacher gave the consent and information sheets to the other adult participants and the parents of the student participants.

Teacher involvement

I conducted an interview that lasted around 20 minutes with the teacher participant about coreboards (see Table 3) and what the intended purpose of them was with predetermined questions (Appendix H). The interview was transcribed from the audio recording of the interview session (Appendix I). A question the teacher did not know the answer to from the interview was reported in the results as she answered the question during one of the observation sessions.

Measures of Validity and Reliability

Inter-observer agreement

Inter-observer agreement was calculated to assess the reliability and accuracy of the observation data. Out of the total observed sessions, the percentage that is video-recorded is 26%. A secondary observer was recruited to watch the video recordings of the recorded sessions. They are a postgraduate psychology student who was briefed about the operational definitions of the independent and dependent variables and were given a formatted excel sheet designed as the observation form (Appendix G) to write their responses. The mean IOA was calculated for the coreboard use, the purpose of coreboard use, and each of the quality of coreboard use (see Table 1 and 2). The mean IOA percentage is 95% or above for each of the categories (see Table 3). As discussed by Cooper et al. (2014), the inter-observer agreement needed for the data to have adequate reliability is between 80% and 100%.

Table 3
Percentage of IOA across independent and dependent variables

Use of coreboard	Look at coreboard	Opportunity or need for communication	Function or purpose	Consequence of coreboard use	Latency	Response type (AP, IN, O)
97%	97%	98%	97%	97%	96%	95%

Data Analysis

For each session, the data from the physical copies of the forms were entered into an Excel sheet. If it was not clear what the purpose of the coreboard use was during the direct observations, the data was analysed after the session to determine what the purpose was. The data for looking at the coreboard was only recorded after session 4 with direct observations, however, the data was able to be collected on looking at the coreboard in the video recordings for sessions 3 and 4. The formulas COUNTIF, COUNTIFS, and SUM were used to transform the qualitative data into quantitative data.

Results/ Discussion

Overall Coreboard Use

Out of the 513 events, 403 (79%) were teacher initiated to a student participant, 51 (10%) were teacher initiated to the class, 18 (4%) were teacher prompts, and 41 (8%) were student initiated (Table 4). All the class interactions were initiated by P.

Table 4
Percentage of Student Initiations across Student Participants

Participant	Student Initiations
S1	2.53%
S2	2.53%
S3	2.92%

Over 7 sessions, the adult participants used the coreboard with S1 169 times (average 24 per session). Over 4 sessions, the adult participants used the coreboard with S2 89 times (average 22 per session) and with S3 163 times (average 41 per session). The data from S2 should be interpreted with caution as he has about half the data points as participants S1 and S3, and had a high-tech device to communicate. However, S3 also has a high-tech device to communicate and was present for the same amount as S2, but the coreboard was used for S3 nearly twice the amount as S2. The adult participants using the coreboard at this rate with S3 suggests there is a need to communicate with S3 more than S2. Investigating what purpose the adult participants used the coreboards for each of the student participants could help figure out what they needed to communicate for (see Figure 3).

Intended Purpose of the Coreboards

Table 5 consists of the summarised responses of the interview questions from the teacher participant and the section below the table identifies the intended purpose of using the coreboards from the responses of the interview questions.

Table 5
Summarised Responses of the Interview Questions from the Teacher Participant

Topic	Data
Training	Trained to use coreboards 3 to 4 years prior to this study and then had training with speech language therapists
Typical practice	Adults' typically repeat the interaction more than once Point to and speak the word or combination of words on the coreboard
Common reasons to initiate	Instructing, asking questions, have a conversation, and play conversation
Issues/ challenges	Daunting at first to use i.e., learning to read upside down Learning to use less words than she usually would vocally Knowing which words or combinations of words to choose
Barriers	Incompetence i.e., looking for a word and not knowing where it is
Perceived benefits	Allowing children to get their message across quickly and easily (referring to all students, not just participants in this study) Visual display helps to get the message across to the student and the visual helps them to figure out what to say back

	Encourage those with echolalia to use coreboards or speak to them with the coreboards there will be no real communication It allows the student's to: indicate what they want from us; communicate with us; and to give them a voice. It allows the teacher's to: have fun with the students; for the students to know what we want; and take away confusion when speaking to the students.
Overall comments	The high-tech devices are for: non-vocal students to give them a voice as the programs on the device produce speech; and students to ask or answer without them having to move to a teacher or a teacher having to move to the student for the student to communicate. Students do not seem to have any trouble using coreboards because they see the core vocabulary the right way around and they have experience with them

From the interview, the intended purpose of the coreboards was identified as:

- For teachers and learning support assistants to communicate to the student quickly and easily:
    - what the teacher or learning support assistants want;

    - to ask questions; and
    - to have a conversation or play conversation.

- To take away confusion when speaking to the students.
- To encourage “real communication” rather than just a repetition of words or phrases.
- To give non-vocal students a voice to communicate:
    - with the teachers; and
    - what the students want from the teachers.
- For the student to figure out “what to respond”.

Interpretation of the Meaning of the Intended Purpose

To interpret the data on how the coreboards are intended to be used, the meaning of the intended purposes will be outlined and defined. The purpose of taking away confusion when speaking to the students is: for the student to understand the communicative message and to respond appropriately. The purpose of encouraging “real communication” is: to encourage the student to have communication diversity, which is responses that are appropriate to the context and not a repetition of what was previously communicated. For instance, the purpose of having a conversation and an open question would fit under this. However, most of the time the format for asking a question by the adult participants was between two matters (i.e., “Is it red or yellow?”) which requires the student participants to repeat one of the choices (vocally or non-vocally) as a response, and therefore, does not fall under the intended purpose of encouraging “real communication”. The next purpose of giving non-vocal students a voice to communicate is: the student is able to independently use the coreboard to communicate with the teachers and for the student to communicate their wants or needs. Finally, the purpose of the student figuring out “what to respond” is: the student using the core vocabulary on the coreboard to respond appropriately to the adult participants.

AAC Definition of Coreboards Compared to their Intended Use

The purpose of an AAC is to address “the needs of individuals with significant and complex communication disabilities characterized by impairments in speech-language production and/or comprehension, including spoken and written modes of communication” (Beukelman & Mirenda, 2012, p. 4). This illustrates that AAC is to provide a system or methods to assist an individual who has issues with communication through language production and/or the formal properties of language to communicate. It is important to note that autism is comprised of a range of neurological conditions that can impact communication skills, rather than the loss of the ability to use language production and/or the formal properties of language to communicate.

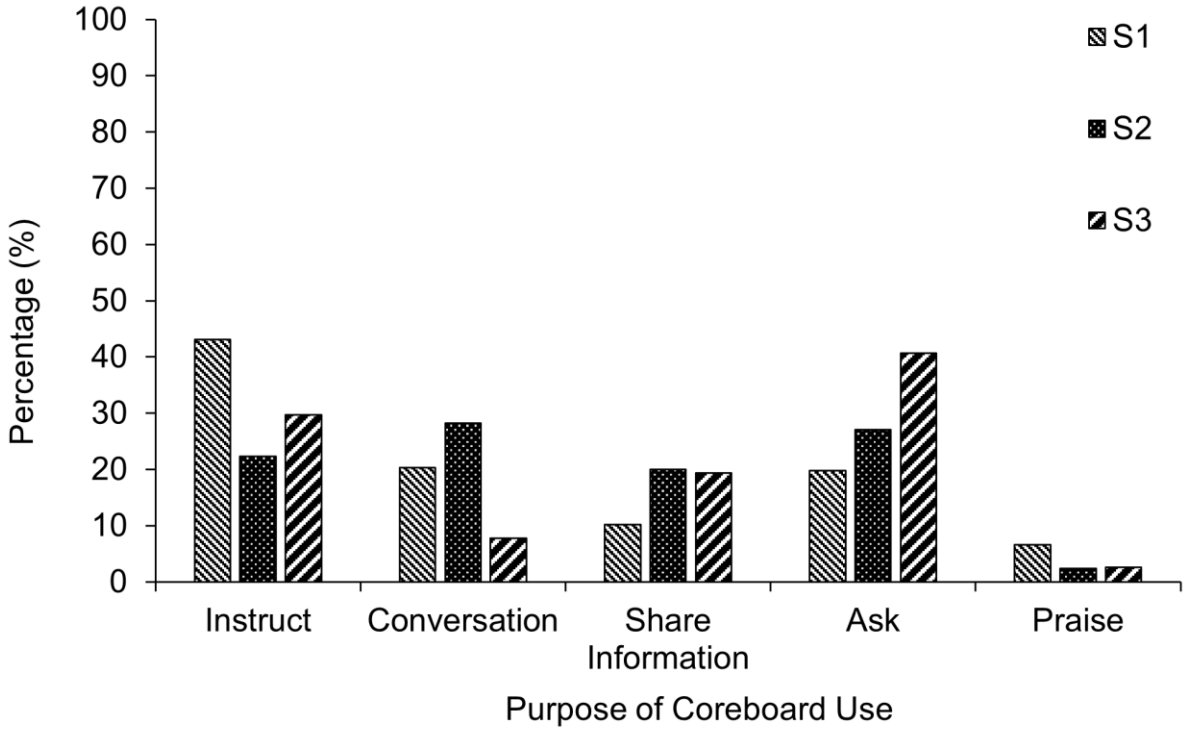
In comparison to the teacher’s intended purpose of using the coreboards, which are an AAC device, it is mainly for the teachers use as a system for themselves to communicate with the students, to encourage students to communicate diversely rather than the repetition of words or phrases, and to help the students understand the message the teachers are communicating. Although the intention is for coreboards to be used as a system for the student participants to communicate, specifically to independently communicate and to respond appropriately using the core vocabulary on the coreboard, the student participants independently initiated use less than 3% of the time. Therefore, it cannot be concluded that they use it for independent communication. The coreboards are set up to remain by the side of the teachers, which may not support initiations by students or independent communications. This is supported by the teacher’s comments in the interview that high-tech devices are useful for students not having to move to a teacher, or a teacher not having to move to a student, to communicate (see Table 5).

Adult Participant’s Purpose of Coreboard Use

In the next section, I will present the purpose of coreboard use by the adult participants to the student participants depicted in Figure 3 and the purpose of coreboard

use by the teacher to the class depicted in Figure 4. None of the class interactions is included in the adult Participants purpose of coreboard use to student participants.

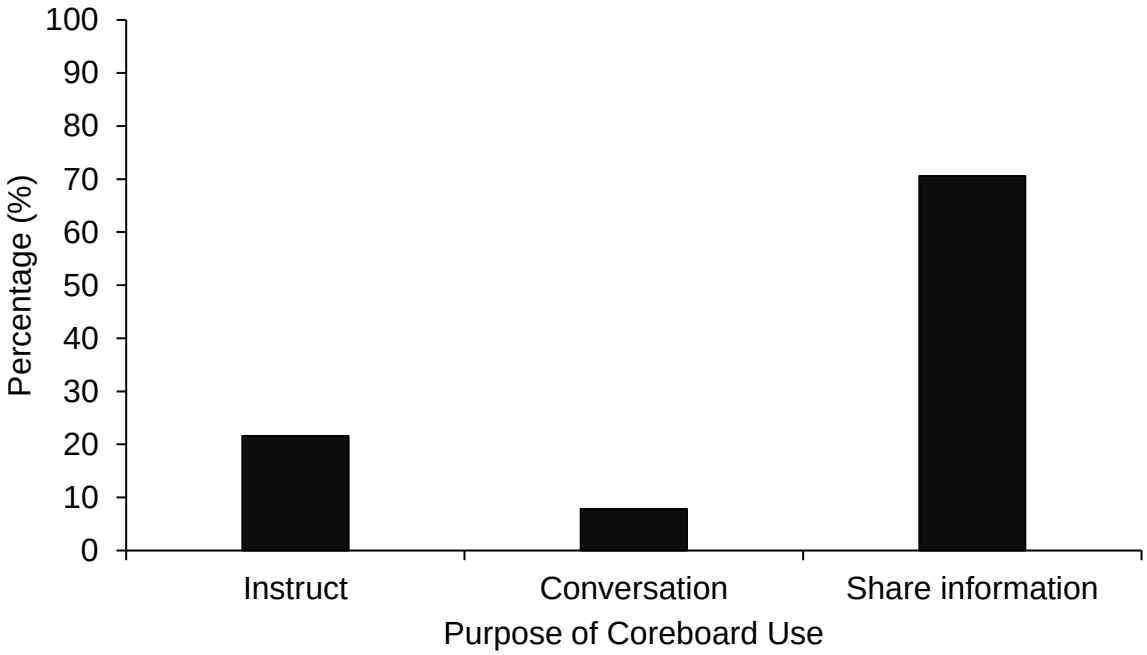
Figure 3
Adult Participants Purpose of Coreboard Use to Student Participants



From the observations, the highest percentage for the purpose of the coreboard use by adult participants to the student participants was *instruct* for S1, *conversation* and *ask* for S2, and *ask* for S3 at 43%, 28% and 27%, and 41% respectively. The lowest was *praise* for all the students with 7% for S1, 2% for S2, and 3% for S3. The second lowest for each student was *conversation* for S3 at 8%, *share information* for S2 at 20%, and *conversation* as well as *ask* for S1 is around 20%.

Figure 4

Teacher Purpose of Coreboard Use to the Class



The teacher mainly used the coreboards with the class to *share information* (71%) and sometimes to *instruct* (22%), or to have a *conversation* (8%).

The findings from Figure 3 and 4 show the adult participants used the coreboard for telling the students what the teachers want (*instruct*), to ask questions (*ask*), and for *conversation* which is what the teacher stated they used them for (see Table 5). However, they also used them to *share information* and *praise* the students.

When using the coreboard to initiate to the class, it was usually to state routines and to tell the class what was about to happen that day. When the adult participants used the coreboard for the students individually, the main purpose of the coreboard use differed between the student participants. S1 and S3 have a main purpose of the coreboard use, for S1 it is *instruct* and for S3 it is *ask*. For S2, the percentage of the purpose of coreboard use is more equally spread across the different purposes rather than having an elevated percentage for one purpose like with S1 and S3. This suggests that there mainly is a need to use the coreboard to communicate instructions for S1 and to ask S3 questions, but the

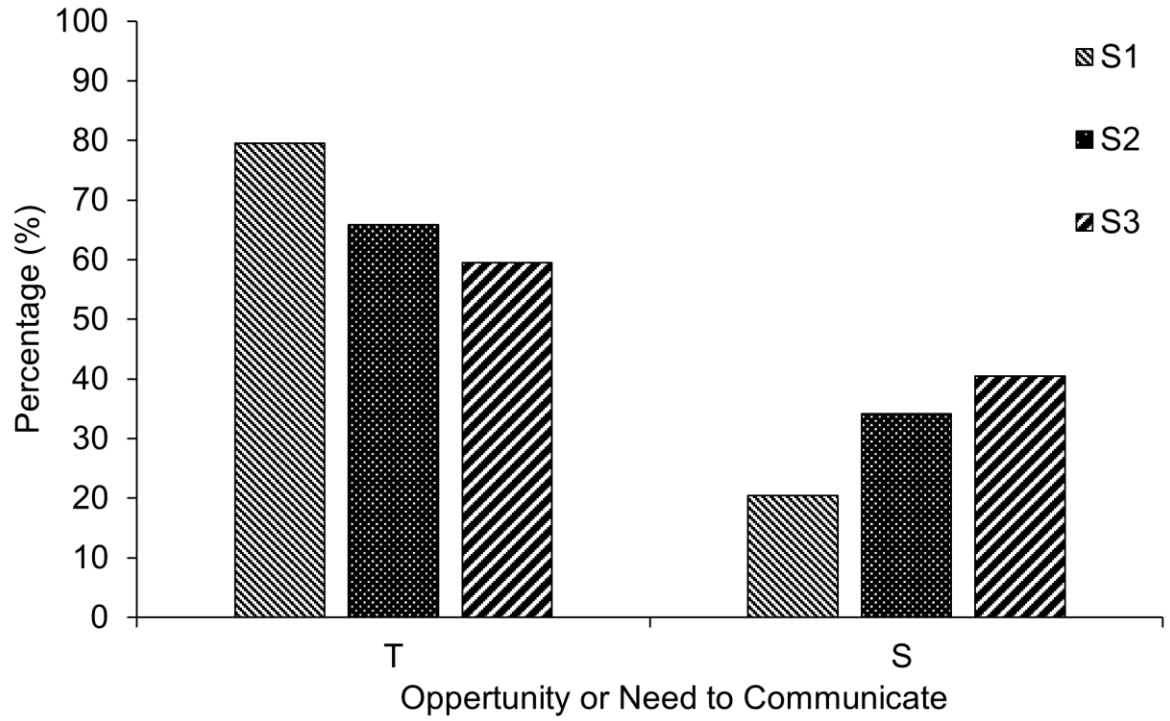
coreboard can be used to communicate a variety of purposes for S2. If S1 and S3 respond appropriately to their main purpose of the coreboard use then there is a need to communicate with that purpose for them, if not then the percentage could be elevated due to repeated use of the coreboard from them not responding appropriately.

Participants Opportunity to Communicate

In this section, the percentage of the adult participants need to communicate or to provide the students to communicate will be presented.

Figure 5

Percentage of Adult Participants Need to Communicate or them Providing the Opportunity for the Students to Communicate



The adult participants gave the student participants the opportunity to communicate 20% of the time for S1, 34% of the time for S2, and 41% of the time for S3 compared to when they used the coreboard to communicate 80% of the time for S1, 66% of the time for S2, and 59% of the time for S3.

The intended purpose of encouraging student participants to have communication diversity is shown by the adult participants providing opportunities for the students to communicate. The coreboards were used to have a *conversation* with S2 the most and S3 the least while the adult participants provided S3 with the opportunity to communicate the most and S1 the least.

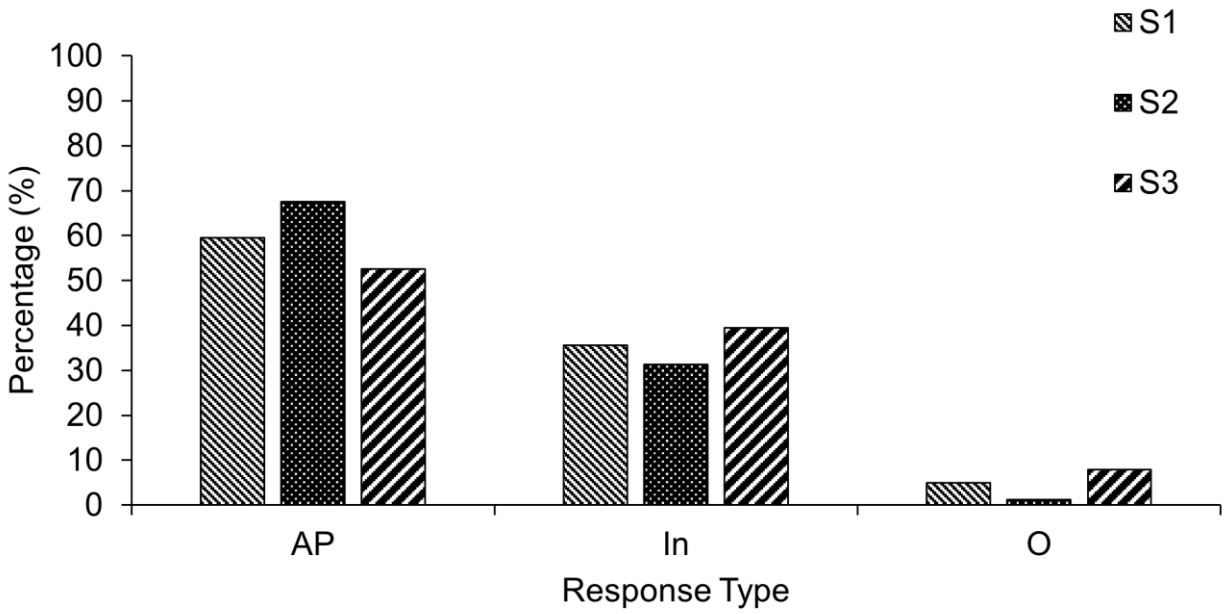
As the purpose of encouraging communication diversity is directed at echolalia (see Table 5), it is interesting to see that S3 was provided with the opportunity to communicate twice as much as S1 even though S1 and S3 have a similar number of interactions (S1= 169, S2= 163) and S3 is non-vocal with a high-tech device for them to communicate.

Student Participants Response Type

In this section, I will present the data for the appropriate (AP), inappropriate (IN), or no opportunity to respond (O) response type from the student participants to the adult participants coreboard use in Figure 6 as well as the AP, IN, and O response type from student participants across the adult participants purpose of coreboard use in Figure 7.

Figure 6

Student Participants Response Type to Adult Participants Initiation or Prompt

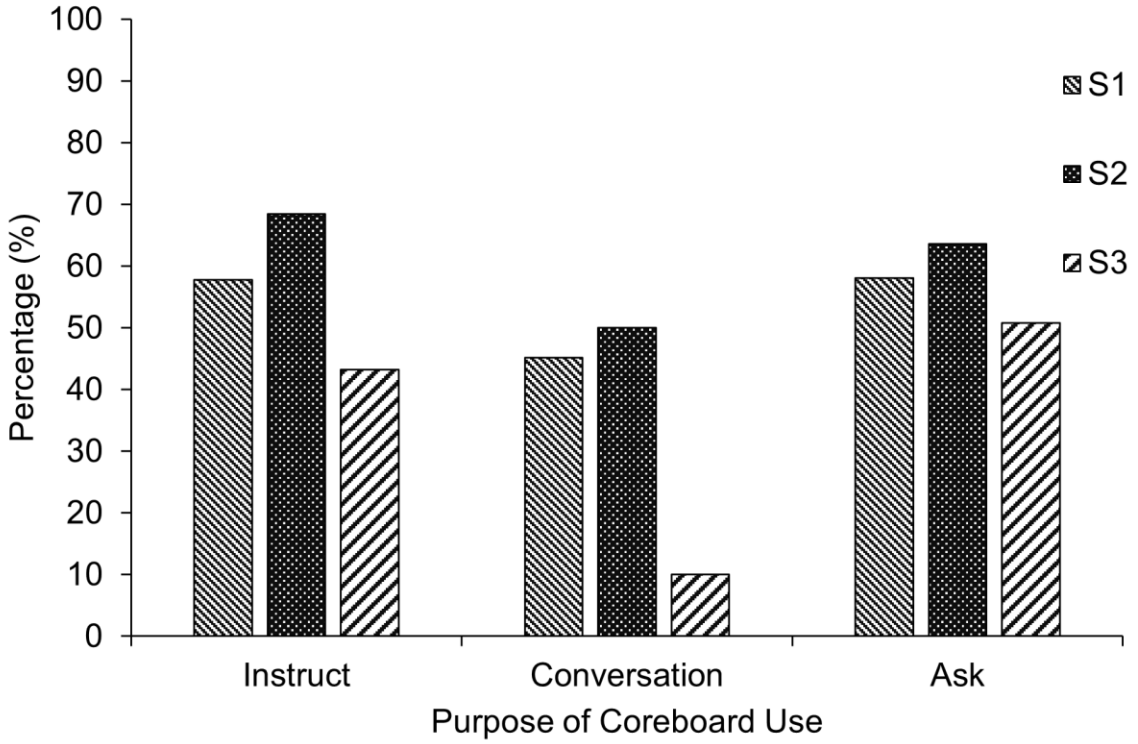


Participant S1 is responding appropriately 60% of the time, inappropriately 36% of the time, and had no opportunity to respond 5% of the time. Participant S2 is responding appropriately the majority of the time at 68%, inappropriately 31% of the time, and had no opportunity to respond 1% of the time. Participant S3 is responding appropriately about half the time at 53%, inappropriately 39% of the time, and had no opportunity to respond 8% of the time.

According to Skinner (1957, 1974), a listener understands the speaker if they can repeat what the speaker said, respond appropriately to the speaker, or know about the controlling variables. If the student participants are not responding appropriately, they may not understand the function of the communication. Reviewing the percentage of appropriate responses over the purpose of the coreboard use would be able to indicate if the student participants have an understanding of the purpose of the communication.

Figure 7

Student Participants Appropriate Response Percentage across Adult Participants Purpose of Coreboard Use



Note: Share information and Praise were excluded as the definition defined a no response (NR) to them to always be appropriate, and O was excluded

When adult participants used the coreboard to *instruct*, S1 responded appropriately 59% of the time, S2 responded appropriately 68% of the time, and S3 responded appropriately 43% of the time. When the coreboard was used to have a *conversation*, S1 responded appropriately 45% of the time, S2 responded appropriately 50% of the time, and S3 responded appropriately 10% of the time. Lastly, when the coreboard was used to *ask*, S1 responded appropriately 58% of the time, S2 responded appropriately 64% of the time, and S3 responded appropriately 51% of the time.

The success rate of S1 responding appropriately to *conversation* at 45% would indicate that it is not a useful method to encourage communication diversity about half the time. Also, S1 may not always understand the purpose of the coreboard use for *conversation*

if he is not responding appropriately the majority of the time. S1 is responding appropriately nearly 60% of the time to *instruct* and *ask* which indicates using it for these purposes is effective some of the time. However, it cannot be concluded for S1 that the use of a coreboard is an effective means for him to follow instructions.

Coreboards are a useful tool for S2 as he is responding appropriately the majority of the time to coreboard use by the adult participants for *instruct* and *ask*, but not effective for *conversation* as he is responding appropriately about half the time, he may not understand the purpose of the coreboard use for *conversation* if he is not responding appropriately majority of the time. For S2, it could be concluded that using the coreboard to *instruct* and *ask* is more effective than *conversation*.

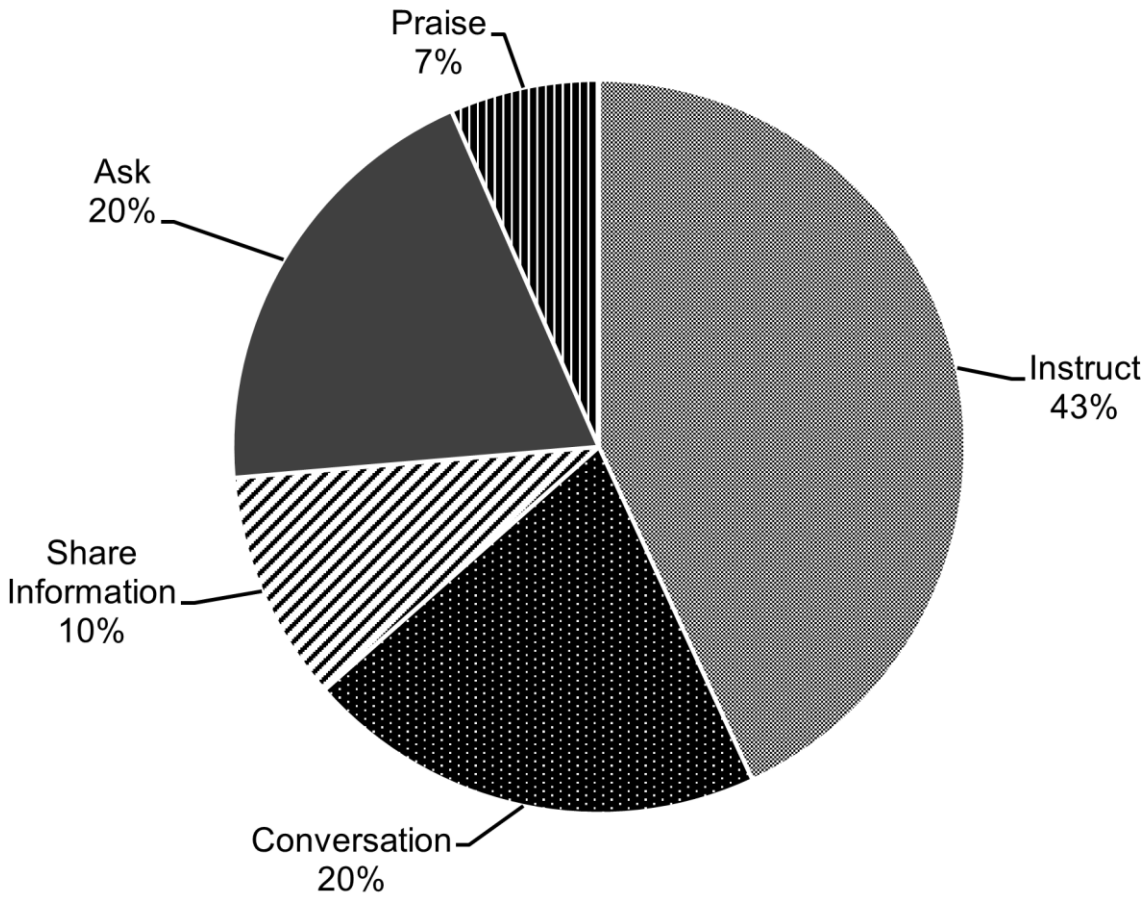
Furthermore, S3 is responding appropriately less than half the time to *instruct*, about half the time for *ask*, and only responding appropriately at 10% to *conversation* which indicates that coreboards are not effective for *instruct* or *ask* for S3, and *conversation* is not effective or useful. As S3 is not responding appropriately the majority of the time for *instruct* and *ask*, he may not understand the purpose of the coreboard use for them. For *conversation*, it can be concluded that he does not understand the purpose of the coreboard use or does not know how to respond appropriately as the appropriate responding is only 10% of the time.

Adult Participants Coreboard Use with Student Participants

In this section, the adult participants purpose of the coreboard use will be shown for the individual student participant rather than comparing the student participants to each other (see Figure 8, 9, and 10). Also, the instances of the student participants not having an opportunity to respond to the coreboard use by the adult participants will be discussed in more detail.

Figure 8

Adult Participants Purpose of Coreboard Use with S1



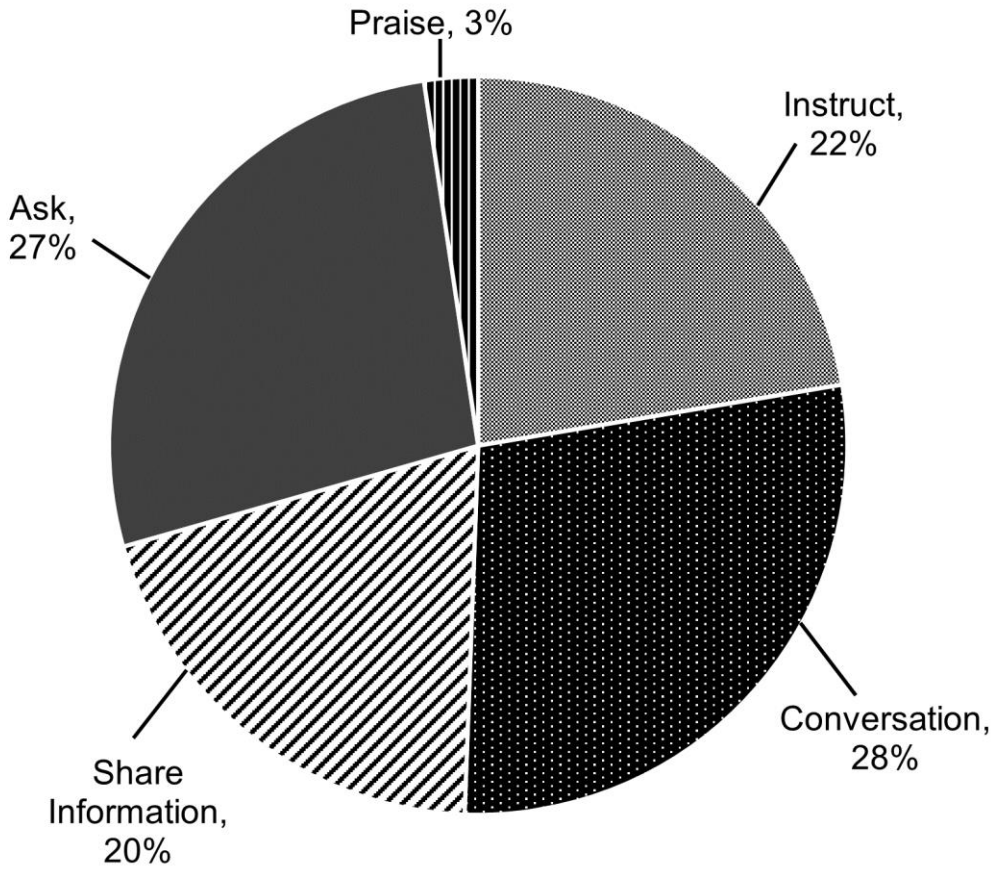
With S1, the adult participants most frequent use of the coreboard was to instruct. S1 did not have an opportunity to respond (O) to some instructions because someone either completed the action for him (see Appendix J Table J2, J3, and J7) or they initiated the response for him (see Appendix J Table J3 and J5). The coreboard was used the same amount of time for *ask* and *conversation*. Another no opportunity to respond (O) for S1 was to an *ask* due to P partially blocking the core vocabulary on the coreboard and S1 was trying to point to an option that was blocked (see Appendix J Table J4). S1 also did not have an opportunity to respond to a *conversation* because P moved away from S1 quickly. There was one instance where S1 tried to use a coreboard by going through the fringe words but a

learning support assistant was holding the board so he could not go through them and instead S1 turned back around in his seat (see Appendix J Table J3).

Field Notes. After the interview with the teacher, in one of the observing sessions, the teacher said participant S1 had training by using a few core words on the back of the coreboard before using the actual coreboard.

Figure 9

Adult Participants Purpose of Coreboard Use with S2

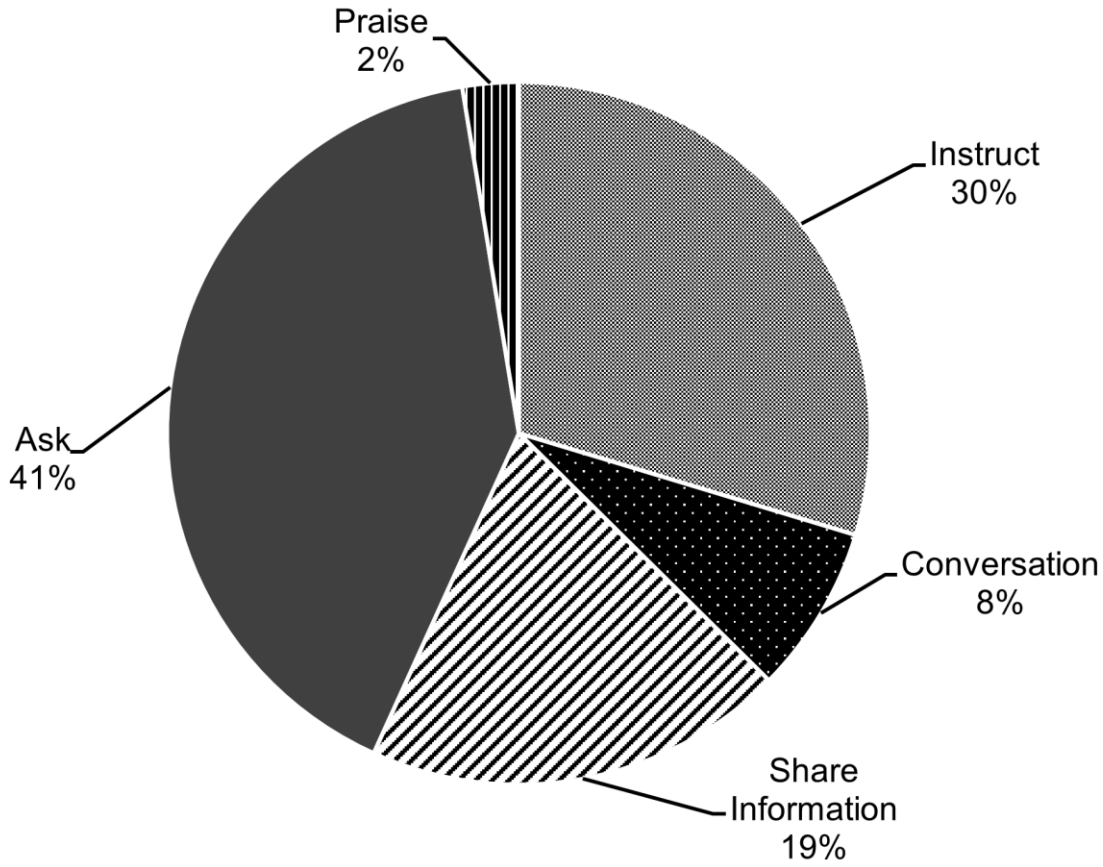


With S2, the adult participants most frequent use of the coreboard was split closely between having a conversation, asking a question and instructing. There was one instance where S2 did not have an opportunity to respond (O) to a *conversation* because the coreboard was taken away when S2 did not respond immediately after the coreboard use (see Appendix J Table J6). The adult participants using the coreboard relatively equally

across the different purposes could suggest that S2 could understand the purpose of the coreboard use as there is not a need to communicate a purpose moreover any others.

Figure 10

Adult Participants Purpose of Coreboard Use with S3



With S3, the adult participants most frequent use of the coreboard was to *ask*, followed by *instruct*. S3 did not have an opportunity to respond (O) to some instructions because someone either completed the action for him (see Appendix J Table J4), they initiated the response for him (see Appendix J Table J3, J4, J6 and J7) or they blocked him from responding (see Appendix J Table J6). S3 did not have the opportunity to respond to an *ask* because P physically assisted S3 from behind to tap “finished” immediately after he initiated and the coreboard was taken away (see Appendix J Table J4). This was because prior to this interaction, S3 was responding inappropriately to a question and he was initiating without the adults understanding what the purpose was. S3 was tapping the core vocabulary “who”, “no”, “what”, “when”, and “where” when initiating and it is unclear if he may

have been scanning or stimming, or something else. He also did not get an opportunity to respond to having a *conversation* because H moved on quickly to the next interaction (see Appendix J Table J4).

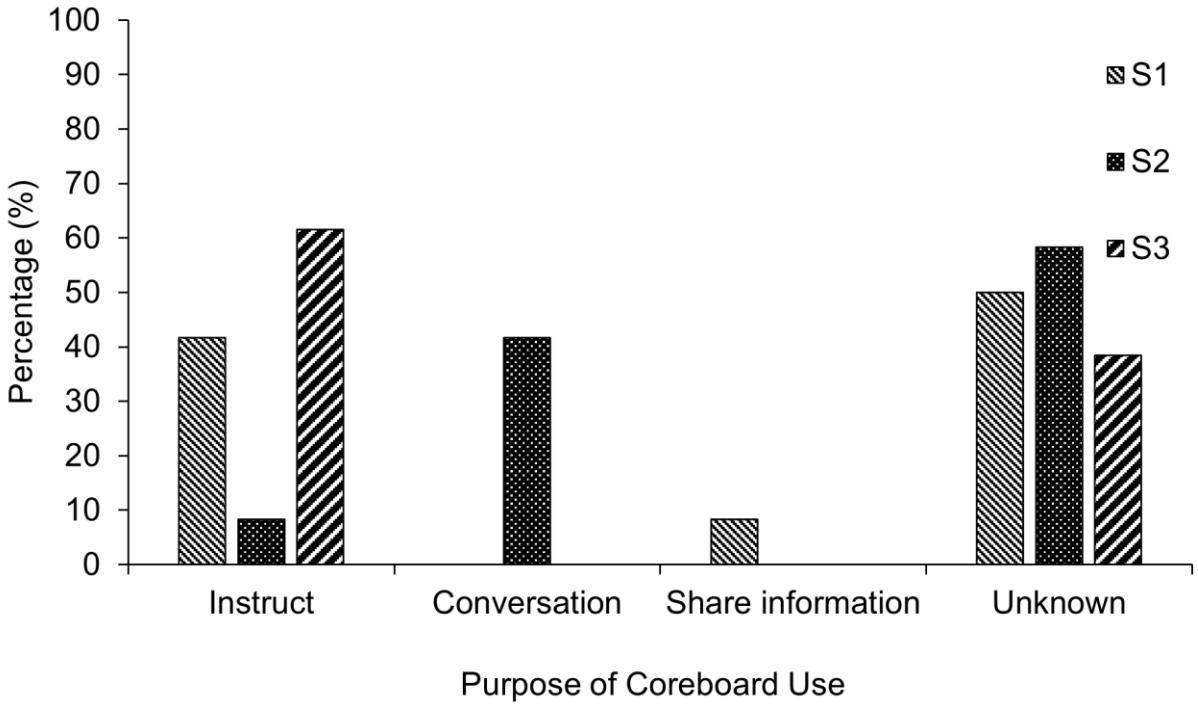
A reason for appropriate responses not being high could be that the student participants might not always know what the purpose is from the use of the coreboard from visuals alone as the same core word/ picture can be used for multiple different purposes (i.e., *instruct*, *conversation*). Also, if they have issues with noise sensitivity then a teacher vocally stating their message may not be helpful for the student to understand them or the purpose of their message as they may not be able to hear them clearly, or too much auditory stimuli could cause a sensory overload (Remington & Fairnie, 2017). A visually similar device to the coreboard is PECS, which is also a visual support AAC, which in the first phase teaches the child (or person in need of it) to mand, and in phase six teaches them to differentiate between wanting, seeing, and feeling through the students being taught to comment in response to questions (Pyramid Educational Consultants, n.d.). PECS is attributed to potentially being an effective tool to teach autistic individuals functional communication because of its key features of concrete visuals and preferred reinforcers to reinforce their functional verbal behaviour (Hart & Banda, 2010). Providing a way to follow the same training as PECS and having a focus on functional communication could teach the student participants the functions of communication and differentiate between them.

Student Participants Purpose of Coreboard Use

In this section, the student participants purpose of the coreboard use will be examined and the latency of the adult participants responses are briefly mentioned.

Figure 11

Student Participants Function of Coreboard Use to Adult Participants



For all student participants, the purpose of the coreboard use was *unknown* for approximately half the time which portrays that coreboards are not useful for them to communicate (S1=50%, S2=58%, S3=38%). S1 used the board to *instruct* 42% of the time and *share information* 8% of the time. S2 used the board to *instruct* 8% of the time and to have a *conversation* 42% of the time. The only other purpose S3 used the coreboard for was for *instruct*, at 62% of the time.

These findings are relevant to the intended purpose of giving non-vocal students the ability to independently communicate and to communicate what they want from the teachers. If the adult participants do not know the function or purpose of the coreboard use by the students, they will not reinforce them as a speaker as the adult participants will not be able to respond appropriately. In addition, if the student participants are not reinforced through social mediation, then they will struggle to gain the role of a speaker which is similar to the results from the study conducted by Calculator and Dollaghan (1982). From this, it can be concluded that coreboards do not facilitate being able to differentiate between the

communication act by the purpose as a symbol, such as car, could be interpreted as an instruction, labelling something in the environment, or they are using the symbol to start a conversation. As discussed previously, providing concrete visuals to differentiate between the purposes of communication could assist with understanding the message of the person initiating, for example the symbols I want, I see, and I feel. Understanding the purpose of the student's communication and responding appropriately is needed to reinforce them as a speaker and could encourage the students to independently initiate with the coreboard more.

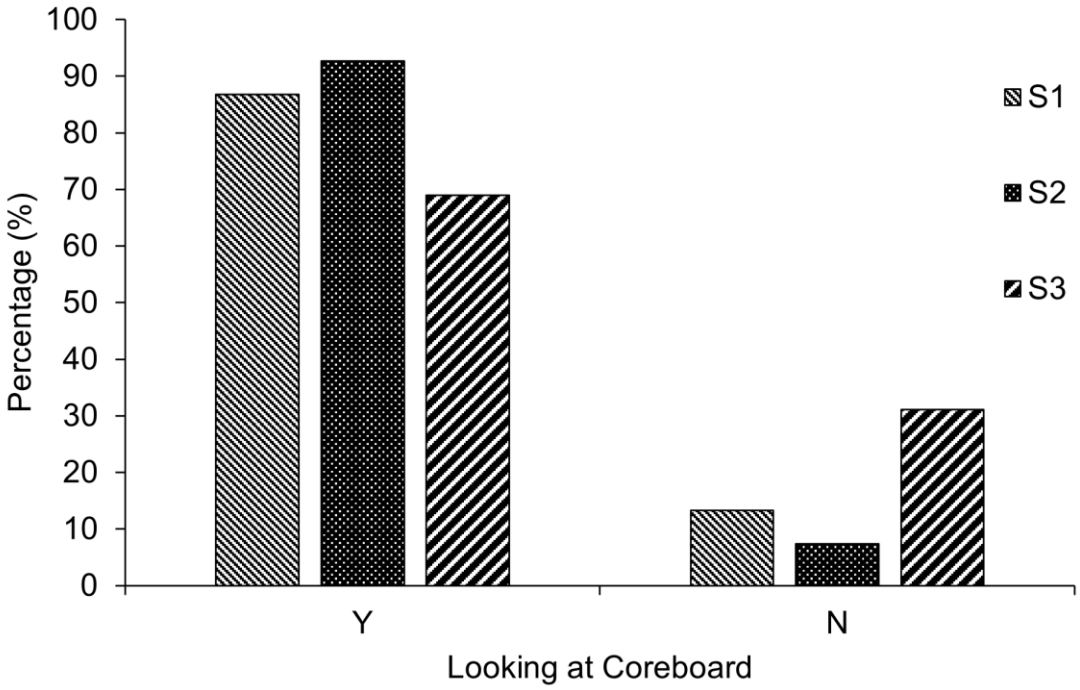
All of the adult participants responded to the student participants within five seconds with the exception of an instance with S2 where the interaction was interrupted by P before H could respond. All of the adult participants responded appropriately to the student participants with the exception of a learning support assistant preventing S1 from initiating with the coreboard by holding the fringe words down so he could not go through them.

Participants Looking or Not Looking at Coreboard

Figure 12 depicts whether the student participants were looking at the coreboards or not during an initiation or prompt.

Figure 12

Student Participants Looking at the Coreboard during Initiations and Prompts



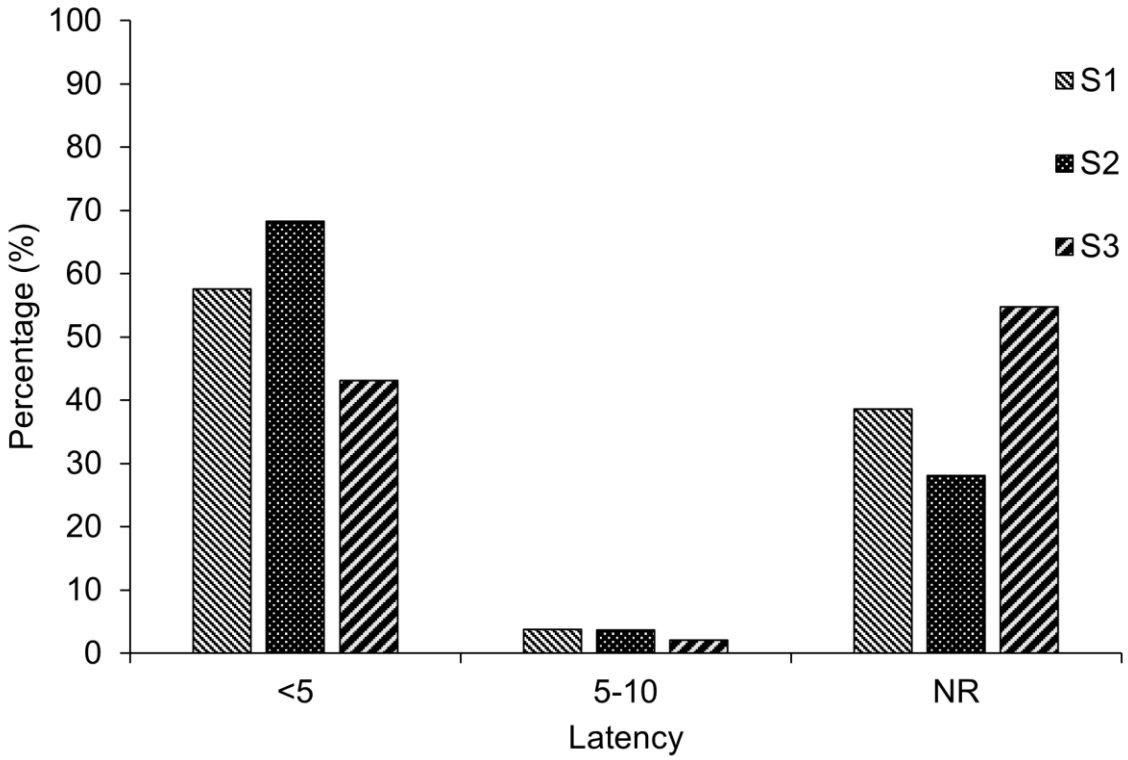
Of the adult participants initiations or prompts, the student participants were looking at the coreboard the majority of the time with S1 at 87%, S2 at 93%, and S3 at 69%. The adult participants always looked at the coreboard when the students initiated.

Student Participants Latency to Adult Participants Initiation or Prompt

Figure 13 depicts the latency of student participant responses to the adult participants initiation or prompt.

Figure 13

Latency of Student Participants Responses to the Adult Participants Initiation or Prompt

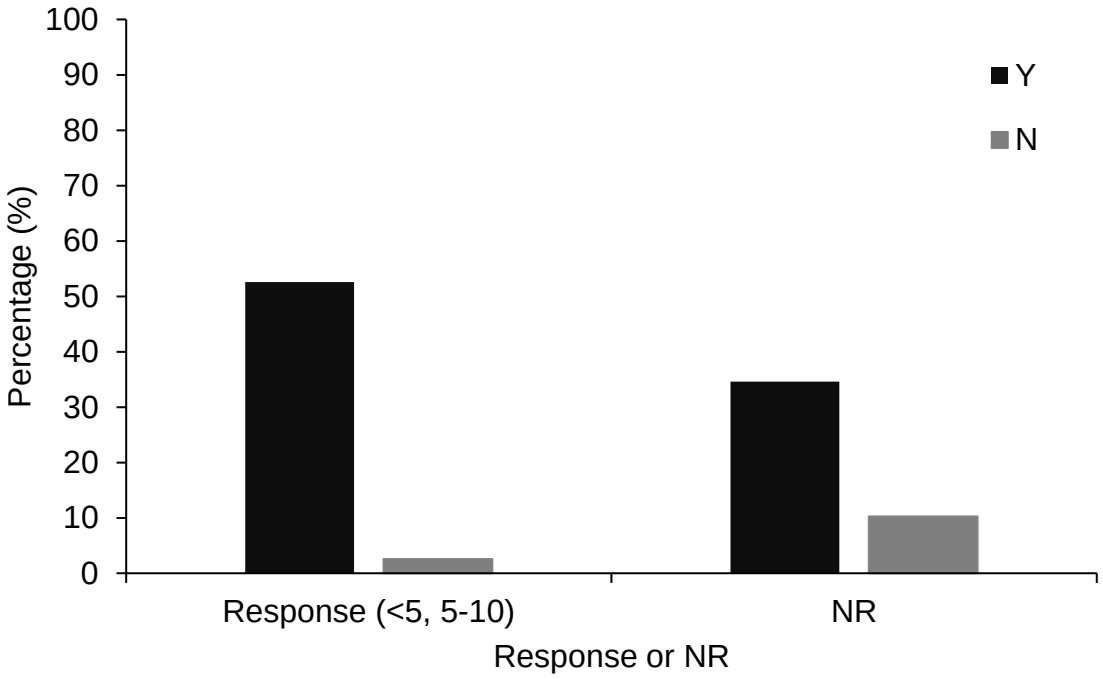


S1 and S2 responded within the first five seconds of the coreboard use by an adult participant the majority of the time at 58% and 68% respectively, while S3 responded less than half the time at 43%. The student participants responded to the latency of five to ten seconds less than 5% of the time for each participant (S1=3%, S2=4%, S3=2%). This shows that majority of the time, the participants either responded within the first five seconds or did not respond. The less than five seconds latency could be elevated because it was typical practice for the adult participants to repeat the initiation of coreboard use more than once and the latency started at the latest coreboard use.

Student Participants Looking at Coreboard and Latency

In this section, the student participants response or no response is compared to when they were or were not looking at the coreboard.

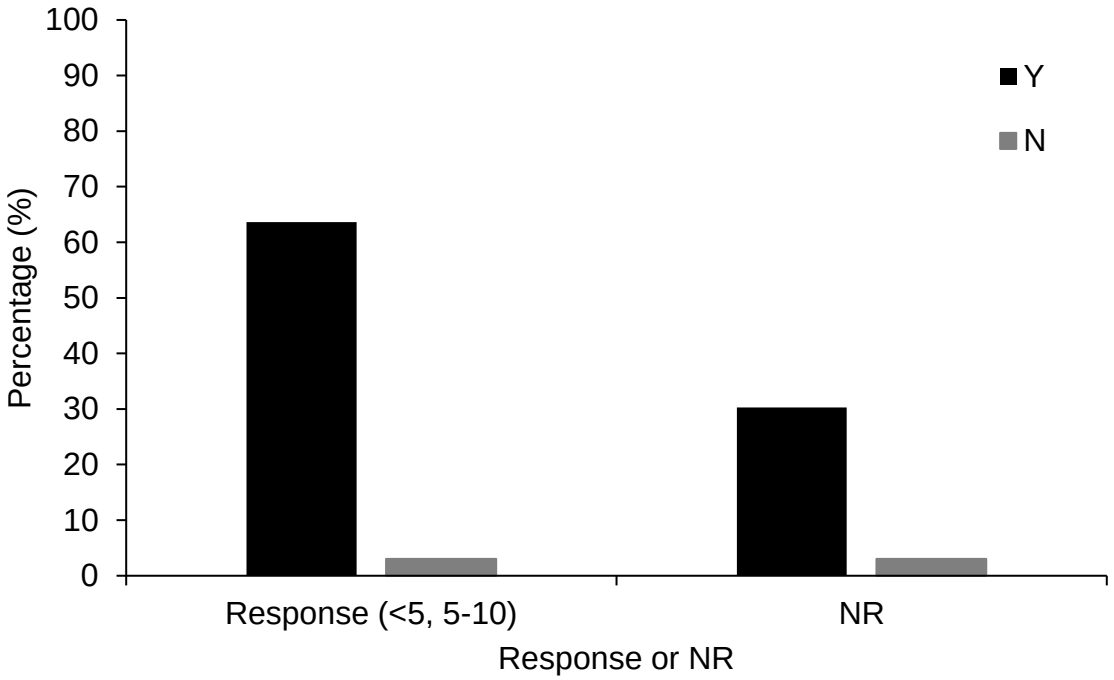
Figure 14
S1 Responding or Not Responding when Looking or Not Looking at Coreboard



S1 looked at the coreboard and responded 53% of the time and did not respond 35% of the time. S1 did not look at the coreboard but did respond 3% of the time and did not respond 10% of the time. S1 is looking at the coreboard more often than not but is only responding when looking about half the time. S1 not looking at the coreboard is not an explanation for S1 not responding, but not looking at the coreboard would impact his ability to respond sometimes.

Figure 15

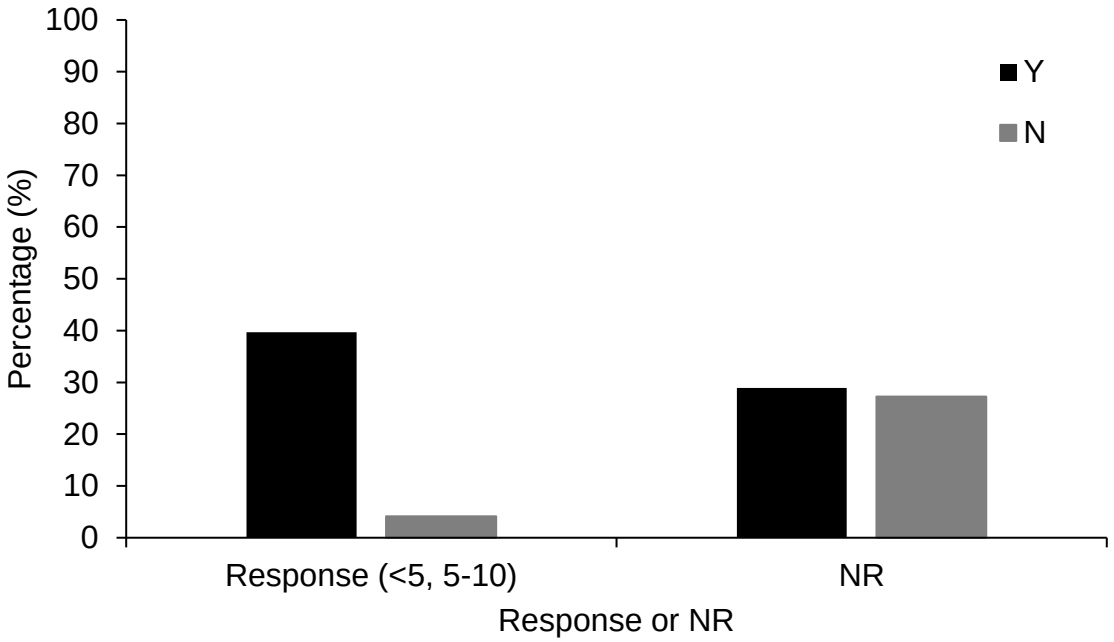
S2 Responding or Not Responding when Looking or Not Looking at Coreboard



S2 looked at the coreboard and responded 64% of the time and did not respond 30% of the time. He did not look at the coreboard but responded 3% of the time and did not respond 3% of the time. S2 is looking at the coreboard more often than not but is not responding when looking at the coreboard nearly a third of the time. S2 not looking at the coreboard and not responding is at about 7% less than S1 which could indicate if S1 was looking at the coreboard he may respond about 5% more often.

Figure 16

S3 Responding or Not Responding when Looking or Not Looking at Coreboard



S3 looked at the coreboard and responded 40% of the time and did not respond 29% of the time. S3 did not look at the coreboard but responded 4% of the time and did not respond 27% of the time. S3 is looking at the coreboard more often than not, but when he responds when looking is a similar percentage to not responding when looking. This portrays that it is important for S3 to look at the board for him to respond as he has a higher percentage of not responding when not looking at the coreboard compared to S2 and S1. If all the student participants are not responding about a third of the time when looking at the board then about a third of the time the coreboard is not effective in facilitating a response.

Strengths

The use of the coreboards may assist in instructing the student participants, however, as there is no comparison data with instructions without the coreboards use it is possible for the students to have a similar response rate to instructions without coreboard use. S2 is the only student participant to use the coreboard with the purpose to have a

conversation and it is his primary purpose to communicate. S1 and S3 primary purpose to communicate with the coreboard is to *instruct*.

Limitations and future research

The main limitation of this study is that it is a descriptive study with no comparison data for non-coreboard communication with the participants. Without data for non-coreboard communication, it cannot be determined if the student participants respond appropriately at the same rate as if the coreboard is used. Future researchers could overcome this limitation by collecting comparison data between communication with and without the coreboard. Another limitation is not knowing if the student participants are able to functionally communicate and if they know communication can be used for a purpose. Future research could investigate the comparison of using coreboards for communication to non-coreboard communication. Also, how coreboards are used in other practical settings and if there are prerequisites needed to be able to use coreboards.

Summary

Coreboards were being used by the adult participants 92% of the time which conveys that coreboard use does not promote independent communication for these student participants as they were initiating use of the coreboard less than 3% of the time. This could be because the adult participants are unable to respond appropriately to the student participants initiations when they do not know the purpose of the initiations which leads to the communication act being unsuccessful and the student participants not being reinforced to initiate. As the student participants are responding appropriately some of the time to the adult participants using the coreboard, it can work to communicate the adult participants message and potentially assist with receptive language skills, but this cannot be confirmed due to not having comparison data to non-coreboard communication.

The teachers use the coreboards for their intended purpose of communicating instructions quickly and easily to the students, of asking questions, and having a

conversation. They also use it to *share information* and *praise* the students. Similarly, coreboard use is used for the intended purpose of the student to understand the communicative message and to respond appropriately as well as to encourage communication diversity rather than the repetition of words or phrases. However, the students do not independently use the coreboard for the intended purpose of communicating with the teachers as the individual initiations of the coreboard for each student participant was less than 3%. They are also not for students to communicate with the teachers because about half the time for S1 and S2, and just under half the time for S3, the purpose of the coreboard use is unknown.

Coreboards are a useful tool for the teachers to use with the S2, but they are not a useful tool for the S1 and S3 because they are not responding appropriately to the adult participants purpose of the coreboard use majority of the time. A change that could improve appropriate responses are having concrete visuals to differentiate between the different purposes of coreboard use to prevent any confusion about the message from the initiator of the coreboard to the person receiving the message. Lastly, the effectiveness of coreboards differed across purposes of coreboard use and student participants with it being more effective for S2 than S1 and S3. Also, the student participants are not responding when looking at the board then about a third of the time which suggests that coreboard use is not effective about a third of the time.

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Appendices

Appendix A: School Information Sheet

Associate Professor Angelika Anderson
School of Psychology
The University Waikato
Phone: 07 838 4466 ext 9209
Email: angelika.anderson@waikato.ac.nz

Ainsley Oldfield
Phone: 0220719506
Email: ao91@students.waikato.ac.nz

Dear (Principal's name / name of school)

We would like to request your permission to conduct a research project at your school. This project will be conducted by Ainsley Oldfield, under the supervision of Associate Professor Angelika Anderson from the Faculty of Arts and Social Science at the University of Waikato. It is part of the requirement for completing Ainsley's Master's in Psychology at the University of Waikato. Please read this information sheet in full before making a decision.

What does the research involve?

This main purpose of the study is to describe the use of coreboards in schools with children with developmental disabilities with a particular focus on the independent use of coreboards by students to achieve specific purposes. We are interested in this study, because to date little is known about the use of coreboards with students with developmental disabilities. Finding out more about how coreboards are used may help inform future best practice. The project will involve direct observations of the use of coreboards by students and their teachers in the school environment. In addition, teachers will be asked to participate in a brief interview (20-30 minutes) to tell us about their views and knowledge of coreboards. Provided everyone concerned consents to this I may also video record some sessions. Alternatively a second observer will be present for 20 – 30% of the observation sessions to collect reliability data. The study is not expected to exceed six weeks.

Who we are looking for

We aims to recruit between one and three students with a developmental disorder, and who regularly use coreboards, and their teachers.

If you agree to permit us to conduct this research within your school, we would like your help in recruiting these participants either by allowing us to post posters in appropriate places inviting the parents of potential student participants to volunteer their children, or by identifying those teachers who regularly use coreboards, and who might be interested in participating. Potential participants (both, teachers and students / the students' parents) will be provided with information sheets and consent forms. Throughout this process I will be available to answer any questions by phone, email, or in face to face meetings.

Results

The results will be presented within my Master's thesis. They may also be presented in the form of a peer reviewed journal article and / or conference presentation. If requested, a summary of the report can be prepared and sent to you and any other interested participant once I have finished my thesis.

Confidentiality

While participation is not anonymous as we will know who the participants are, participation in this project will remain confidential and we will not disclose identifying information to anyone. We will assign each participant and the school with codes or pseudonyms (fake names), so that the data collected is not linked to names to protect the confidentiality of the participants. When the data is presented in reports, presentations, or publications, neither the participants nor the school will be identifiable.

Storage of Data

At the end of the project all of the data will be given to my supervisor to be stored on a password-protected University drive for five years. Only the researchers will have access to the data. At the end of the storage period, the data will be destroyed by deleting the electronic files.

Right to Withdraw

Participating in this project is voluntary and no one is under any obligation to consent to participate. Even after consent is given, participants have the right to withdraw at any point in time, without explanation. This includes the withdrawal and destruction of information and data collected, up until 2 weeks after participation has been completed in the project.

What happens now?

If you are happy for me to conduct this project in your school, please send me a letter or e-mail giving permission for this project to be conducted at your school. You can also contact me via the phone number or email address at the top of this information sheet if you have any further questions. I am also happy to meet with you if you in person if you would like to discuss the project further.

This research project has been approved by the Human Research Ethics Committee (Health) of the University of Waikato. Any questions about the ethical conduct of this research may be sent to the chair of the committee (humanethics@waikato.ac.nz).

Appendix B: Teacher information sheet

Associate Professor Angelika Anderson
School of Psychology
The University of Waikato
Phone: 07 838 4466 ext 9209
Email: angelika.anderson@waikato.ac.nz

Ainsley Oldfield
Phone: 0220719506
Email: ao91@students.waikato.ac.nz

Participant information sheet (Teachers)

You are invited to take part in a research project conducted by Ainsley Oldfield, under the supervision of Associate Professor Angelika Anderson from the School of Psychology at the University of Waikato. This project is part of the requirement for completing my Master's in Psychology at the University of Waikato. Please read this information sheet in full before deciding whether or not to participate in this research. If you would like further information about this project, please contact us via the phone numbers or email addresses above.

What does the research involve?

This main purpose of the study is to describe the use of coreboards in schools with children with developmental disabilities with a particular focus on the independent use of coreboards by students to achieve specific purposes. We are interested in this study, because to date little is known about the use of coreboards with students with developmental disabilities. Finding out more about how coreboards are used may help inform future best practice. The project will involve direct observations of the use of coreboards by students and their teachers in the school environment. In addition, teachers will be asked to participate in a brief interview (20-30 minutes) to tell us about their views and knowledge of coreboards. Provided everyone concerned consents to this I may also video record some sessions. Alternatively a second observer will be present for 20 – 30% of the observation sessions to collect reliability data. The study is not expected to exceed six weeks.

Who we are looking for

This project aims to recruit between one and three students who have a developmental disorder, have opportunities to use coreboards and have been taught/ encouraged to use coreboards, and the teachers who work with these students and commonly use coreboards.

Teacher involvement

At the start of this project you will be invited to take part in a 20-30 minute interview with me about your thoughts and opinions on coreboards as well as what training or experience, if any, you had on how to use them. With your permission this interview will be audio recorded. I will transcribe the interview and you will have the opportunity read this and edit the transcription to ensure that it correctly represents what you said.

I will also engage in regular unobtrusive observations in the classroom and at recess. The focus of these observations will be your interactions with the participating student(s). The time and duration of these observations will be discussed with you and the school, to ensure

that we choose times that are acceptable and suitable to you and the participating student(s). Provided that both you and the student's parent consent we may video record some session to facilitate interobserver agreement assessments. Alternative a second observer will accompany me for about 20 – 30 % of the observation sessions for reliability checks.

Student involvement

Participating students will be observed at the same time, during school hours as negotiated with you.

Results

The results will be presented within my Masters thesis. They may also be presented in the form of a peer reviewed journal article and / or conference presentation. If requested, a summary of the report can be prepared and sent to you, the participating students' parents, and the school, once I have finished my thesis.

Confidentiality

While participation is not anonymous as I will know who the participants are, participation in this project will remain confidential and I will not disclose identifying information to anyone. I will assign each participant and the participating school with codes or pseudonyms (fake names), so that the data collected is not linked to names to protect the confidentiality of the participants. When the data is presented in reports, presentations, or publications, neither the participants nor the school will be identifiable.

Storage of Data

After I have finished my thesis, I will give all of the data to my supervisor and it will be stored on a password-protected University drive for five years. Only the researchers will have access to the data. At the end of the storage period, the data will be destroyed by deleting the electronic files.

Right to Withdraw

Participating in this project is voluntary and you are under no obligation to give consent to participate. Consent is given by signing and returning the consent form to the researchers. By signing the consent form, you are giving consent participate in the study.

Even after consent is given, you have the right to withdraw at any point in time, without explanation. This includes the withdrawal and destruction of information and data collected, up until 2 weeks after participation in the project has been completed.

What happens now?

If you are interested in participating in this project, please sign the consent form and return it to me. I am available to answer questions at any time, and I am also available to arrange a time to meet with you if you would like to discuss the project further in person.

This research project has been approved by the Human Research Ethics Committee (Health) of the University of Waikato. Any questions about the ethical conduct of this research may be sent to the chair of the committee (humanethics@waikato.ac.nz).

Appendix C: Parent Information Sheet

Associate Professor Angelika Anderson
School of Psychology
The University of Waikato
Phone: 07 838 4466 ext 9209
Email: angelika.anderson@waikato.ac.nz

Ainsley Oldfield
Phone: 0220719506
Email: ao91@students.waikato.ac.nz

Participant information sheet (parents / guardians)

You or your child's teacher have suggested that your child is a suitable participant for a research project conducted by Ainsley Oldfield, under the supervision of Associate Professor Angelika Anderson from the School of Psychology at the University of Waikato. This project is part of the requirement for completing my Master's in Psychology at the University of Waikato. Please read this information sheet in full before deciding whether or not to agree for your child to participate in this research. If you would like further information about this project, please contact the researchers via the phone numbers or email addresses above.

What does the research involve?

This main purpose of the study is to describe the use of coreboards in schools with children with developmental disabilities with a particular focus on the independent use of coreboards by students to achieve specific purposes. We are interested in this study, because to date little is known about the use of coreboards with students with developmental disabilities. Finding out more about how coreboards are used may help inform future best practice. The project will involve direct observations of the use of coreboards by students and their teachers in the school environment. Provided everyone concerned consents to this I may also video record some sessions. Alternatively a second observer will be present for 20 – 30% of the observation sessions to collect reliability data. The study is not expected to exceed six weeks. We already have permission from the school to conduct this research at your child's school.

We are looking to recruit between one and three students who have been diagnosed with a developmental disability and have opportunities to use coreboards and their teacher(s).

As a part of this project, your child and their teacher will be observed during school hours in differing contexts and at different times deemed appropriate by the teacher. The following outlines what your child will experience if you choose for them to participate in this study:

Throughout the project, I will engage in regular, unobtrusive observations in the classroom or during recess. The student may realize they are being observed by an unfamiliar person. We will work hard to keep any disruption to a minimum.

Some sessions may be video recorded but only if all concerned consent to this. Alternatively, there will be some occasions when there will be two people observing your child.

Results

The results will be presented within my Masters thesis. They may also be presented in the form of a journal article and / or conference presentation. If requested, a summary of the report can be prepared and sent to you and the participating school, once I have finished my thesis.

Confidentiality

While participation is not anonymous as I will know who the participants are, participation in this project will remain confidential and I will not disclose identifying information to anyone. I will assign each participant and the participating school with codes or pseudonyms (fake names), so that the data collected is not linked to names to protect the confidentiality of the participants. When the data is presented in reports, presentations, or publications, neither the participants nor the school will be identifiable.

Storage of Data

After I have finished my thesis, I will give all of the data to my supervisor and it will be stored on a password-protected University drive for five years. Only the researchers will have access to the data. At the end of the storage period, the data will be destroyed by deleting the electronic files.

Right to Withdraw

Participating in this project is voluntary and you are under no obligation to give consent for your child to participate. Consent is given by signing and returning the consent form to the researchers. By signing the consent form, you are giving consent for your child to participate in this study.

Even after consent is given, you have the right to withdraw your child at any point in time, without explanation. This includes the withdrawal and destruction of information and data collected, up until 2 weeks after participation has been completed in the project. If your child longer wishes to participate in this project at any point in time, they will be allowed to stop. There will be no negative consequences for you or your child regardless of the choices you make.

What happens now?

If you agree for your child to participate in this project, please sign the consent form and return it to me. I am available to answer any questions you might have at any time. I am also happy to arrange a time to meet with you if you would like to discuss the project further.

This research project has been approved by the Human Research Ethics Committee (Health) of the University of Waikato. Any questions about the ethical conduct of this research may be sent to the chair of the committee (humanethics@waikato.ac.nz).

Appendix D: Teacher Consent Form

UNIVERSITY OF WAIKATO

DIVISION of ARTS, LAW, PSYCHOLOGY & SOCIAL SCIENCES

PARTICIPANT CONSENT FORM

[A completed copy of this form should be retained by both the researcher and the participant]

I understand that I can ask further questions about the research at any time during my child's participation. I am aware the findings from this research will be stored in a secure sever in Waikato University and will be published as a masters thesis.

When I sign this consent form, I give consent for the researcher to use the data collected for the purposes of the research outlined in the Information Sheet.

Please complete the following checklist. Tick [✓] the appropriate box for each point.	**YES**	**NO**
I have read the information sheet provided and understand it.		
I have been given sufficient time to consider whether or not to participate in this study.		
I understand that my participation in this study is confidential and that no material, which could identify me personally, will be used in any reports on this study.		
I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without penalty.		
I know who to contact if I have any questions about the study in general.		
I am satisfied with the answers provided about the study.		
I have the right to decline to participate in any part of the research activity.		
I understand that the information supplied by me could be used in future academic publications.		
I consent to allowing researchers to observe in the class and recess at agreed times.		
I consent to the video-recording of these observation sessions.		
I consent to participating in an interview at the start of the study.		
I consent to the interview being audio recorded.		

I understand that participation in this study is confidential and that no material, which could identify me or my child personally, will be used in any reports on this study.		
I have a copy of the information sheet and this consent form.		
I wish to receive a copy of the findings.		

Participant :		Researcher :	
Signature :		Signature :	
Date :		Date :	
Contact Details :		Contact Details :	

Appendix E: LSA Consent Form

UNIVERSITY OF WAIKATO

DIVISION of ARTS, LAW, PSYCHOLOGY & SOCIAL SCIENCES

PARTICIPANT CONSENT FORM

[A completed copy of this form should be retained by both the researcher and the participant]

I understand that I can ask further questions about the research at any time during my child's participation. I am aware the findings from this research will be stored in a secure sever in Waikato University and will be published as a masters thesis.

When I sign this consent form, I give consent for the researcher to use the data collected for the purposes of the research outlined in the Information Sheet.

Please complete the following checklist. Tick [✓] the appropriate box for each point.	**YES**	**NO**
I have read the information sheet provided and understand it.		
I have been given sufficient time to consider whether or not to participate in this study.		
I understand that my participation in this study is confidential and that no material, which could identify me personally, will be used in any reports on this study.		
I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without penalty.		
I know who to contact if I have any questions about the study in general.		
I am satisfied with the answers provided about the study.		
I have the right to decline to participate in any part of the research activity.		
I understand that the information supplied by me could be used in future academic publications.		
I consent to allowing researchers to observe in the class and recess at agreed times.		
I consent to the video-recording of these observation sessions.		
I understand that participation in this study is confidential and that no material, which could identify me personally, will be used in any reports on this study.		
I have a copy of the information sheet and this consent form.		

I wish to receive a copy of the findings.		

Participant :		Researcher :	
Signature :		Signature :	
Date :		Date :	
Contact Details :		Contact Details :	

Appendix F: Parent Consent Form

UNIVERSITY OF WAIKATO

DIVISION of ARTS, LAW, PSYCHOLOGY & SOCIAL SCIENCES

PARTICIPANT CONSENT FORM

[A completed copy of this form should be retained by both the researcher and the participants]

I understand that I can ask further questions about the research at any time during my child's participation. I am aware the findings from this research will be stored in a secure sever in Waikato University and will be published as a masters thesis.

When I sign this consent form, I give consent for the researcher to use the data collected for the purposes of the research outlined in the Information Sheet.

Please complete the following checklist. Tick [✓] the appropriate box for each point.	**YES**	**NO**
I have read the information sheet provided and understand it.		
I have been given sufficient time to consider whether or not to let my child participate in this study.		
I understand that it is my choice to consent for my child to participate in this study that I have the right to withdraw them from the study at any time without penalty.		
I understand that if my child does not want to participate in the study, they will be allowed to withdraw from the study at any time without penalty.		
I know who to contact if I have any questions about the study in general.		
I am satisfied with the answers provided about the study.		
I consent to relevant information about my child (i.e., age, sex, education, classroom behaviour, management approaches) being disclosed by the teacher to the researcher.		
I consent to allowing researchers to observe my child in school.		
I consent to video-recording of these observation sessions.		
I understand that participation in this study is confidential and that no material, which could identify me or my child personally, will be used in any reports on this study.		
I have a copy of the information sheet and this consent form.		

I wish to receive a copy of the findings.		

Parent/parents :		Researcher :	
Signature :		Signature :	
Date :		Date :	
Contact Details :		Contact Details :	

Appendix G: Revised Data Collection Form

Date:

Activity/ context: Teacher:

Start time: End time:

Participant:

Event	Teacher or student use (TI or SI, TP or SP)	Look at the board (Y or N)	Opportunity or need for communication	Function or purpose	Consequence of coreboard use	Latency (<5, 5-10, NR)	Notes
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Appendix H: Interview Questions

Functional Assessment Interview (FAI) – Revised
Student: _____ Age: _____ Sex: M F
Date of Interview: _____
Interviewer: _____
Respondents:
_____

A. Describe Coreboards

- **What type of coreboards do you use**
- **What is the design of the coreboards**
- **How is it organised**
- **In what contexts do you use them**
- **How often in a school day do you use them with these students**

B. Training teacher and student

- **Were you trained to use coreboards, if so, what did the training involve?**
- **Were the students taught to use coreboards, if so, what did it involve?**

C. Define situations or events that the coreboards are used in

- **In what situation or event does the student initiate the use of the coreboard in the classroom?**
- **In what situation or event does the student initiate the use of the coreboard at recess?**
- **Does the student have free access to the coreboard, if so, in what contexts?**
- **In what situation or event do you initiate the use of the coreboard in the classroom with the student?**
- **In what situation or event do you initiate the use of the coreboard at recess with the student?**
- **What is a common reason for you initiating use of the coreboard with the student?**

D. Views on Coreboards

- **How easy do you think the coreboard is to use for these students?**
- **What, if any, difficulties have you experienced when using the coreboards?**
- **What, if any, benefits have you experienced when using the coreboards?**
- **How useful do you think these coreboards are?**

Appendix I: Interview Transcription

Date: 31st August

Time: 3pm

Context: Classroom

23 mins

Interviewer: Cool. So, thank you for having me here and everything. (.5) Um, so what coreboards or communication boards do you use?

Teacher: Uh (int: inaudible), we just have the {pauses for 1.5 sec to show coreboard} the standard coreboard (int: yep) we, assist, um, so this is the standard coreboard that is used by all specialist schools now (int: okay). So that's, the, that part there {referring to board} and (int: yeah) then the fringe is, uh, designed for, um, our specific a- well our children. So these (int: okay) are our [Main school] fringes (int: yup), um, and we've added, um, this line across the bottom {referring to the board} with [Main school] too with the yes and no and numbers and the toilet (int: okay). Cause uhm we use those a lot (int: alright) with the children so.

Interviewer: would I be able to take a picture of that (teacher: Yes) at some point? (Teacher: ab-) Ok, cool. Um, so is that is that you said is your standard design?

Teacher: So, this uhm yes, it was our coreboard originally looked a bit different (int: okay) this part looked a bit different {referring to the board}. Um, and it's we had them changed last year (int: okay) to - last year or this year it's so hard to work out now what (both laugh).

interviewer: since COVID it's all a big blur (teacher: Oh it's I know everything's a big blur) (laughs).

teacher: um so we had a new (int: yup) core boards (int: okay) um and they are standard now apparently across (int: Okay) that's what is used there was a few slight differences (int: okay)

interviewer: so what are the fringe words for again?

Teacher: so the fringe words so we've got our um just regular kind of greetings and (int: mmhm) um just words that we things we use a lot. We've got us (int: yup) so that's my class. That's a class next door. Your family groupings. School vocab. So they're just all labelled with choices playgrounds feelings (int: okay) so (int: cool) that is a whole range of things, um, right down to, um, some of the food and that that sort of thing is specific too. Um, body parts, music, singing, um some of these are specific sort of songs the kids that we might use a lot. And what they like (int: okay). Um, and we can have a fringe made if there's specific things within our class (int: yup) we might use or, um, or we can have, um, fringes made for to go on our board's (int: okay) if we want to. And I use a, um, a big one as well.

Interviewer: what are the sizes of, of-of them, just out of curiosity? (laughs)

teacher: I don't know.

Interviewer: okay.

Teacher: Um, and I, um yeah, I mean I could I could measure them for you, but that's just the one that sits that I can use (int: yeah) when talk-talking to the whole class just (inaudible) get a visually especially if we've got anybody we've got one other boy with a visual disability so (int: yah) he if he's sitting back [directing to the back of the class] (int: yeah) (inaudible)

interviewer: yeah so he can see it, yeahp. Um, how was it organised? I-I've done some research on it but I've noticed there's a lot of different (teacher: Well, I, yeah) types and so (laughs).

Teacher: so I'm, um, I'm new to core boards as well because new new to- well this is only my second year ((School bell starts ringing for an announcement)) oh sorry.

Interviewer: that's alright

((announcement))

interviewer: okay

teacher: that may happen but (int: okay (laughs)). So, um, awh I would love to tell you I know really well but I don't (int: okay). So this things like verbs {directs to the

board} (int: yup) um, nouns you've got your nouns here. Questioning words. Yaeh, I - I'm not an expert so (int: laughs) I don't (teacher: laughs) but I-

interviewer: that's alright. Okay.

Teacher: Um, (int: So yeah I'll) describing (int: yeah) here

interviewer: there's so many different types out there

teacher: Yeah, there is. And it's a bit different to all what I started using last year which I knew really well so this is (int: right) um, there are some different ones (referring to the words) on here that we didn't have before (int: okay). Yeah so you got your questioning.. words. These are all related to time (int: yup). And these positional (int: okay).

Interviewer: what contexts do you use the coreboards?

Teacher: Um, several, like, uh for some children for the likes of [participant 1], um, I might use it to ask him a question. So (int: yep) if I asked him just verbally he doesn't always comprehend (int: right) but if I ask him in relation to this (referring to the board) it's like it might (inaudible) do you want more? Yes or no. And he can tell me yes or no (int: okay). Um, so [participant 2] is another one. They are both the ones that, um, were nominated for this study (int: yup). Um, [participant 3] has a device as well but if he if he hasn't got it handy then will use the coreboard (int: okay). Um, their (.2) movements with heads and that sort of thing is I-is limited sometimes they don't get the shaking and the nodding (int: okay). So, they need to have a visual (int: right) f-for them to be able to relay their message. So, we use it like that, um, we use it for instructions. Um, so in the mornings I'll go chairs to tables and they know they need to move their chairs away before we do our next activity (int: okay). Um, and it's interesting because some of the ones that you think have a really good grasp of language I might give them an instruction or ask them a question and they'll sort of set the and I'll think awh their processing time is just a little bit too long and I'll re-ask it with the coreboard and they'll straight away (snapping finger) (int: oh) know what what I'm looking for (int: right) and what to say back (int: okay). Um, and they'll tend to use the coreboard, um, we've got a little bo-we've got one of our little boys he has just started, um, he gets quite fixated on the coreboard but he wi-has just started

when he wants to have something else out of his lunch box he will come up and ask and he puts it together in a in a d-, um, different way (int: yeah) so he uses the coreboard and then he just adds at the end the food that he wants (int: right). So he will go (referring to the coreboard) I, um, I wan-where's want, I want please Apple (int: okay). Um, but gets his message across (int: yep).

Interviewer: do you use it at recess as well?

Teacher: Yep, we take them out we wear them all the time (int: okay, basically). So we take them out into out into the playground and actually it's interesting because a lot of the other kids will come up (int: okay) the mainstream kids will come up and want to know about it and they will start using it, um, and sometimes they've been known to come over and say 'oh look I'm trying to say this' and they'll find the words that they want on there to talk to one of the kids (int: yeah). Or let them know if they want to play game with them with something like that (int: okay) which is quite cool (int: yeah!). Um, so, so instructions, conversati-sssome of them awh we can do it sometimes we use it we might use it, um, if we getting them to encourage more language from them. So if we're so the likes of it might be that we're going out to-into the kitchen to use Play-Doh so we might ask them what colour they want, um, what shape they want from the tray to make shapes with and it just encourages them to use more language because they could just sit in silence and just choose and not have any communication with us (int: yeah) but it just encourages them to communicate with us and to learn that communication is valuable (int: yep) because sometimes they forget to communicate (int: laughs) they just because they don't talk (int: yup) as a rule, uhm, a lot of them in my class have echolalia so they're just echoing what they hear (int: yup). So, if we don't encourage them to use the coreboard or speak to them with the coreboard they will just repeat things (int: okay) and there will be no real communication (int: okay).

Interviewer: sorry just told me it couldn't detect any sound (teacher: oh). Is it okay if I sit a little closer?

Teacher: Yep, (int: laughs) that's fine.

Interviewer: hopefully (.4) that will be good (teacher: okay). Okay. So how often in the school day do you use them?

Teacher: Oooh, (.5) I've never thought it is just (int: laughs) something that we do. Um, we use them a lot at mealtimes. I-so I would use mine (.5), um, ooh, that's a hard one to quantify. Upwards of 50 times a day (int: okay). You know sometimes (int: yup) it's just the word or it's just a they might say because a lot of them use echolalia so they're just imitating so if I said good morning to them (int: yup), um, they might say-if I say good morning [student], he will say good morning [student] and I'll say 'who' (int: laughs) and if I just said who to him then I'd get nothing back if I said 'who' (using the coreboard) he is like (teacher, imitating [student], laughs) good morning [teacher] (int: laughs) so the visual really gets him thinking about what he's supposed to be doing (int: okay). So, it's just little inciden-incidental ones like that along with giving them instructions (int: okay) and they use it too. They're (int: yep) telling us they are using they're pointing out what they want (int: cool) so a lot (int (laughing): a lot). Yep.

Interviewer: too much to count.

Teacher: Yeah, well, we I don't think I've ever sa-thought to count. 'cause it's on us all the time (int: yup).

Interviewer: so, you're using these boards and a high-tech device as well?

Teacher: I've got three devices (int: yeah). So, two different programs (int: yeah). Um, we've got touch chat and uh-a Lamp (int: okay). Lamp is the the new one in the class.

Interviewer: are they a similar layout to this or are they different completely?

Teacher: they're different completely.

Interviewer: okay. So what would you use these for and the high-tech for?

Teacher: Uh, the high-tech are the children who don't speak are the non-verbal children (int: okay). So, they're my three high children who don't speak have devices (int: okay). Um, they use these (referring to the coreboard) as well but they use their probably use they would use their device more but if the device is not available then they would use these (int: okay) to let us know what they want (int: okay).

Interviewer: what will the criteria be for the high-tech one? Just non-verbal?

Teacher: Um.

Interviewer: Rather than having them on this? Or vice versa?

Teacher: it gives them a voice (int: okay). So it means that because they don't speak j-even using this (referring to the coreboard) they still don't have a voice (int: yup) as such. So, the technology gives them a voice (int: yup) so allows them to be heard (int: yep) rather than it just being (int: being (inaudible)) because if he was sitting up here and I sitting here and I ask them a question it relies on somebody being right beside them with the coreboard (int: yup) or me moving to them (int: okay) with a device I don't have too-no one has to go t-to their aid (int: mmhm) they can just answer (int: right) on their device (int: okay). So it allows them to be heard as well (int: okay). And you get a lot from them if they've got no voice using that in-(taps device) (int: right) (inaudible) (int: okay) because they can kind of-they can type on it and that sort of thing as well (int: okay) I mean it's quite, um, one of them is extremely proficient so proficient in fact it-spelling out words on here we can't keep up (int (laughs): awh okay). Um, so it's much easier on his device for him (int: yup) but usually you know if we can use this in writing the sounds and that sort of thing (int: okay. cool)

interviewer: so were you trained to use the coreboard's?

Teacher: I have done training to use the coreboard yup.

Interviewer: okay. What did it involve?

Teacher: Um, I've done it twice because I started using it when I was a mainstream with a non-verbal, um, boy that was in my class so I came to a course and had the speech therapist who was visiting who was working with us at school so she did a bit of work with me, um, on it that was three-three four years ago. Um, and then he left so I didn't have any need for it again and then I've, uhm, had training with the speech language therapists so she's so we've gone through it's a skill to be able to read it upside down (int (laughs): yes) and know where to find things I still have to say (int: so much) look is there this word in their you know what could we use instead of. Um, um, some of the LSAs have been here for a lot longer than me so (int: yeah) they, uh, a pretty proficient at it. Um, but yeah it's learning to read it upside down and in

which order to put the words (int: yeah) and just how many words to use in to get your message across (int: yeah). Um, you can't use as many words you would use verbally you need to shorten it down and it is just a skill of knowing which ones to do and which combinations to put together to get your message across (int: okay) for them. So.

Interviewer: what about the students were they taught how to use the coreboards?

Teacher: Um, my students have been here for-I'm a – I-my students have been here for a number of years so I would have to ask [name] that (int: that's alright) I don't know (int: okay) but I'm picking that they probably have because I know some of them have got coreboards (int: okay) at home (int: alright) that (int: okay) they've had them since they since they've (.1) (int: had them) been at school (int: okay). Yeah. (int: um) they're a lot more proficient at using them. I mean some of them I might ask one of the LSAs a question and one of the kids is likely to hop up and show me (int: laughs) where it is so (int: cool).

Interviewer: Um, so, does the student initiate the use of the coreboard?

Teacher: Uh, it's a bit of both.

Interviewer: a bit of both.

Teacher: Yep. Some of them will, um, come over and get your coreboard if they want to get-ask you something and actually will, um, the likes of [participant 1] he will like if he sitting at the mealtime he will grab the coreboard and will go drink please (int: okay). Um, he could just say it but he's used to just saying going drink please. Um, we use it a lot for, um, ready steady- so if we're playing games and that sort of thing they might come over and go ready steady go (tapping on the coreboard) and you know if they want to do a race with us or something like that they'll come over and go ready steady go (tapping on the coreboard), um, or we will have a swinging chair and they might want to turn in it and they might come over and ask us for that sort of thing so.

Interviewer: so is (teacher: they) it how it happens at recess (teacher: um)? Use it as much at recess?

Teacher: some of them tend to. A lot of them at recess we don't tend to, um, we tend to leave them to their own devices (int: right). Um, we do we do interact with them but children in mainstream don't normally have a-an adult (Int: yep) you know talking to them or interacting (int: yeah) with them all the time and these guys have a lot of adults around them all the time so while we do use them, um, uh al-a lot of the time they will come over and ask us to interact in some way shape or form. There are a group of them but just like to wander in their own time in their own thoughts (int: yeah), um, so we leave them but we will use it to indicate that it's time to come inside or that they need to be (int: right) not doing what they're doing (int: (laughs)yeah) climbing on you know things like that (int; yep) mm. (int: cool)

interviewer: so they have free access to them then?

Teacher: Oh, yep. Yep, and they will come over and grab them and tell us I mean we got one girl that likes to grab one of our coreboards in the morning so she might grab mine and I'll that or she uses that. T-she's, um, speech wise her speech is a little bit unintelligible at times (int: right) so, um, this is really good for her because it means that she we can actually work out what she's saying to us (int: yep. Cool).

Interviewer: so you would initiate with them as well?

Teacher: Um, (int: in the classroom and at recess?) In the classroom? Yeah, we d-it's a bit of both its (int: yeah) it's kind of, um, depends who wants to initiate the conver-initiate the talking (int: okay). If they want to talk to us or pass- get a message to us they'll use this, um, if we want to do the same we-we do it (int: mhm).

Interviewer: so what are the common reasons for you initiating?

Teacher: Uh, to give instructions, to ask questions, just to have a conversation (int: mhm). Um, we might cause a lot of these children don't value communication in terms of conversational, um, communication (int: yep). So we all as trying to you know just things like they might be doing something we might just say you are silly (int: laughs) you are silly or you're being silly and it just gets them to respond 'no no"you know (int: laughs) it's just a lot of it is people games where you just trying to get them to communicate (int: yeah). To have a bit of fun and just communicate so a lot of it the, um, incidental communication is that that sort of thing so it's so really

yeah instructions, questions, and just that play sort of communication conversational (int: cool). Mm.

interviewer: so how easy do you think it is to use the coreboard's?

Teacher: Uuh, it looks daunting (int: laughs), um, and it is still sometimes you look at it fwah, um, but you do you do work out, um, your motor plan of where things are and we put things together so things that you use a lot you do work out you know you automatically go from A to B to get your message across, um, it isn't that hard sometimes it can take a little bit longer if you're searching for but that's actually not a bad thing because it gives them a bit of processing time along the way (int: okay). Um, rushing them to answer you or to get your information across to them can confuse them so taking a little bit longer to find something or to put it together and we never do it just once you know you will always do more than once (int: right). So once you find what you want to say you gonna repeat it a couple of times anyway (int: okay). Um, so that doesn't really make too much difference just as the processing time.

Interviewer: yeah. What about for the students?

Teacher: they don't, um, they don't seem to have any trouble (int: yeah.). I mean they're looking at it like that (referring it to the right way around) and they they have a really good idea of of I mean they have been looking at the symbols their whole time at school so, um, I would imagine for the younger ones it's probably a little bit, um, trickier because they're only just and if they haven't had it before, um, but these guys I mean they're on their fourth and fifth year fifth and six year at school so (int: okay) that had it for a wee while (int: had a- had a bit of experience) and some of them have got it at home so (int: right). Um.

Interviewer: Um, what if any difficulties do you have with

teacher: uh, me (int: coreboards) my incompetence (int (laughs): awh). That's my biggest barrier (int: okay) as me not knowing where to find things (int: yeah) and feeling like I am floundering when I'm trying to find things (int: okay). So I do sometimes just sit look through it upside down because otherwise if you spent time looking at (int: yeah) it like this you learn it that way (int: the other way round, yeah)

but you need to look at it and do it that way. And it's quite interesting to look through and just think oh okay I can ohh next time I'll use that (int: laughs) or you know. I find the whole thing fascinating that that's how we communicate with them. It's just such an effective way to you know things like today is Monday tomorrow is Tue-Tuesday. Yeah.

Interviewer: okay. what about when you first experience them? using them?

Teacher: Ohh I was little bit daunted (int: yep). Um, and the reading upside down that (int: okay) I found really difficult to start with second nature now but it did you know (.1) it did. I mean my fringe that I used for my first coreboard didn't have all of this on it (int: right). Um, because it wasn't relevant to that child (int: okay) and it wasn't, um, this is [Main school]. I mean I would imagine that, uh, fringes anywhere probably have a lot of this stuff in it but has specific things for [Main school] and (inaudible) (int: okay).

Interviewer: Um, what benefits do you think this would have?

Teacher: Um, it allows those children who find communicating just with their voice alone, um, it allows them to get their message across really quickly and easily (int: okay). Um, we know straightaway what they mean, uh, the likes of [student2] she, um, because her speech is intelligible the little of the time it's really confusing (int: yeah). If you've got this here with you all the time it saves her getting frustrated and upset and not wanting to talk to you (int: okay). So it just means for her it's it's it's a way of communi-it's her way of communicating with us when her speech lets her down (int: yeah). Um, for those children with no voice it allows them to indicate what they want (int: yup) from us, um, we don't take the devices out into the playground simply because they put them down and then someone runs over (int: yeah) them and (int: laughs), um. So the coreboard is their way of communicating with us out in the playground. Um (.3). It was the benefits wasn't it. I've forgotten (int (laughs); yep. That's alright). Ohh look it just gives them a voice (int: yep). It just allows them to communicate with us it, it allows us to have fun with them (int: yep) and for them to know what we are wanting., Um, it just takes away any confusion around if you're speaking to them. Sometimes I will jus-I will forget and I would just say something to them and I can see that confused (int: mhm) cloud come over and then I'll use my

coreboard and it just clears up (int: right). So it's just, for me it just clears that path to that direct communication between us (int: cool).

Interviewer: so how useful do you think they are?

Teacher: Oh, I wouldn't be without it (int: laughs). It's a- it's a lifesaver in our class because because we have non-verbal children and because we have children that don't freely speak it allows everybody to have a voice (int: okay. cool).

Interviewer: that's all the questions I have (teacher: cool). Do have anything else you want to talk about?

Teacher: No. I – look, I, I love my coreboard (int: laughs). It's oh you know I even got my own specific strap on it now so they are, they're they're a lifesaver in a class like ours.

Interviewer: cool, thank you.

Teacher: and it allows, the other thing I was gonna say is is it allows them when they're upset (.2) to without their voice to indicate (int: yup) you know they can tell us. If they're crying and they can tell us why (int: yup) you know they can they can tell us somebody hurt them or there is something that's hurt, um, or what they want to do or how they want to solve something, so.

Interviewer: Yeah (teacher:mhm). Cool (.3). Cool.

Teacher: Kay.

Interviewer: I'll stop the recording –

Note: The teacher clarified in session 4 observations that the participants started with a few symbols on the back of a coreboard to begin with and then were brought over to the current coreboard.

Appendix J: Raw Data

Table J 1

Session 1 Raw Data

Event	Teacher or student use (TI or SI, TP or SP)	Opportunity or need for communication	Function or purpose	Consequence of coreboard use	Latency	Response appropriate (Y, N, O, N/A)	Notes
1	TI-h-1	T	Conversation - To say good morning	-	NR	IN	9.15am – morning circle (P at front with big CB; H and N behind with small CB). *Classroom*
2	TI-h-1	S	Ask	Got a hug	<5	AP	Small CB
3	TI-p-class	T	share info - Tell what day/month it is	-	-		Big CB (talk for about 15sec) NR

4	TI-h-1	T	share info - Repeating what P said	1 touched board	5-10	AP	Small cb
5	SI-p-1	-	unknown - Say day		<5	AP	
6	TI-h-1	T	Instruct - finish task	1 take finger away	<5	N/A	
7	TI-h-1	T	share info - number of days left	1 taps on CB	<5	AP	H physically prompts on number 7
8	TP-h-1	S	ask	1 taps board with physical prompting	<5	AP	
9	TI-p-1	T	Instruct - choose video	1 puts chair away and chooses video	<5	AP	“its your turn” – p
10	SI-p-1	S	Instruct	Play video	<5	AP	
11	TI-p-1	T	Instruct - Get 1 to sit	1 touches toes and interacts with P	5-10	IN	

12	TI-n-1	T	Ask	-	NR	IN	CB usage lasts for 5 sec Asks with CB twice then leaves alone
13	TI-p-1	T	Conversation	Play	NR	IN	
14	TI-p-1	T	Conversation	Play - Counting orange cars/vehicles – response putting orange car in group	<5	AP	
15	TI-h-1	T	conversation	-	NR	*IN*	*Morning tea*
16	TP-h-1	T	Ask	1 taps board	<5	AP	
17	TI-h-1	T	conversation	-	N/A	N/A	Got interrupted
18	TI-h-1	S	Ask	-	NR	IN	Hard to hear – 1 was saying “stay away”
19	TI-h-1	T	conversation		NR	IN	About other student

20	TI-h-1	T	Praise	Interaction – high five	<5	AP	1 finished food and put away plate
21	TI-h-1	T	Instruct- to put on vest	1 grabs vest	<5	AP	
22	TI-h-1	S	Ask- H asks if 1 wants help	1 gives vest to H	<5	AP	
23	TP-h-1	T	Instruct - 1 to put on vest	H help with putting on vest	<5	AP	
24	TI-h-1	T	conversation		NR	IN	P “you are funny, sounds like a monkey” – 1 is making monkey sounds

25	TI-p-1	T	Conversation - To get 1 to interact with P	Gives way for 1 to walk past	<5	AP	**Recess** – P "ready, set…" 1 pointed to go on CB. P did this interaction six times while the student walked around the perimeter of the playground. P pointed to ready and set.
26	TI-p-1	T	Conversation - To get 1 to interact with P	Gives way for 1 to walk past	<5	AP	**Recess**
27	TI-p-1	T	Conversation - To get 1 to interact with P	Gives way for 1 to walk past	<5	AP	**Recess**

28	TI-p-1	T	Conversation - To get 1 to interact with P	Gives way for 1 to walk past	<5	AP	**Recess**
29	TI-p-1	T	Conversation - To get 1 to interact with P	Gives way for 1 to walk past	<5	AP	**Recess**
30	TI-p-1	T	Conversation - To get 1 to interact with P	Gives way for 1 to walk past	<5	AP	**Recess**
31	TI-p-1	T	Conversation - To get 1 to interact with P	Goes back to class and puts vest away	<5	AP	**Recess**
32	TI-p-1	T	praise	-	NR	*AP*	*Classroom P "you are awesome" (for sitting in the chair)*
33	TI-h-1	T	Instruct	1 sits down to do art	<5	AP	
34	TI-h-1	T	Instruct	1 takes shoe/ sock off with H help	<5	AP	1 vocally repeats after h

35	TI-h-1	S	Ask – what colours	Paint feet – this was delayed/ teacher goes get colours	<5	AP	
36	TP-h-1	T	Instruct – to paint feet – ready, set, go	Paint feet	<5	AP	S said “ready” before TP
37	TI-h-1	T	praise	1 vocally repeats ‘good work’ and puts shoes on	<5	AP	
38	TP-p-1	T	Instruct - Get toy back from another student (1 toy)	1 got toy back	NR	IN	There was physical prompting halfway through
39	TP-p-1	T	Instruct - to write name	Sit down to do chore	<5	AP	There was physical prompting halfway through
40	TI-n-1	S	Instruct - “what’s next” to find letter	1 finds letter	<5	AP	

41	SI-p-1	-	unknown - letter	1 finds letter	<5	AP	Very fast interactions – back and forth between 1 and P for spelling out name
42	TI-n-1	T	Instruct - 1 to write	1 writes letter	<5	AP	
43	TI-n-1	T	praise	‘good job’ and 1 got a high five	<5	AP	
44	TI-n-1	S	Ask - want marshmallow	1 said ‘Yes please’ and got a marshmallow	<5	AP	

Table J2

Session 2 Raw Data

Event	Teacher or student use (TI or SI, TP or SP)	Opportunity or need for communication	Function or purpose	Consequence of coreboard use	Latency	Response appropriate (Y, N, O, N/A)	Notes
1	TP-p-1	T	Instruct - go back to class	1 goes back to class	<5	AP	Recess Before this, a ball fell near 1 and another student got close to 1 and 1 pulled their hair- CB almost used

2	TI-h-1	T	conversation - to 1 about another student being noisy "be quiet"	1 repeats 'be quiet' H says to 1'are you telling me to be quiet'	<5	IN	*Classroom*
3	TI-p-1	T	Instruct – stop biting hand	1 stopped biting hand	5-10	AP	Said it across class then used the CB when next to 1
4	TI-p-1	S	Ask - what video to watch	Chose colours and got to watch colours video	5-10	AP	1 said 'I want…' P came over and 1 said 'colours please' then 1 pointed to board
5	TI-n-1	S	Ask – what colour do you want?	N went and got the colour	<5	AP	unrelate d to colours video

6	TI-n-1	T	Instruct – choose words to put on mug		NR	IN	1 was looking at video playing and vocally repeated N
7	TI-p-1	T	Instruct – N says ‘1 choose’		NR	IN	>20 P goes turn off video then 1 chooses
8	TI-n-1	T	Instruct – choose different colour	Got a different colour	<5	AP	N asked ‘are you finished’ without board
9	TI-n-1	T	Praise – ‘really good’	-	NR	AP	
10	TI-n-1	T	Instruct - go play	1 went to play	<5	AP	

11	TI-n-1	T	Conversation	-	NR	N/A	Another student interrupted Red cars being grouped N pointed at something then stopped asked 1 ‘what colour is this’ without CB
12	TI-n-1	T	Instruct – count cars	1 vocally counts	<5	AP	
13	TI-p-1	T	Instruct – blow your nose	1 blew nose	<5	AP	

14	TP-k-1	T	Instruct – finish activity	Got left alone	<5	IN	Echolalia – K said ‘3, 2’ and 1 repeated ‘3, 2’K took toy then 1 went back to activity (cars)Originally was an initiation but asked a 2nd time and was physically prompted
15	TI-p-1	T	Instruct – finish activity	1 put toy car away then watched others pack up	NR	IN	This happened a couple minutes after last interaction <10
16	TI-p-1	T	Instruct – stop picking at mouth and nose	P hold hands slightly	O	O	

17	TI-p-1	T	Instruct – go to the loo	Went to the loo	<5	AP	1 said ‘picking hurts’ – echolalia
18	TI-p-1	T	Instruct – time to sit	Sat	<5	AP	

Table J3

Session 3 Raw Data

Event	Teacher or student use (TI or SI, TP or SP)	Look at board (Y or N)	Opportunity or need for communication	Function or purpose	Consequence of coreboard use	Latency	Response appropriate (Y, N, O, N/A)	Notes
1	TI-h-3	Y	T	Conversation – good morning	3 did nothing	NR	IN	*Classroom* Hard to hear what h said
2	TI-h-3	Y	T	Praise – good singing	3 did nothing	NR	AP	3 first looked at CB then looked away
3	TI-h-3	Y	T	Instruct – hands down	after looking at cb 3 stops hitting and just makes noises	<5	AP	3 was hitting head & h was hold arm to try stop 3 Moved onto next activity

4	TI-p-3	Y	T	Instruct – your turn	P grabs 3 hand to strip and physically prompts	O	O	Prior p touches 3 face to try and get attention to look at board After grabbing hand and looking at strip 3 answers on H/D
5	TI-p-3	N	S	Ask – are you sure yes or no	3 touches strip not CB - hip bump	<5	AP	
6	TI-p-3	Y	S	Ask – are you sure yes or no	3 points to Yes and 3 gets a hip bump (3)	<5	AP	P brings 3 attention back to board Looks away half way through
7	TI-p-3	Y	T	Share info – activity will finish later	P moves on to next student	O	O	

8	TI-h-3	N	-	-		NR	N/A	Can't hear
9	TI-h-3	Y	-	-	Grabs 3 face gently to try to face board	NR	N/A	Can't hear
10	TI-p-1	Y	S	Ask – are you sure you don't want to do something different	1 chose same on CB and got a hug	<5	AP	1 chose squeeze on strip prior
11	TI-p-1	Y	S	Instruct – good morning who?	1 chose p on CB and said her name after p prompting again saying the first sound of her name	<5	AP	
12	TI-h-3	Y	T	Conversation – other student is "feeling frustrated"		NR	IN	

13	TI-h-3	Y	T	conversation	3 taps other student face on CB	<5	AP	
14	TI-h-3	Y	S	Ask - H says, “Do you feel frustrated?”	3 was rocking in chair and looking at P	NR	IN	
15	TI-h-3	Y	S	Ask- Do you want him to stop?	3 beings to wobble side to side	NR	IN	H Only points to stop symbol
16	TI-h-3	Y	S	Ask - Do you want him to stop?	3 rubs eyes	NR	IN	H Only points to stop symbol
17	TI-h-3	N	T	Instruct – stop	3 interacts with H/D and continues to make noises	<5	AP	Before this 3 slaps own arm and makes noises

18	TI-h-3	N	T	Instruct - stop	3 wobbles head	NR	IN	
19	TI-p-class	-	T	share info – activity finished	-	n/a	N/A	
20	TI-h-3	N	S	ask - toilet	3 rocks back and forth	NR	IN	
21	TI-h-3	Y	S	ask – toilet	3 rocks back and forth	NR	IN	
22	TI-p-class	-	T	Share info – time to do calendar	-	N/A	N/A	
23	TI-h-3	N	T	-	-	NR	N/A	h gives up quickly

24	TP-h-3	N	T	Share info – yesterday was the 7		NR	AP	H physically assists 3 hands to touch the board
25	TI-p-class	-	T	Share info – yesterday was the 7 today is the 8	P writes on board	n/a		
26	TI-h-3	N	T	Share info – 13 days left of term	3 continues to wobble head	NR	AP	
27	TI-h-3	Y	T	Share info – 3 weeks left of term	-	NR	AP	
28	TI-h-3	Y	T	conversation – 13 days left of term	-	NR	IN	Before 3 screams and smiles

29	TI-p-class	-	T	Share info – days left of term	-	n/a		
30	TI-h-3	Y	T	conversation – so good (13 days left)	-	NR	IN	
31	TI-p-class	-	T	Share info – one sleep; now 0	-	n/a		
32	TI-h-3	N	T	Share info – mimic p	-	NR	AP	Starts off directed at 3 but then turns to class
33	TI-h-3	Y	T	Share info – mimic p	-	NR	AP	
34	TI-h-3	Y	T	Share info – mimic p	-	NR	AP	

35	TI-h-3	Y	T	Share info – birthday	3 flips through fringe words on CB	<5	AP	
36	TI-h-3	Y	T	share info	3 briefly flips through fringe words	NR	AP	
37	TI-h-3	N	T	Share info	-	NR	AP	H refers to using H/D
38	TI-p-class	-	T	Share info	-	n/a	N/A	1 echolalia starts up – repeating p

39	TI-n-1	Y	T	share info - N “today is Tuesday”	1 starts saying while looking at board “today is Tuesday”	<5	AP	
40	SI-n-1	Y	-	Unknown	Tries to go through fringe words but n is holding board	<5	IN	1 turns back around in seat
41	TI-h-3	Y	T	Share info - today is Tuesday	-	NR	N/A	Before 3 on H/D says “Tuesday”
42	TI-h-3	Y	T	Share info – same (referring to coreboard and H/D)	3 interacts with H/D	NR	AP	

43	TI-h-3	N	T	conversation – he (other student) is noisy	3 looks at student	NR	IN	
44	TI-h-3	Y	T	Instruct – “you have to say shhh” – points to shh symbol	-	NR	IN	H moves onto counting with P
45	TI-h-3	N	T	Share info	-	NR	AP	3 doesn’t look when h tries to get attention
46	TI-h-3	N	T	conversation – “(other student) shhhh"	-	NR	IN	3 doesn’t look
47	TI-p-class	-	T	share info - Calendar is finished	-	n/a	N/A	“before we finish

48	TI-h-3	N	T	share info - Calendar is finished	-	NR	AP	
49	TI-h-3	Y	T	share info - Mimicking P – we're doing something different	-	NR	AP	
50	TI-p-class	-	T	share info – doing something different (sing happy birthday)	27 sec later sing happy birthday	n/a	N/A	None of the participants respond – 2 starts to clap hands along
51	TI-h-3	Y	T	share info – activity finished	-	NR	AP	3 was waving hands and wobbling head

52	TI-p-class	-	T	share info – activity finished	-	n/a		
53	TI-p-class	-	T	Instruct – chairs to tables	1 & 2 get up and take chairs to tables <5	n/a		Says twice before completing Instruct
54	TI-h-3	Y	T	conversation	3 gets tickled	O	O	Interaction begins right after initiation – not time to respond
55	TI-h-3	Y	T	Instruct – chair to tables	3 gets up and waddles then h takes 3 H/D	NR	IN	3 begins to take chair to table – after prompting w/o board (30sec)
56	TI-h-3	-	S	ask – what would you like	-	N/A	N/A	Nothing happened because they were interrupted /activity changed/
57	TI-h-3	-	T	Instruct – arms out	H Holds 3 hand	NR	IN	Hold hand because 3 did not respond?

58	TP-h-3	-	T	Instruct - arms out	Arms out then play – slaps hands	<5	AP	
59	TI-p-class	-	T	Instruct- sit in circle	P walked away1,2,3 did nothing	n/a	N/A	
60	TI-p-class	-	T	Share info – about activity	Pulls out cards with lines on them and counts how many sticks/blocks fit on the line	n/a	N/A	
61	TI-p-class	-	T	Share info	7 blocks to fill line/five blocks to fill another	n/a	N/A	
62	TI-p-class	-	T	Share info – 1st toilet then morning tea	Ready, steady, go – 1,2 leave (<5)	n/a	N/A	
63	TI-p-3		T	Instruct – toilet	P rolls 3 over and pushes gently to get up	O	O	

64	TI-p-1		T	share info – look, apple		<5	AP	
65	TI-p-1		S	ask – slice apple 3 or more slices	1 asks for more on CB	<5	AP	*Morning tea*
66	TI-p-1		T	conversation – enjoy apple	1 continued eating	NR	IN	
67	TI-p-1		S	ask – more apple	1 keeps eating food	NR	IN	
68	TI-h-2		T	Instruct – need help	2 got help	5-10	AP	Touched CB
69	TI-h-2		T	conversation – I don't see a kit kat (h)	-	N/A	n/a	Was using High tech device before this Got interrupted

70	TI-h-2		T	conversation – cool	2 laughs	<5	AP	Was using High tech device before this
71	TI-n-1		T	Praise – you're awesome	-	NR	AP	
72	TI-n-1		S	Instruct – help put vest on	1 got help with vest	<5	AP	Before TI, 1 placed vest on N
73	TI-k-2		-	-	-	N/A	N/A	Recess Too far away/noisy to know what was happening – K was holding socks
74	TI-k-3		S	Ask – what's wrong	-	NR	IN	*Classroom 3* was head banging and making noises – then they got interrupted
75	TI-k-3		T	share info	Eventually went to the big playground – delayed	NR	AP	(going to the big play ground)

76	TI-p-class	-	T	Instruct – going to big playground then “ready set go”	All got up	N/A		
77	TI-k-1		T	Instruct – play on equipment	1 did not comply / respond	NR	IN	*On big playground*
78	TI-h-1		S	Ask – do you want a push	1 picked no	<5	AP	
79	SI-h-2		-	Unknown	H was confused “bottom?”	<5	AP	

80	TI-p-2		S	Ask – did you fart?	1 laughs	<5	AP	P “crazy” Proceed to have multiple interactions with P, H, and 2 with the teachers and 2 engaging in initiation to play
81	SI-p-2		-	Unknown	P “are you happy?”	<5	AP	also directed at h
82	TI-p-2		S	conversation	P picks up bark and pretend its chips “is it bark… is it raisins….” 2 response on CB its popcorn	<5	AP	
83	SI-p-2		S	Conversation – picked hungry	P “you’re hungry”	<5	AP	

84	TI-p-2		S	conversation – “is this bacon?” when referring to a stick	2 responds yes	<5	AP	
85	SI-p-2		S	conversation – picked sandwich	P “no it’s a sausage”	<5	AP	H interrupts P
86	TI-p-1		T	Instruct – ready , set, go	-	NR	IN	
87	TI-p-1		T	Instruct – 1 says “ready”, p grabs 1 hands “stop” because 1 was not choosing right symbol	Play, got up then sat other side of P and played with bark	<5	IN	

88	TI-p-1		T	Instruct – brush off bark on clothes	After P brushes of bark 1 get up and sits other side of p	O	O	
89	TI-p-1		T	conversation – you are getting me dirty		NR	IN	Because 1 was putting bark on p 1 grabs bark and watches it fall
90	SI-p-1		S	share info – “ready..”	Play with bark and P	<5	AP	
91	TP-p-1		T	Conversation	Play with bark and P	<5	AP	
92	TI-p-3		T	Instruct – play – ready steady…	Play	<5	AP	
93	TI-h-2		S	ask		<5	AP	H “do you like..”
94	TI-h-2		S	Ask – tickle	Yes- Got tickled	<5	AP	

95	SI-h-2		S	Instruct - Get tickled	Got interrupted and put headphones on	NR	N/A	
96	TI-k-1		T	Conversation	1 does not respond	NR	IN	K “like a digger”
97	TI-k-1		T	Conversation	1 touches board	<5	AP	
98	TI-h-1		T	conversation	H picks up bark and lets it fall	NR	IN	H “it’s raining”
99	TI-p-2		S	Ask – jump, on, or off	2 pointed to different symbol;	<5	IN	*Classroom – turned into play - laughing*
100	TI-P-2		T	Instruct – toilet then lunch	Went out of class to toilet	<5	AP	

101	TI-p-1		T	Instruct – toilet then lunch	P went to 1 and got him up and 1 went to wash hands	O	O	1 didn't initiate response till after P pulled him up… is it a response or not?
102	SI-k-1		S	Instruct – drink please	K got drink – delayed	<5	AP	
103	TP-k-1		T	Instruct - For 1 to say thank you	1 said thank you	<5	AP	
104	TI-k-2		T	Share info	"Wednesday" on high tech device	<5	AP	
105	TI-n-3		T	Instruct – tidy up	Picks up plate after n got up	<5	AP	

106	TI-p-2		T	Share info – take photo of 2	Got photo taken	NR	AP	
107	TI-p-3		T	Share info – time for playground	3 got up and started bouncing	<5	AP	
108	TI-k-2		-	-	-	n/a	N/A	Recess – too far way
109	TI-k-2		-	-	-	N/A	N/A	Recess Looked through CB and then stopped
110	TI-h-1		T	Instruct	Got up and got chair	<5	AP	*Classroom*
111	TI-h-3		T	Instruct	3 does not respond	NR	IN	

112	TI-h-3		T	Instruct	Put toys away	<5	AP	
113	TI-h-1		T	Instruct – sit on chair	1 sat on chair	<5	AP	
114	TI-p-2		T	Instruct – sit down	2 sat down	<5	AP	High tech device battery died
115	TI-h-3		T	Share info – it's my birthday so I get to choose the movie	3 cried and H went to choose the movie	NR	AP	
116	SI-h-1		S	Instruct – I want cupcake	Got a cup cake	<5	AP	

117	TI-h-3		S	ask – do you want more or are you finished (food)	Chose later	<5	AP	
118	TI-h-3		S	ask – jump or not	Chose jump	<5	AP	
119	TI-h-3		S	ask – jump now or later	“now and later”	<5	AP	
120	SI-h-3		S	Instruct – jump fast	3 chose go	<5	AP	SI-h-3 then H prompts
121	SI-h-3		S	Instruct – slow (speed)	Chose slow then fast jump	<5	AP	
122	TI-h-3		S	Ask – good?	3 chose yes	<5	AP	

123	SI-h-3		S	Instruct – play	Play	<5	AP	

Table J4

Session 4 Raw Data

Event	Teacher or student use (TI or SI, TP or SP)	Look at board (Y or N)	Opportunity or need for communication	Function or purpose	Consequence of coreboard use	Latency	Response appropriate (Y, N, O, N/A)	Notes
1	SI-p-3	Y	S	instruct – hip bump fast and turn	Play – hip bump fast and turn	<5	AP	*Classroom* Initiated on CB then said again on high tech device Physical Prompt to say good morning on H/D
2	TI-p-1	Y	S	Ask – p says “something different?”	1 repeats ‘something different’ then says “the same” and 1 got a hug	<5	AP	
3	TI-p-1	Y	T	Instruct – sit down	1 sat down	<5	AP	

4	TI-p-class	-	T	Share info – calendar	Changing date on white board	n/a	N/A	
5	TI-p-class	-	T	Share info – calendar	Changing on white board – counting down days till an event	n/a	N/A	
6	TI-p-class	-	T	Share info – calendar	Changing on white board – counting down days till an event	n/a	N/A	
7	TI-p-class	-	T	Share info – calendar	Changing on white board – counting down days till an event	n/a	N/A	
8	TI-p-class	-	T	Instruct – cushions to the green couch	1 and 3 did not comply	n/a	N/A	1 already walking around when asked (wasn't looking) 3 had to be given cushion 3 had to be given cushion 3 eventually did it

9	TI-p-3	-	-	nil – p says “do you…” then flips through fringe words		n/a	N/A	Couldn’t see P moved onto next activity quickly
10	TI-p-3	Y	T	Instruct – arms out	3 taps in on CB and p says “no not in, arms out” put arms out	<5	AP	
11	TI-p-3	Y	T	Instruct - arms out and sit	3 put arms out and slightly squats and p says” oh yes do it again”	<5	AP	
12	SI-p-3	Y	-	can't see - 3 flips through fringe words and taps CB	Instruct – arms out then sit (squat) 3 doesn’t comply	<5	AP	P physically assists 3 arms out
13	TI-p-1	Y	T	Instruct – arms out then sit; stand up	1 gets up and walks away	<5	IN	
14	TI-p-1	Y	T	Instruct – stop, arms out then sit – ready set go	Arms out but drops them up and down	<5	IN	

15	TI-p-1	Y	T	Instruct – go	P demonstrates squatting	NR	IN	Gets marshmallow for putting arms out and uses them for him to reach to
16	TI-p-3	Y	T	Instruct - arms out and sit	Arms out Physical prompting for squatting Got attention and marshmallow	O	O	Squatted after physical prompting and multiple times
17	TI-k-3	N	T	share info – 1 more go noodle	3 did not respond	NR	AP	
18	TI-p-3	Y	T	Instruct – activity finished	P took 3 hand and lead him to next activity	O	O	

19	TI-p-3	Y	T	Instruct – how many - 1, 2, 3… - you count		NR	IN	says you count while flipping through fringe words prior to this 4;46
20	SI-p-3	Y	-	can't see - 3 taps something on CB	P says “okay what number”	<5	AP	
21	TI-p-3	Y	S	Ask – what number	3 wrote down number on paper after p pointing and counting and P gives thumbs up	5-10	AP	Multiple times asking – got interrupted by student
22	TI-p-3	N	T	Ask – count grasshoppers	3 taps paper	<5	AP	
23	SI-p-3	Y	-	Unknown - Points to number on CB	P begins counting on Cb and saying “1, 2…” and stops at 7 and 3 writes on paper	<5	AP	3 doesn’t look at CB while counting he taps the paper

24	TI-p-3	Y	S	Ask – what number (inaudible) P begins counting on Cb and mouthing “1, 2…” and stops at 8	3 writes on paper	<5	AP	3 Looks at CB when counting to 8
25	TI-p-3	Y	S	Ask– what number X count P begins counting on Cb and 3 follows on his paper	3 writes on paper and p intervenes to make 3 press harder on the pencil to make the response show	<5	AP	3 Looks at CB when counting
26	TI-p-3	N	T	Instruct – add	3 makes noises and puts pencil in p’s face	NR	IN	P took 3 to office
27	TI-k-1	N	-	-	1 continues playing	NR	N/A	Could not hear

28	TI-k-1	Y	S	Ask – about carts	1 does not respond	NR	IN	
29	TI-k-3	Y	S	Ask - is it a	3 points at board	<5	AP	- Multiple interactions
30	TI-k-3	Y	S	Ask - its got wheels is it a *points at CB*	3 grabs toy truck then points at board	5-10	AP	
31	TI-k-3	N	S	share info - this one is a police car		NR	AP	
32	TI-k-3	Y	S	Ask - what have you got there	3 points at board	<5	AP	
33	TI-k-3	Y	S	Ask - driver??	3 points at board	<5	AP	
34	TI-k-3	N	-	-	3 takes toy from k		n/a	can't tell - points to wheel maybe?
35	TI-k-3	Y	-	-	3 does not respond	NR	n/a	can't hear / see
36	TI-k-1	Y	T	Instruct – finish activity	1 begins to pack up	<5	AP	
37	TI-p-1	Y	T	Instruct – finish activity	1 begins to put cars on box then stops	<5	AP	
38	TI-p-1	Y	T	Instruct – finish activity	1 begins to pack up and p helps	<5	AP	

39	TI-p-1	Y	T	Instruct – all finished; toilet	1 puts box away and goes to the toilet	<5	AP	
40	TI-p-3	-	T	Instruct – toilet	P pulls 3 up and 3 walks out	O	O	
41	TI-h-1	-	T	Instruct - stop	1 stopped speaking	<5	AP	*Morning Tea 1 way saying 'stop'*
42	TI-h-1	Y	T	conversation – 1 sandwich	1 said "sandwich"	<5	AP	1 was saying one sandwich before this interaction and pointing at H
43	TI-h-1	Y	T	conversation –sandwich	1 said "eat a sandwich"	<5	AP	
44	TI-h-1	Y	T	Instruct – eat sandwich ready set go	Echolalia and taps on CB After ready set go reaches for sandwich but doesn't pick it up	<5	IN	

45	SI-h-1	Y	-	Unknown - 1 taps CB and says ”1 sandwich’	H - yup ready?	<5	AP	
46	SI-h-1	Y	-	Unknown - 1 taps CB and says ”1 sandwich’	H - yup 1 sandwhich	<5	AP	
47	TI-h-1	Y	S	Share info – H says "look... Knife"-	1 says ‘knife…' taps the board then 'sandwich first’ H says “ yup sandwich first I will get a knife’	<5	AP	H eventually cuts sandwich
48	TI-h-1	Y	T	Praise – good eating		NR	AP	
49	TI-h-1	Y	S	ask – yummy or yucky sandwich		NR	IN	
50	TI-h-1	Y	S	ask - is it yummy	1 - responds yucky on CB	<5	AP	
51	TI-h-1	Y	T	conversation - I think its yummy		NR	IN	
52	TI-h-1	N	T	conversation - silly		NR	IN	Echolalia/

53	TI-h-1	Y	T	Instruct – time to eat	1 laughs	NR	IN	
54	TI-n-3	-	T	Instruct – pack up	3 does not comply - n says are you already tired	NR	IN	
55	TI-h-3	Y	S	ask – more or finished	3 chose more and finished	<5	AP	
56	TI-h-3	Y	S	Instruct – choose 1, more or finished	3 chose more and finished	<5	IN	
57	TI-h-3	Y	S	Instruct – more or finished	3 taps on CB then H says “okay your finished’ and takes CB away	<5	IN	3 makes noises and pulls CB to him
58	SI-h-3	Y	-	unknown - 3 taps on CB	H says what 3 is tapping on CB “who, who, no’ then taps who	<5	AP	

59	SI-h-3	Y	-	unknown - 3 taps on CB	H says what 3 is tapping on CB "what…when…where'	<5	AP	
60	TI-h-3	Y	S	ask – more or finished	3 taps on CB	<5	AP	
61	TI-h-3	Y	S	ask – more or finished	3 taps on CB H repeats what he tapped "How… "	<5	IN	
62	TI-h-3	Y	S	ask – more or finished	3 taps on CB and P physically assists 3 to tap finished and H takes CB away	O	O	3 makes noises and reaches arms out either side after CB is taken away
63	TI-p-3	N	T	Instruct – clean up		NR	IN	
64	TI-p-1	Y	T	praise		NR	AP	
65	TI-p-3	N	T	Instruct – stand up		NR	IN	

66	TI-p-3	Y	T	Instruct – stand up	3 stood up with prompting from P	5-10	AP	Looked briefly after p got his attention After 3 stood up p took chair away
67	TI-p-3		T	Instruct – go that way		NR	IN	Recess
68	TI-h-3		T	Instruct – reading is finished (counted 10 to 1)	3 took h hand and followed	<5	AP	*Classroom*
69	TI-h-3		T	Instruct – sit	3 does not comply	NR	IN	
70	TI-p-3		T	Instruct – stop then choose 1 (cushion) to sit down	3 chose orange cushion	<5	AP	
71	TI-h-3	Y	T	Share info - video 'we are doing the cat came back'		NR	AP	
72	TI-p-class	-	T	Share info – finishing art	P brings out hair dryer	n/a	AP	

73	TI-k-1	-	T	Share info – hair dryer	1 does not respond	NR	AP	
74	TI-p-class	-	T	conversation – oh no its broken	3 got interaction/play	N/A	N/A	
75	TI-k-1	-		can't hear				
76	TI-p-3	-	T	share info - Ready set go	3 got play	NR	AP	
77	TI-p-3	-	T	share info - Ready set go	3 got play	NR	AP	
78	TI-k-1	-	T	conversation – slow one (car)	K walked away	NR	IN	
79	TI-p-3	-	S	Ask - colour	3 chose Orange	<5	AP	
80	TI-p-3	-	S	Ask – more orange	3 – no	<5	AP	
81	TP-p-3	-	S	Ask – colour		NR	IN	

82	TP-p-3	N	S	ask – red, blue or yellow		NR	IN	evetually used h/td
83	TI-p-1	-	T	Instruct – do art		NR	IN	
84	TI-p-1	Y	S	Instruct – colour, ‘red, yellow, blue, orange’ ‘you choose’	1 tapped the table	<5	IN	
85	TI-p-1	Y	T	Instruct – ‘you choose’	1 chose red	<5	AP	
86	TI-p-1	Y	T	Share info – little squeeze		NR	AP	
87	TI-p-1	Y	S	Ask – more red or different colour	P grabs 1 hands and tells 1 to stop	<5	IN	1 seems to be tapping the board a lot

88	TI-p-1	Y	S	ask – colour different or same	1 chose orange then P tries to physically prompt but 1 pulls away	<5	AP	P goes to the colours in the jar to ask the question
89	TI-p-1	Y	T	share info – stop (blowing hair dryer)	P stops it after 3 sec NR	NR	AP	
90	TI-p-1	N	T	Share info – that's yellow		NR	AP	Prior P asks yellow or orange and 1 chooses yellow jar while saying orange
91	TI-p-1	Y	S	ask – colour (orange or bule)	Tried to choose something else on board (p was blocking other options)	5-10	O	P points to colour jars then 1 responds
92	TI-p-1	N	T	conversation – we made green	1 says "I made" pauses then says "green" with P as she points to green	<5	AP	

93	TI-h-3	-	T	Instruct – be quiet	Play/ quiet down	N/A	N/A	
94	SI-h-3	Y	S	Instruct	Play – tickled	<5	AP	play
95	TI-h-3	Y	S	Ask - More yes or no	3 answered no (pointed) and h took board away	<5	AP	3 began making noises
96	TI-h-3	Y	S	Ask – did you actually want more	3 pointed to yes & more	<5	AP	3 grabs at board at h takes it away
97	SI-h-3	Y	S	instruct - yes more fast - multiple taps-slow-multiple taps	H initiation - next event	<5	AP	
98	TI-h-3	Y	S	ask - fast or slow	3 tapped slow then got slow tickles	<5	AP	

99	TI-h-3	Y	S	Ask – more yes or no	2 tapped more then yes then fast and slow together multiple times	<5	AP	Got fast then slow tickles
100	TI-h-3	Y	S	ask -more	3 tapped turn then turned the fringe words over	<5	AP	Before 3 was hovering finger over board
101	SI-h-3	Y	S	instruct - Points to Tt then Ii then Cc; Kk; Ll; Ee. Then Ss	H responds ‘tickle’ Then ;tickles’	<5	AP	
102	SI-h-3	Y	-	unknown - Taps ‘turn’	H ‘you wanna tickle h?’ 3 nods	<5	AP	H puts hands down by 3 and doesn’t do anything (has hands near h hands though) h then tickles 3
103	TI-h-3	Y	S	Ask – h turn for tickles or 3 turn for tickles or are you finished		NR	IN	was looking initially but then turned away

104	TI-h-3	N	S	Ask – are you finished	H grabs thing 3 is looking at and directs attention to board	NR	IN	
105	TI-h-3	Y	S	ask -more or finished	3 taps up and fast together multiple times H then grabs 3 hands and pulls up fast	<5	AP	
106	SI-h-3	Y	S	Instruct – taps slow and down multiple times	H turns 3 around and pulls 3 fast up then puts slowly down	<5	AP	H Verbally asks 1 more and 3 nods
107	TI-h-3	Y	S	ask – what next	3 makes noises	NR	IN	3 went to use board but h used
108	TI-h-3	N	S	ask – are you finished or do you want more	3 makes noises then another coreboard sits on 3's face	NR	IN	

109	TI-h-3	Y	S	ask -more or finished	3 flips through fringe words and taps ‘Vv’ h goes to grab V toy	<5	IN	does not when h asks but afterwards
110	SI-h-3	Y	-	unknown – Vv; Oo	H – v and o - vo	<5	AP	
111	TI-h-3	N	T	conversation - v and o is vo or o v is ov		NR	IN	
112	TI-h-3	N	T	conversation – coreboard in face aha that’s silly	Play	NR	IN	
113	TI-h-3	N	S	ask – oh no, where is [S3]	Play	NR	IN	
114	TI-h-3	Y	S	ask – do you want T I C K L E S yes or no	3 taps 3	<5	IN	

115	TI-h-3	Y	S	ask - 3 tickles yes or no	3 taps 1 then 2 then 3 then 4 then 5	<5	IN	
116	TI-h-3	Y	S	ask - 5 tickles yes or no	3 taps yes then reaches for fringe words; they flick through a few then stop	<5	AP	
117	TI-h-3	Y	S	ask – 5 tickles ready	3 taps 6 then 7, 8, 9, 10, 11 then h and 3 counts until 40	<5	IN	
118	TI-h-3	Y	S	ask – 40 tickles yes or no	3 taps 40	<5	AP	
119	TI-h-3	Y	S	ask – 40 tickles yes or no	3 taps yes then 40 then gets 40 tickle	<5	AP	
120	TI-h-3	N	T	conversation – lots of tickles		O	O	

121	TI-h-3	Y	T	Instruct – activity finished time to pack up the alphabet	3 shuffles alphabet and points to it	<5	IN	
122	TI-h-3	Y	T	share info – play later		NR	AP	
123	TI-h-3	Y	T	Praise - for low five		NR	AP	

Table 5

Session 5 Raw Data

Event	Teacher or student use (TI or SI, TP or SP)	Look at board (Y or N)	Opportunity or need for communication	Function or purpose	Consequence of coreboard use	Latency	Response appropriate (Y, N, O, N/A)	Notes
1	SI-p-1	Y	-	can't see - p moved forward and held 1's hands (stop from picking at lips) p let go and 1 tapped board	p may not have seen - hard to tell - her hand was on his hand	NR	n/a	
2	TI-p-1	-	T	Instruct – sing	1 did not sing	NR	IN	*Classroom*

3	TI-p-1	Y	T	Instruct – stop	Touches boards and says “hands down and stop”	<5	IN	1 goes back to picking at face
4	TI-p-1	Y	S	Instruct – how about you do something different; no big squeeze, something different	Didn’t respond on CB but on card strip less than 10 big squeeze	<5	IN	P suggests wiggly dance and they do one
5	TI-p-1	Y	T	conversation - we did something different	P says good job and moves on	O	O	
6	TI-p-class	-	T	Share info – calendar	Change date on whiteboard	n/a	N/A	
7	TI-p-class	-	T	Share info – calendar	P Started counting	n/a	N/A	
8	TI-p-class	-	T	Share info – calendar	Nil	n/a	N/A	

9	TI-p-1	-	T	Instruct – stop	Continued with activity	N/A	N/A	Hard to tell if 1 stopped
10	TI-p-class	-	T	Share info - 4 sleeps left until birthday	writes on white board			
11	TI-p-class	-	T	Share info - counting down to Pepsi's birthday	writes on white board			
12	TI-p-class		T	Share info - counting down to student's birthday				
13	TI-p-1	N	T	Instruct -stop	1 keeps muttering/ talking; P continued with activity	NR	IN	
14	TI-p-class		T	Share info - birthday countdown				

15	TI-p-class	-	T	Instruct – chairs to tables	Only 1 did chairs to tables after 10 seconds	n/a	N/A	
16	TI-p-2	-	T	Instruct – go (exercise)		<5	AP	Physical assisting in response
17	TI-p-2	-	T	Instruct – 7 (keep exercising); your turn	P assisted with pointing on how to exercise	<5	AP	
18	TI-p-2	-	T	Instruct – 8	P assisted with pointing on how to exercise	<5	AP	
19	TI-p-2	-	T	Share info – 9	P assisted with pointing on how to exercise	<5	AP	Eventually needed physical assistance to respond
20	TI-p-2	-	T	share info – 10	2 got reinforcement (high five) and a biscuit	N/A	N/A	CB used as 2 was doing the behaviour Biscuit was delayed
21	TI-k-1	Y	T	Instruct – get up	K pulled 1 up	O	O	

22	TI-k-1	Y	T	Instruct – get up off green stool	K pulled 1 up	O	O	
23	TI-p-2	Y	T	conversation – silly billy (from hiding marshmallows)	2 laughs	<5	AP	Multiple interactions
24	TI-p-2	Y	T	conversation	2 got play	NR	IN	
25	TI-k-2	Y	T	conversation – circle (train tracks)	2 shows plaster and k says to put it in the bin	<5	AP	
26	SI-k-2	Y	-	Unknown - Tapped bed on CB	K says “bed, 2 do you wanna go to bed”	<5	AP	

27	TI-k-2	Y	S	Share info – taps 2 face on CB then hovers over other core words without tapping	2 taps H face on CB and k says ‘ h isn’t here”	<5	AP	
28	TI-k-2	Y	S	ask – 2 sleepy	2 chooses bus	5-10	IN	
29	TI-k-2	Y	S	ask – 2 come in the bus or the car; come with mum or grandma	2 taps grandma no then taps mum then yes	<5	AP	
30	TI-k-2	Y	T	conversation - K says ‘maybe mum will pick you up’ while tapping car		NR	IN	from last interaction

31	TI-k-2	Y	S	ask – what should we do… then what should we do with that (toy vehicle)	2 puts toy on track	<5	AP	
32	TI-k-2	Y	T	conversation – number 2 (vehicle)	2 taps swimming	<5	IN	
33	SI-k-2	Y	S	conversation – 2 tapped hurt	K says ‘ is 2 hurt’	<5	AP	
34	SI-k-2	Y	-	Unknown – 2 taps 2 face on CB	K taps 2 face and hurt and where	<5	AP	
35	TI-k-2	Y	S	Ask - K taps 2 face and hurt and where	2 taps “unhappy face” then flips through fringe words and stares at peoples faces	<5	AP	follow on from last event

36	SI-k-2	Y	-	unknown – 2 taps 3 face on CB	K says ‘ 3 must be sick’ after flipping through words for a while	<5	AP	
37	SI-k-2	Y	-	unknown – taps know	K says ‘ that’s a different know, not like that one’ tapping no	<5	AP	
38	TI-k-2	Y	T	share info – no is different to know	2 taps 'big' k says ‘big. Not the word’	<5	AP	
39	TI-k-2	Y	T	share info – 2 letters 4 letters	2 taps big	<5	AP	
40	TI-k-2	Y	T	ask – what is big	2 taps know	<5	AP	
41	TI-k-2	Y	S	ask – who is big	2 reaches to chose girl then k taps and says ‘girl’	<5	AP	
42	TI-k-2	Y	S	ask – is the girl big	2 taps something on board (can’t tell) and k goes to the toys	<5	n/a	

43	TI-k-2	N	T	Share info – number 2 (train)		NR	AP	
44	TI-k-2	N	T	share info -1		n/a	N/A	2 puts #2 train on #1 train as the interaction is initiated
45	TI-k-2	N	T	share info - 1, 2, 3 (train)		-	-	
46	TI-k-2	N	T	Ask - ‘how about 4’ and taps 4 and puts up 4 fingers in front of 2	2 adds another toy to the train that is not #4 but is a 4th train	<5	AP	
47	TI-k-2	Y	S	Ask – who is that (toy doll)		NR	IN	At 10 sec 2 lightly hits toy with board
48	SI-k-2	Y	-	unknown – 2 taps something on board	K asks ‘is it a girl’ while tapping it ‘or a boy’	<5	AP	

49	TI-k-2	Y	S	Ask - K asks ‘is it a girl’ while tapping it ‘or a boy’	2 taps mum	<5	AP	follow on from last event
50	TI-k-2	Y	S	Ask – is it 2’s mum	2 taps mum then no … then grandma then yes. K taps and says ‘grandma’	<5	AP	
51	TI-k-2	Y	T	conversation – grandma is looking good		NR	IN	
52	TI-k-2	Y	S	Ask – is she jumping	2 taps hurt then taps 2 face on CB k asks is 2 hurt	<5	IN	

53	TI-k-2	Y	S	Ask – is 2 hurt then points at hand then taps hand on CB	2 shows hand with scab and k taps and says ‘hand’ or 'foot’ then 2 shows foot	<5	AP	
54	TI-k-2	Y	T	Share info – foot	2 Taps something on board (k didn’t see)	5-10	AP	
55	TI-k-2	Y	S	Ask – girl got a dress on or ----	2 leaves	NR	IN	
56	TI-n-2	Y	T	conversation – look there is a fire engine (book)	puts face right next to book	<5	AP	
57	TI-n-2	Y	T	conversation – oh no there is a fire	2 flips pages	NR	IN	

58	TI-n-2	Y	T	conversation – there is no fire at the moment		NR	IN	
59	TI-n-2	Y	T	Share info – finished (book)	2 flips page	NR	AP	
60	TI-n-2	Y	T	conversation – thank you for saving us (book)	2 points to book	<5	AP	
61	TI-n-2	Y	T	conversation – thank you (book)	2 flips page	NR	IN	

62	TI-n-2	Y	T	conversation – putting all the ((inaudible)) inside (inaudible)) - book	2 taps on book	<5	IN	
63	TI-n-2	Y	T	Share info – counting people in book		NR	AP	
64	TI-n-2	Y	T	share info - that is a cow (book) - there is 1 cow and 1 horse (book)		NR	AP	
65	TI-k-1	Y	T	Instruct – tidy up	1 begins to puts toys away	<5	AP	

66	TI-n-2	N	T	conversation – taps all		NR	IN	
67	TI-n-2	Y	T	Instruct – activity is finished; time for toilet then morning tea	N puts board away	NR	IN	
68	SI-k-1	Y	S	Instruct – open (says please and taps board)	K taps what on board multiple times	<5	AP	Morning tea
69	SI-k-1	Y	S	Instruct – open (says please and taps board)	K says what and gestures to the table	<5	AP	

70	TI-p-1	N	T	conversation – 2 sandwiches yum	K puts lid on lunch box and P says 2 sandwiches save the rest for lunch	NR	IN	Echolalia from P
71	SI-k-1	Y	-	Unknown – says ‘save rest for lunch’ while pointing at CB randomly (stimming??)	K pats 1 on shoulder and walks away	<5	AP	
72	TI-n-2	Y	T	conversation – taps and says no, that was yucky then taps yucky	2 laughs and then grabs board and taps yucky and then no	<5	AP	

73	TI-n-2	Y	T	Instruct – stop that (burping) then taps yucky	2 laughs then taps something on board; n taps and says no; 2 taps no	<5	AP	
74	TI-n-2	Y	T	Instruct – n taps and says no	2 taps yucky then no	<5	AP	2 reached for board first but n used it
75	SI-n-2	Y	S	conversation - taps yucky then no	N (in the middle of 2 interaction) taps yucky and says ‘yeah that’s yucky’	<5	AP	
76	SI-n-2	Y	S	conversation - taps yucky then no	N (in the middle of 2 interaction) taps yucky and says ‘yeah that’s yucky if you do it again I will take your ginger bread away’	<5	AP	

77	TI-n-1	Y	T	Praise – that's awesome you've eating sandwich	N left and 1 continued to drink water then n offered bar from 1 lunch box; 1 put lid back on lunchbox (didn't take bar)	NR	AP	
78	TI-n-1	Y	T	Instruct – finished then tidy up	1 does not comply	NR	IN	1 starts engaging in giggling and putting hands to face
79	TI-p-1	Y	T	instruct - wait to go outside	1 runs/ pushes away	NR	IN	Recess 1 ran back to class
80	TI-p-2	Y	-	-	-	-	-	unsure - can't see
81	TI-p-2	Y	S	Ask – would you like a nap then taps yes	2 nods and taps something on CB	<5	AP	

82	TI-p-2	Y	T	Share info – first we do ((inaudible)) then ((inaudible))	2 looks around	NR	AP	Does tap board after 10 secs 25;49 - 26;01

Table J6

Session 6 Raw Data

Event	Teacher or student use (TI or SI, TP or SP)	Look at board (Y or N)	Opportunity or need for communication	Function or purpose	Consequence of coreboard use	Latency	Response appropriate (Y, N, O, N/A)	Notes
1	TI-p-3	Y	S	Ask – are you sure yes or no; you really want a hip bump yes no	P prompted 3 to look at board	NR	IN	*Classroom*
2	TI-p-3	Y	S	ask– yes or no	3 taps yes on CB and gets a hip bump	<5	AP	
3	TI-p-3	Y	S	Ask – slow or fast; fast and big or fast and little	3 taps fast	<5	AP	

4	TI-p-3	Y	S	Ask – I know fast but fast and big or fast and little	3 taps big and fast then little and slow then up and down then turn around then go and stop	<5	IN	
5	TI-p-3	Y	T	share info – ready steady go	P did fast and big hip bump then slow and little hip bump then went down then up then down then turned around then hip bumped	<5	AP	
6	TI-p-3	-	T	Instruct - your turn		NR	IN	
7	TI-p-1	Y	S	Ask – have your fingers been in your nose yes or no	1 taps ‘something different’ on CB P says ‘something different or the same’	<5	IN	
8	TI-p-1	Y	S	Ask – are you doing something different or the same	1 turns to H and says to be squeezed	<5	AP	

9	TI-h-1	Y	T	conversation – but that's the same	1 turns back to P and she asks to chose from strip; 1 chooses elbow bump	NR	IN	
10	TI-p-1	Y	T	conversation – oh so you chose something different	P does elbow bump with 1	<5	AP	
11	TI-p-2	Y	S	Ask – how is your friend	2 taps happy birthday on HTD	<5	IN	
12	TI-p-2	Y	S	conversation – so look, good morning to 2's friend (toy 2 is holding)	2 waves the dolls hand	<5	AP	
13	TI-p-class	-	T	Share info – yesterday it was Monday		n/a	N/A	Interrupted by student
14	TI-p-class	-	T	Share info – yesterday it was Monday and it was 2's birthday		n/a	N/A	

15	TI-p-class	-	T	Share info - today is	1 says ‘today is Monday tomorrow is Tuesday’ P says ‘today is Tuesday, you’re right 1’	n/a	N/A	
16	TI-h-1	Y	T	share info – Tuesday		NR	AP	
17	TI-h-1	Y	T	share info – calendar		NR	AP	H following P
18	TI-p-class	-	T	Share info – calendar		n/a	N/A	
19	TI-h-1	Y	T	share info – calendar		NR	AP	
20	TI-h-1	Y	T	share info – calendar – 4 sleeps until holidays	1 says ‘four’	<5	AP	

21	TI-h-1	Y	T	share info – calendar – 4 sleeps until holidays		NR	AP	
22	TI-p-class	-	T	share info - P - 3 school days left of term (counting down)		N/A		
23	TI-p-class	-	T	share info - P - yesterday 3 sleeps till N bday now 2 sleeps		N/A		
24	TI-h-1	Y	T	share info – calendar	1 says ‘two sleeps’	<5	AP	
25	TI-p-class	-	T	share info - P - 5 sleeps to students birthday today there are only 4		N/A	N/A	
26	TI-h-1	Y	T	share info – calendar		NR	AP	
27	TI-h-1	N	T	Share info - calendar is finished		NR	AP	

28	TI-p-class	-	T	Instruct – time for chairs to tables	1 and 2 put chairs to tables <5 3 does not	n/a	N/A	
29	TI-p-2	Y	T	Praise – that's awesome	Got high five	<5	AP	
30	TI-p-1	Y	T	Praise – that's awesome	Got left alone	NR	AP	
31	TI-h-3	-	T	Instruct – your turn	3 got pulled up by h and p to do exercise	O	O	3 did not respond
32	TI-p-3	N	T	Praise – that's awesome	3 moved arms up and down behind him	NR	AP	
33	TI-h-3	Y	T	Praise – good work	Got high five	<5	AP	
34	TI-h-3	Y	T	Instruct – activity has finished	Got balloon taken away	NR	AP	
35	TI-p-1	Y	T	Instruct – time for 1 video; choose go noodle (video)	1 went to toy cars and pulled them out	NR	IN	
36	TI-h-3	Y	T	Ask– dance	3 tapped walk on CB	<5	IN	
37	TI-h-3	Y	T	share info		NR	AP	

38	TI-h-2	Y	T	Instruct – if you want doll then dance; lets go		NR	IN	
39	TI-h-2	Y	T	Instruct – lets go	H takes doll and goes to dance	NR	IN	
40	TI-h-2	Y	T	Praise – good work		NR	AP	
41	TI-p-class	-	T	Instruct – activity finished; its time to sit down		n/a	N/A	1 sits down
42	TI-h-2	Y	T	Instruct – sit down	2 sits down	<5	AP	
43	TI-p-1	Y	T	Instruct - turn around	1 turns around and crawls to sit in front of P	<5	AP	
44	TI-p-class	-	T	share info – counting rulers 'I have got 1, 2, 3, 4, 5 rulers and 1, 2, 3, 4 are different'	-	N/A	N/A	Interrupted by student
45	TI-p-class	-	T	Share info – counting rulers 'and 2 are the same'	P shows rulers to everyone	N/A	N/A	

46	TI-p-class	-	T	Share info – showing rulers to class ‘they’re different. Well, they’re both bule but that one has got a big crocodile on it’	Showing/comparing rulers to class	N/A	N/A	
47	TI-p-class	-	T	Conversation – whether rulers give the same or different measurement	P gets whiteboard to write down measurements	N/A	N/A	
48	TI-p-class	-	T	Share info – rulers are different but measured the same	P shows the rulers and emphasis that although they are different they measured the same	N/A	N/A	

49	TI-h-2	Y	S	Ask – do you think it is going to be different or the same	2 taps different and same	<5	IN	
50	TI-h-2	Y	T	Instruct – choose one different or the same	2 taps the same	<5	AP	
51	TI-k-3	Y	S	ask – do you think its going to be the same or different		NR	IN	Another student is using the CB at this time
52	TP-k-3	Y	S	Ask – do you think its going to be the same of different	3 points to CB but P says no you are not going to the toilet chose 1 please	<5	IN	
53	TI-h-2	Y	T	Instruct – down	2 stops what they were doing	<5	AP	
54	TP-k-3	Y	S	Ask – do you think its going to be the same of different	3 taps on board and starts making noises	<5	IN	

55	TI-k-3	Y	S	Ask – same or different (p says ‘choose one please after)	3 tries to stop k from using board	<5	IN	
56	TI-k-3	Y	S	Ask – same or different (p says ‘choose one please)	3 is attempting to stop tapping the board by grabbing k hands and is making noises	<5	IN	3 starts making louder noises and then p moves on to another student
57	TI-p-1	Y	S	ask – same or different	1 taps same then p measures with ruler	<5	AP	
58	TI-p-class	-	T	conversation – it’s the same		N/A	N/A	
59	TI-p-class	-	T	conversation – it’s the same		N/A	N/A	
60	TI-p-1	Y	T	conversation – it’s the same again		NR	IN	
61	TI-h-2	Y	S	ask – same or different	2 taps different and same	<5	IN	

62	TI-h-2	Y	S	instruct – choose one different or the same	2 taps bad	<5	IN	
63	TI-h-2	Y	S	instruct – different or the same	2 taps different and same	<5	IN	
64	TI-h-2	Y	S	Instruct – choose one	2 taps different and same	<5	IN	
65	TI-p-1	Y	S	Ask – do you think its going to be the same or different	1 says ‘yes sandwich’	<5	IN	
66	TI-h-2	Y	S	Ask – different or the same	2 taps different	<5	AP	
67	TI-p-1	Y	S	ask – no not a sandwich, the same or different	1 looks away	NR	IN	
68	TI-h-2	Y	T	conversation – you say different	H pauses briefly before taking CB away	O	O	

69	TI-p-1	Y	S	ask – no not a sandwich, the same or different	1 say ‘hands down’	<5	IN	
70	TI-p-1	Y	S	ask – yes hands down, the same or different with the ruler	1 begins to tap the board and p says ‘stop’ and takes 1 hand away from CB	<5	IN	
71	TI-p-1	Y	S	Ask –the same or different with the ruler	1 taps fringe words and p starts to flip through them and then taps one. P tries to gets 1 attention but he doesn’t look. P moves on.	<5	IN	
72	TI-p-1	Y	T	Instruct – you can go use the cars	1 went to toys	<5	AP	
73	TI-k-2	Y	S	conversation – read book	K turns pages	NR	IN	

74	TI-k-3	Y	T	Instruct	3 chose 1	<5	AP	K asked multiple times before response
75	TI-k-2	Y	T	conversation		<5	AP	Faces in book
76	TI-h-3	N	S	ask	3 had negative behaviour	NR	IN	intraverbal
77	TI-n-3	N	T	-		NR	N/A	
78	TI-n-3	N	T	-		N/A	N/A	
79	TI-n-3	Y	S	ask	3 answered 2 – "wrong start again"	<5	AP	intraverbal
80	TI-n-3	N	S	ask	Interactions with P, K, and N happened which resulted in 3 having negative behaviour and then 3 got play then went to the loo	NR	IN	intraverbal
81	TI-p-2	Y	T	Instruct – go to the loo	2 went to the loo	<5	AP	
82	TI-p-2	Y	T	conversation		NR	IN	

83	TI-n-3	Y	T	Instruct – stop	N blocked 3 to stop what they were doing	O	O	
84	TI-h-2	Y	T	Share info - reprimand – don't hit friends		NR	AP	
85	TI-h-2	Y	T	Share info - reprimand – don't hit friends		NR	AP	
86	TI-h-1	-	T	Instruct – sit	1 sat down and got shoe laces tied	<5	AP	
87	TI-p-2	Y	T	Instruct – go to class	Went to class	<5	AP	Recess

Table J7
Session 7 Raw Data

Event	Teacher or student use (TI or SI, TP or SP)	Look at board (Y or N)	Opportunity or need for communication	Function or purpose	Consequence of coreboard use	Latency	Response appropriate (Y, N, O, N/A)	Notes
1	TI-p-3	N	T	Instruct – you turn	-	NR	IN	
2	TI-p-3	N	T	Instruct – you turn	3 tapped activity finished on high tech device	<5	IN	
3	TI-p-3	N	T	Instruct – you turn	P says “activity finished” 3 tapped ‘good morning’ on high tech device	<5	AP	
4	TI-p-1	N	T	Instruct – something different	1 taps and says “the same” and got a hug	<5	AP	

5	TI-p-2	Y	T	conversation – thank you that was a big squeeze	2 said good morning P on H/D	<5	AP	
6	TI-p-class	-	T	Instruct – activity finished and time for next one		n/a	N/A	
7	TI-p-class	-	T	Instruct – calendar	Started calendar	n/a	N/A	
8	TI-k-3	Y	T	share info – calendar		NR	AP	Far away to hear/see but 3 flipped through fringe without making a response

9	TI-k-3	N	T	Share info – activity is not finished	activity continued	NR	AP	3 said activity is finished on HD 3 covers ears with hands
10	TI-p-class	-	T	Instruct – chair to table	1 and 2 did chair to tables <5	n/a	N/A	
11	TI-h-3	Y	T	Instruct – stand up	3 got pulled up	O	O	
12	TI-p-1	Y	T	Instruct – stand up	-	NR	IN	
13	TI-p-1	Y	T	Instruct – turn (foot)	Did exercise and got marshmallows	O	O	Didn't have to responded because they turned his foot

14	TI-p-3	Y	T	Instruct – jump	3 pointed at board	<5	AP	
15	TI-p-class	-	T	Instruct – sit at table	1 went to table <5	n/a	N/A	
16	TI-h-1	Y	T	Ask – colour of cucumber		NR	IN	
17	TI-h-1	Y	S	Ask – yummy or yucky	1 tapped yucky	<5	AP	
18	TI-h-1	N	T	Instruct - bite food	Food touched 1 lips	NR	IN	
19	TI-h-1	Y	T	conversation - yummy	-	NR	IN	
20	TI-h-1	Y	T	Ask – bite, yes or no	1 tapped yes and did not bite	<5	AP	
21	TI-h-1	Y	T	Praise – eating	1 stims on board	NR	AP	

22	TI-h-1	Y	T	Instruct – finished or more	1 said finished and took plate away	5-10	AP	
23	TI-h-1	Y	T	Instruct – toilet	1 went to toilet	<5	AP	
24	TI-h-3	Y	T	conversation – making face with cucumber	3 got play	NR	IN	p was also making fun
25	TI-p-3	Y	T	Instruct – toilet	3 went to toilet	<5	AP	
26	TI-p-1	Y	T	Instruct – wash hands	1 walks away then starts flipping through class CB (stimming?)	NR	IN	
27	TI-k-1	N	T	Instruct	-	NR	IN	
28	TI-k-1	N	-	-		n/a	IN	1 blocked use of CB and got left alone

29	TP-h-1	Y	T	Instruct – activity finished	1 went to morning tea	<5	AP	Grabbed hand and put 1's finger on finished
30	TI-h-3	Y	S	Ask – more	3 tapped yes and got attention/ touched face	<5	AP	
31	TI-h-3	N	T	Instruct – finished	3 shakes head (stimming)	NR	IN	
32	TI-h-3	N	S	ask – finished yes or no	-	NR	IN	
33	TP-k-3	N	S	ask	3 turns water bottle around and makes noises	NR	IN	

34	TI-k-3	N	T	Instruct – want water bottle open	-	NR	IN	K eventually opens water bottle and 3 immediately began to drink out of it
35	TI-p-3	Y	T	Instruct	-	NR	IN	
36	TI-p-3	Y	T	Share info – p turn finished	3 starts bouncing	NR	AP	