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COMMUNICATION THROUGH PLAY

Playing to learn: Learning to TALK

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'*We love the fact she can learn through play, because she is learning but not realizing, and she does not feel pressurized to learn*' (parent of a child with neurodiverse developmental disorders [NDD]). Engaging children with NDD in meaningful learning can be challenging, and that challenge is exacerbated when children are neither motivated nor equipped with the skills to facilitate engagement. Communication barriers hinder learning, and children with NDD need extra support to develop language skills. This action research promoted communication competence through structured interventions, consolidated via play. The findings confirmed that progression in spontaneous communication and interaction interrelates with creative play. An innovative structured teaching approach, including video-modeling, was devised and named total augmented language and key skills (TALKS). This research affirms that changing the learning environment by employing an integrated teaching model involving connectivity and adopting TALKS. enhances a whole-school approach to communication competence for children with NDD.

Key words: **neurodiverse development disorders, communication competence, play, action research**

Research context

This action research was conducted over one academic year in a special school in East England, working with ten children with NDD. The school embraces alternative educational development and is aspirational in promoting personalized learning for neurodiverse needs among its school population. Having seen a significant increase in children with medically complex needs and *comorbid* autistic traits in recent years, a whole-school curriculum

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review was undertaken to ensure fitness for purpose. The review identified teaching inconsistencies in developing children's communication skills in class and across the school. Various interventions were in place but were fragmented and lacked cohesion. Being critical to children's attainment and present in all aspects of curriculum delivery (Peterson et al., 2016), this action research aimed to identify an original and comprehensive whole-school approach to teaching communication skills. Using play as the medium to measure children's progress, impacts of specific interventions were evaluated. The overall aim was to enable children with NDD to become effective intentional communicators, developing communication competence and, subsequently, ownership of their life choices.

Research rationale

Communication competence is acquired through social participation at school and home, and offers the potential to increase achievement, social mobility and life chances (Dockrell et al., 2011; Hartshorne, 2006; Reitemeier & Blatchford, 2020). Successful communication competence involves skills and abilities in receiving and processing information and conveying meanings to others. Meanings are shared through speaking, gestures, body language, writing, vocalizations and facial expressions (Bloom, 1993).

Skills in communicating intent and sharing meanings are fundamental in the early stages of every child's development (Buckley & Schofield, 2017; Trevarthen, 1998). In 2019, at the end of the early years foundation stage, 28% of children in England had not achieved the expected levels of development within communication, language and literacy (Department for Education [DfE], 2020a). In addition, after autism (30%), speech, language and communication needs have been identified as the second-most prevalent need (15%) (DfE, 2020b) in formal assessments (education, health and care plans).

Strategies to reverse these trends are supported by the view that a command of language and being able to express oneself effectively are fundamental to success in school and later life (Gibbard & Smith, 2016). Identifying difficulties in communication early can trigger interventions that are vital for a child's continued language development (Law et al., 2015), and while some children may catch up, others can continue to experience difficulties into adulthood (Allen, 2011). Competency for individuals with complex communication needs is a more dynamic interpersonal construct, based on the functionality of communication; the adequacy of communication; and sufficient knowledge, judgment and skills (Light, 1989).

Communication usually involves two people – a listener and a speaker – and a chain of interlinked processes that enable understanding and the conveyance of messages. Acquiring communication competence is a complex process, dependent upon one's attention span, working memory, and receptive and expressive language skills because the social intent to convey meaning is intertwined with both sensory and cognitive capabilities (McLachlan et al., 2013; Thompson, 2016). Difficulties in one area impact upon other aspects of the communication chain (Asmussen et al., 2018). Learning to communicate begins before birth with hearing within the womb. A young infant, without hearing or sight impairments, quickly learns to pay attention to what they can see and hear (Atkinson, 2014). Processes of developmental change follow with typically older children being more accomplished in their cognitive domain than younger children (Bjorklund, 2018; Ginsburg & Koslowski, 1976). However, children with NDD are characterized by slower developmental rates with deliberation continuing as to whether there are critical learning periods – phases when they are better prepared or able to master skills associated with early language acquisition (Tamis-LeMonda et al., 2001).

Lenneberg et al. (1967) first implied that language learning needs to be completed by puberty, while others (Krashen, 1973; Pinker, 1994) suggested that language acquisition is compromised if not achieved by the age of six. More compelling evidence suggests that language learning is a fundamental continuous process, and that *interventions for both speech and language should ideally start in the first year of life, be intensive and continue into adulthood (Buckley & Schofield*, 2017; Rodríguez-Fornells et al., 2009).

Early forms of communication are learnt through social interaction and play. 'To a child play is work. It helps build mind, body, behavior and when it comes to playful learning, the earlier *this commences*, the better' (Swartz, 2004, p. 17). Play typically presents before nine months and establishes turn taking, where exchange and anticipation of what is about to happen next are rehearsed through familiar routines. Words learnt through play link directly to daily experiences and become representative of a child's immediate and familiar world (Mathieson, 2013). Environmental influences through social interactions clarify language stems and promote functional language use. Social interaction facilitates the progressive process of language acquisition, enabling development from preverbal interaction to phonological awareness and competence in communication (Tomasello et al., 2005). Play promotes interaction and engagement, enabling a systematic

process of learning, incorporating both assimilation of new knowledge through experiences, and accommodation of that knowledge into a child's existing internal organized patterns of thought and behavior, known as schemas (Pizzo & Bruce, 2010). Schemas are represented as repeated patterns of behavior in a child's play. When appearing to be testing boundaries, children are using play to build learning structures, forging connections in their brains, thus enabling future learning and development (Nutbrown, 2011). Play skills acquired from approximately two years of age are limited only by a child's experience and imagination.

Sheridan (1993) discussed different developmental hierarchies of learning to play from exploratory play (developing the integration of gross and fine motor skills and sensory processing) through to increasingly intricate and complex co-operative play with others (Craig et al., 2018). By contrast, some argue that instead of linear development, children can be involved in multiple kinds of play (Kernan, 2007) moving rapidly from one type of play to another (Hughes, 2002). While children may show a preference for one type of play, it is important for them to experience various types of play to support holistic learning and develop well-being, identity, a sense of belonging, communication, exploration and thinking skills (DfE, 2017).

Communication competence is facilitated through play, providing learning opportunities to focus attention, shifting between objects of play and individuals. Children typically demonstrate integrated attention to various play tasks/skills from six years of age. For atypical children, acquiring listening and attention skills is a longer process. Attention is also challenging if the requirement is to focus on something given rather than arising from personal interest. Play facilitates choice and decision making, reaffirming the social nature of learning (Smith & Pellegrini, 2013). Play enables young people to establish a sense of who they are and learn social skills, such as co-operation, empathy and respect (Dunn & Cutting, 2001).

Consideration should also be given to children's capacity to store and retrieve information underpinning their ability to transfer language and social skills to different settings (Cowan, 2014). A child's ability to retain and recall verbal sequencing, a key component of Buchsbaum's (2016) working memory model, facilitates or hinders communication competence. Sheridan, M. (1993) Spontaneous Play in Early Childhood, from Birth to Six Years. Routledge Archibald (2016) reviewed the impact of working memory on language learning, concluding that there is a symbiotic relationship between working memory and language learning.

Limitations in working memory might hinder decoding linguistic detail, and poor language knowledge places greater demands on working memory for retaining unfamiliar phonological information. Lockhart (2010) discussed the development of key cognitive functions, such as working memory, through a 'plan, do and review' approach to play, providing opportunities for children to tap into their working memory and articulate their ideas, choices and decisions.

Recognizing that the challenges in being an effective communicator increase for children with NDD, opportunities are required for children to rehearse and transfer their learning, and play is an ideal medium to do this. Play is integral to a child's growth and development, offering multiple benefits. The most influential gift we can give a child is a healthy concept of play. By carefully observing play and noting any changes in what children do and how they communicate, it is possible to identify if learning has occurred. This research set out to identify how communication competence is enhanced through teaching strategies reinforced through play for children with NDD.

Method

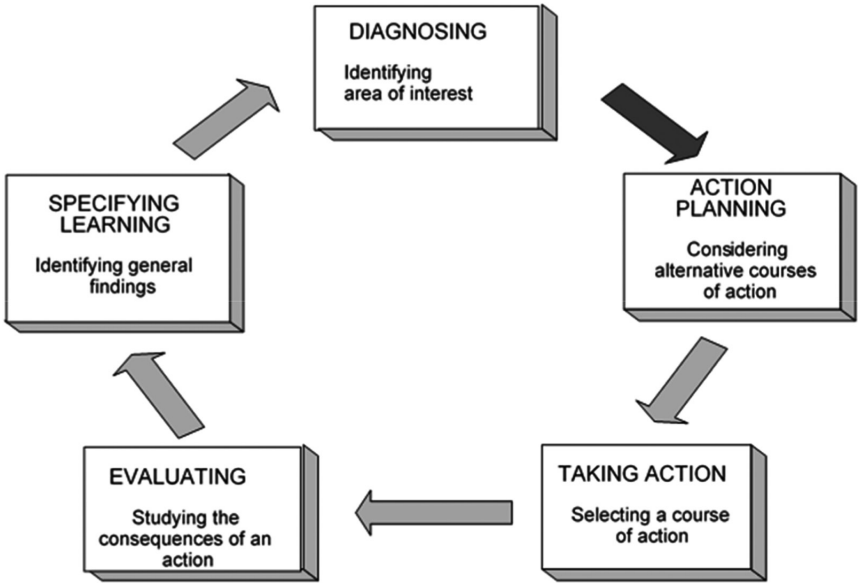
This action research set out to 'learn as we do' and explain findings of interventions implemented over the course of one year, teaching a class of ten physically and neurodiverse pupils, aged five to eight. As 'processors of the curriculum' (Hargreaves, 1978), class-based practitioners (one teacher, four teaching assistants) trialed a series of different interventions 'following up hunches on ways of coping' (Barton & Walker, 2007, p. 341) with communication difficulties observed in children's learning. Interventions were adapted through three cycles of diagnosis, action planning, doing, evaluating and specifying learning gained (Susman, 1983) (Figure 1).

Diagnosis and evaluations were supported by formal assessments of communication competence, completed at the start of the research.

Three communication checklists were used:

1. typical chronological developmental milestones for language and communication, subdivided into listening and attending, understanding, speaking, and social development (I CAN, 2012);
2. a vocabulary checklist of our first 120 words;
3. an interaction and play checklist (Down Syndrome Education [DSE], 2012).

Figure 1: Action research model



The first two assessments were completed for all ten children at the outset by the supporting speech and language therapist. Progress was measured against these three checklists at each review stage of the three cycles, and the results were categorized into three areas: preverbal, limited speech or developing speech.

- Video recordings (VRs) – towards the end of each cycle, five-minute VRs were taken, every half hour over one school day to capture the children at play. Each series of 12 VRs from each cycle was analyzed to identify the percentage of time each child engaged with different types of play (see Table 1, adapted from McLachlan et al., 2013).

The participants were also assessed informally through:

- class-based observations;
- parents' informal observations identifying any changes in their child's communication and language skills, evidenced through home-based play patterns.

Table 1: Types of play

Category	Descriptor(s)	Examples
Non-play	Challenged behaviors	Various behaviors deemed as non-play or unsocial
Exploratory play	12 months: understanding of everyday objects	Using objects appropriately and extending understanding to objects beyond their personal 'items'
	15 months: recognition of character dolls (large doll play)	Using dolls to represent people and act out daily routines with real objects. Usually solitary
	18 months: symbolic play (small world/ book corner)	Recognizing miniature representation. Demonstrating an understanding that an object or picture can symbolize another. Usually solitary
	Two years: joining of two play sequences	Beginning to establish an understanding of the world. Usually parallel to peers
	Three years: start of role play	Dressing up of real or imaginary people – an important stage for social and emotional development
Co-operative play	Four years: Co-operative and socially interactive with peers	Engagement of various self-directed play with peers; starting to develop roles

At the end of each 'doing' stage of the three cycles, an illuminative evaluation framework (Parlett & Hamilton, 1976) was used to analyze and interpret the data, establishing a deeper understanding of the value of promoting communication through play. This illuminative evaluation provided description and interpretation alongside the formal assessments of progress. Emerging patterns of children's communication evidenced through engagement in play informed each subsequent stage of intervention with revised teaching strategies introduced to enhance the children's progress and development.

Identified needs

The specific hunch in this research revolved around recognition that the class of ten children needed support in prerequisite language skill acquisition and in developing a curiosity to learn in order to enhance their communication competence. Initial communication assessments identified that two children had clear speech but presented challenges in retaining

information to relay messages; the other eight pupils had limited or no speech, accompanied by short attention spans and distractibility, characteristic of poor working memory (Alloway & Gathercole, 2006). All pupils required a pedagogy encompassing visual scaffolding, concrete learning materials and multi-sensory techniques. At the outset six children understood single information words but were inconsistent in following two key information-carrying words within an instruction. They performed better at identifying familiar objects (naming) but were weak with comprehending verbs and other language strands. Individual learning targets centred upon developing attention, speech sounds and understanding information-carrying words.

Findings

Planned interventions: cycle 1

To develop a communication strategy through play, the first cycle started with classroom changes, creating an enabling environment (DfE, 2017) by setting up dedicated activity areas for reading, circle time, numeracy, role play, small world play, outside play, and craft and sensory exploration. Children, who used laptops or iPads, had classroom spaces dedicated to assistive technology. The class followed a topic-based curriculum, including specific interventions: cued articulation (Passy, 2016) to support speech mechanics, colorful semantics (Ogg, 2013) activities linked to the class text and the 'see and learn' reading programme (DSE, 2012). A total communication approach, combining Makaton signing and a dynamic communication book to promote engagement in repeated 'make, read, sign/say' processes, was introduced. While routines were maintained during formal learning sessions, children were given increased opportunities to make choices, particularly during introductory play sessions.

The review at the end of the first cycle identified limitations in progress. Changes in 'doing' had been challenging for children, who lacked an understanding of options and decision making, hindering communication development. VR data showed that 'challenged play' (Table 1), a breakdown in a child's ability to progress through play in relation to individual growth, was significantly higher than time spent engaging in creative purposeful play. Children presented as solitary, disinterested in both small world play and sensory exploration (Tomchek et al., 2018). Concerning behaviors during play were categorized as roaming the classroom, detachment and unfriendliness, rejecting peers, loss of speech or disinterest in communicating. Occasionally, children reverted to comfort behaviors, such

as babbling, single sound repetition or a continuous, monotone sound. They demonstrated disinterest in environmental exploration and limited interaction with resources. Contrary to observations by Wragg (2013), children with NDD needed and sought additional reassurance through staff guidance and direction. The lack of structure for play sessions also impacted upon staff confidence and required the staff to adopt different communication partner skills to develop and support a child-led learning approach. In conclusion Cycle 1 had not significantly progressed the children's communication or play skills.

Planned interventions: cycle 2

Pedagogical changes with targeted strategies promoting communication alongside sensory processing needs (problems with balance, spatial awareness and sensitivity to different environmental stimuli) were established with sensory circuits at the start of each school day (Horwood, 2009). The sensory circuit model was based on a sequential framework design – alert, organize and calm. Circle time followed and the children used personalized daily visual schedules to provide structure. Targeted daily language and literacy session were delivered, incorporating cued articulation, see and learn and colorful semantics. Additional calming resources and movement breaks, weight therapy, and tactile and rhythm routines (Stewart, 2020) were also introduced.

This cycle was significant for the changes in class dynamics, with a shift from a dependency culture towards independence; the staff signposted rather than led activities. Focused topic areas were maintained, but daily routines were revised. A clearer structure to affirm a play ethos was integrated into classroom practice. 'Free' play was limited to the end of learning sessions, and children finished each day with one hour of 'free' play. However, analysis of VR data from the second cycle identified that the children still required occasional supportive directions during free play to help them focus on turn taking and sharing in order to reduce quarrels between peers. The need for clear routines and the predictability of 'what comes next' in Cycle 3 could provide increased security and children's confidence in engagement with learning (Bird, 2016).

Planned interventions: cycle 3

With a strong focus upon promoting meaningful communication through play, the teaching interventions introduced in Cycle 2 were refined for the last cycle. Connecting visual cues and articulated words throughout the day and

during play sessions was key. Planned time on structured tasks was incrementally increased, and children were motivated with opportunities 'to go and play'. Connectivity between sessions was achieved by adapting class-based activities, building upon the children's familiarity with strategies introduced in Cycles 1 and 2.

Teaching resources included electronic writing tools (CrickSoftware, 2021) augmented-reality tools and video-making software to develop literacy skills.

The following specific interventions were included:

- Colorful semantics techniques – subject (orange), verb (yellow), object (green) and place (blue) – support connectivity in developing language through visual cues. Resources were labeled with the corresponding color-co-ordinated language cues. Colors related to 'doing' and 'transition' were added to the daily visual schedules;
- Visual scaffolding approaches to developing language skills were supported by cued articulation (Passy, 2016) to enhance speech clarity, focusing upon the mechanics of communication. Video inserts, emphasizing the mouth, were added to augmented video-modeling resources based upon 'see and learn' reading tools.
- Sensory communication resources through touch and music were used (Stewart, 2020).
- Video-modeling facilitated independence in speech and self-help skills. Color coding (objects [green] and verbs [yellow]) was repeated in the modeling to support connectivity in understanding semantics. A close-up on the mouth pronouncing the word was incorporated into each skill video. Stills from the videos were converted to word banks using the color coding system;
- For every sensory story, topic-based activity and exploratory learning sessions, word banks were created to reinforce spoken language with visual cues. Children experimented with word banks to rehearse unfamiliar words and joining words together. Extended use of word banks and repetition aided language comprehension.
- Visual scaffolding of four-part sentences was implemented into conversation diaries, encouraging sentence construction and language rehearsal through make, read, say/sign, do approaches.
- Intensive interaction (Nind & Hewitt, 2001) was employed for those at pre-intentional communication stages to rehearse and develop the fundamentals of communication.

- The classroom layout was modeled upon the principles of the treatment and education of autistic and related communication-handicapped children (TEACCH) (Siegel, 2003) with clear visual signing to help maintain routines.
- Targeted intervention sessions ended with social turn-taking games, selected to build engagement through anticipation and surprise elements.
- Role play (holding a tea party), using Numicon to revise number concepts or small world scenarios using 'little people' playsets, required symbolic understanding and sequencing to convey meaning.

Cycle 3 proved to be the most illuminating. Revisions in connecting planned interventions through colorful semantics and video-modeling proved successful in promoting children's self-confidence regarding communication and independence. Seven of the children began to engage autonomously in small world play, evidencing developing abilities in symbolic play, simple sequencing, and importantly, emerging communication skills. Simple two-word sentences were used more frequently. The children's experiments with language expanded to greeting staff and peers by name. Colorful semantics-coded word banks supported communication; the children now used language to explain their feelings and behavior. Moreover, the children were more responsive to their learning environment and initiative-taking in social engagement. One video observation captured a verbal peer interaction with a friend with limited speech using 'talk-tubes'. A short conversation comprising closed questions and answers resulted in a spontaneous request to go and play, which the two children then did. Another child, who regularly presented with the enclosure schema (emptying and filling boxes with toy train equipment) during free play sessions progressed to engaging with different objects, and when playing with farm animals, he used the corresponding animal sounds. His play became more organized and expressive, building towers and spontaneously using words from the 120-word checklist. Parental feedback supported this: '*He is turn taking and playing with figurines more*.' Another parent posted a video clip in their son's online journal showing him engaged with small world play and playing collaboratively with his siblings. By the end of Cycle 3, the children had progressed from using single words to beginning to combine words/signs. They demonstrated increased and sustained engagement with structured tasks, free play activities and circle time. All the children were engaged for 20 minutes in literacy sessions and participated in group social games.

Results

At the end of each cycle, VRs were analyzed to identify if changed engagement in types of play (Table 1) contributed to communication development. Engagement was recorded as a percentage time for each child and then calculated for the whole group (Table 2).

The data were also analyzed to identify changes in types of play over the three cycles (Table 3).

The interpretation of the VR data suggested that the children's engagement in creative play increased over the three cycles and that non-play behavior decreased. Introducing more structure to daily timetables and organizing play-related

Table 2: Engagement with types of play/cycle

	Non-play behaviors	Exploratory play	Co-operative play
Cycle 1	62%	38%	0%
Cycle 2	32%	68%	0%
Cycle 3	27%	70%	3%

Table 3: Engagement in different types of play

	(% time engaged/five-minute recording)		
	Cycle 1	Cycle 2	Cycle 3
Play behavior			
Large doll	11	12	13
Small world play	3	8	20
Reading corner	16	15	12
Role play	5	33	18
Sensory play	0	0	7
Co-operative play	0	0	3
Non-play behaviors			
Roaming	16	6	4
Unfriendliness	6	3	6
Rejection of peers	6	9	3
Lack of environmental exploration	21	8	9
Limited interaction with resources	11	6	5

activities around 'plan, do and recall' supported progress. In addition, developing 'regulation' sequences for on-task behavior during Cycle 2 helped the children focus and adapt their learning patterns. The 120-word checklist evidenced individual progress in spontaneous language for all the children (Table 4).

Changes in social interaction and communication through creative play were also observed at home. One parent said, '*We are so pleased he is coming home and playing more with his sisters*.' Another parent reported that their child was '*role playing school and describing how she is learning*'. In Cycle 3, longer periods of parallel play and sharing of space and resources were observed. Significantly, the children played co-operatively, worked as a team and supported each other during different activities. They worked co-operatively in the reading corner, although sharing books still required occasional staff intervention. The children had progressed to greater independence, sought less adult guidance or reassurance, and, as one parent observed, her daughter '*wants to read all the time*'.

Communication competence was increasingly demonstrated through play, with significant outcomes observed in the children's ability to produce language on demand. One child who had previously struggled to respond to any interactions was observed using communication for meaning during role play. Another child who used little speech at the beginning of the year and was reliant on his picture exchange communication system (PECS) (Bondy & Frost, 1985) developed clearer comprehension and use of speech, although he still gave only one-word responses to most questions (Table 5).

Use of cued articulation strategies, incorporated into video-modeling, drew the children's attention to specific mouth shapes and helped them produce different sounds evidencing intent to communicate. Videos that portrayed skills and symbol vocabulary were followed by a close-up of the mouth pronouncing the word. These unique visuals engaged the children and encouraged imitation of the targeted vocabulary. Life skill recordings included familiar adults in familiar settings conducting focused skills, such as toothbrushing. Videos were used as scaffolding and played while rehearsing skills. iPads, attached to bathroom walls, reinforced personal hygiene routines.

Validation of the interpreted VR data was confirmed by the end of year I CAN language checklist assessments (Table 5), and as one parent said, '*He is talking much more*.'

Table 4: Progress in spontaneous language

	120 words checklist								
	Cycle 1			Cycle 2			Cycle 3		
	Understands	Imitates	Spontaneous	Understands	Imitates	Spontaneous	Understands	Imitates	Spontaneous
Child A	120	120	92	120	120	105	120	120	113
Child B	120	120	116	120	120	118	120	120	120
Child C	83	26	18	87	31	18	96	47	27
Child D	111	67	54	120	73	57	120	76	63
Child E	68	37	22	72	56	46	93	74	67
Child F	71	28	18	83	32	26	96	44	31
Child G	54	15	10	74	21	17	102	27	19
Child H	68	23	11	69	25	16	82	31	26
Child I	32	8	3	34	8	3	38	11	4
Child J	19	4	1	22	4	1	27	5	3

Table 5: Assessing communication competence

Communication level	Typical chronological stages I CAN (2012) Communication chart	No. of children: Baseline assessment	No. of children: End assessment
Preverbal	Up to three months	0	0
	3–6 months	0	0
	6–12 months	1	1
	12–15 months	2	1
Limited speech	15–18 months	4	1
Developing speech	18 months–2 years	0	3
	2–3 years	3	1
	3–4 years	0	3

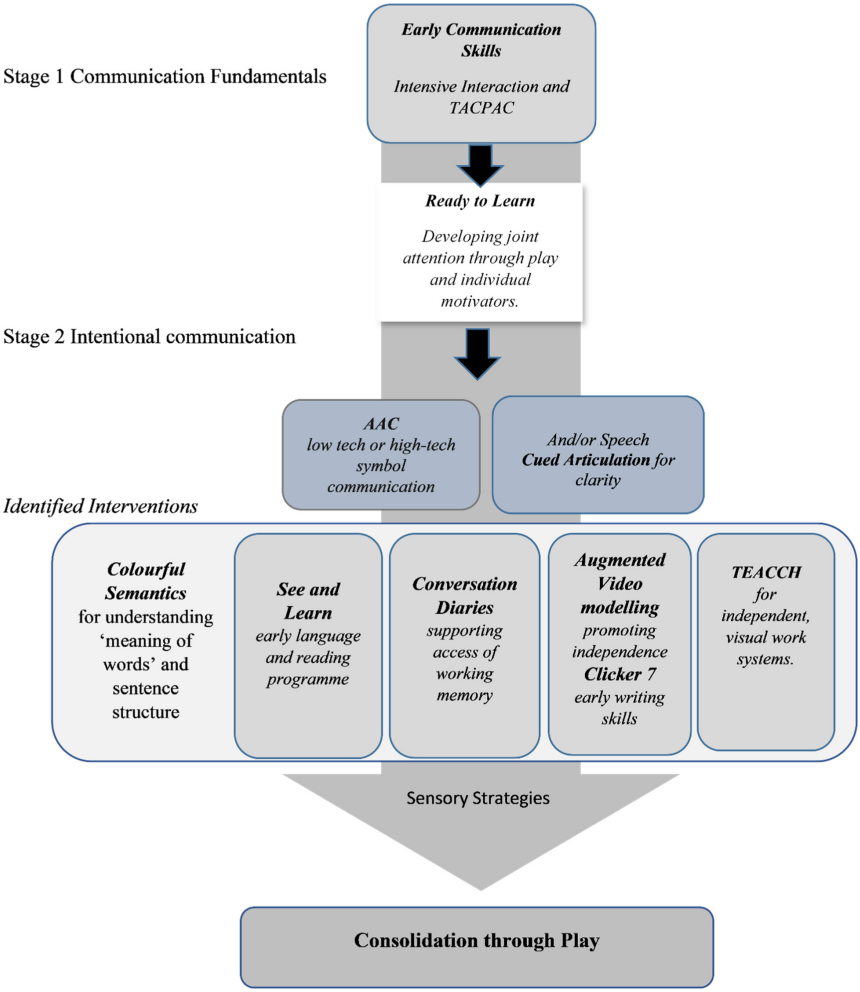
Assessments confirmed that eight students' communication skills had progressed by one developmental stage (I CAN assessment). One student progressed by two stages; however, another remained within the same stage. The final 120-word checklist assessment revealed that the children's understanding of words and symbols remained comparable with the baseline data, although improvements were identified in their verb comprehension. Significant improvements were observed in both spontaneous use and imitation of language, signifying progression in the children's expressive abilities.

Discussion

By revising the curriculum and pedagogical approach to facilitate communication competence for children with NDD, the findings of this research provide solutions to address the complexities of impaired sensory processing that can delay progress and achievement for children with NDD. Getting these strategies correct was essential for supporting children to communicate. An individually tailored sensory intervention to develop readiness for learning increased the children's ability to attend (Council for Disabled Children, 2020). Skills in interpreting and processing their world resulted in an increased curiosity to engage and interact with their learning environment. Through a process of following hunches and adapting delivery over the course of a year, a differentiated communication model, underpinned by meeting sensory differences, evolved (Figure 2).

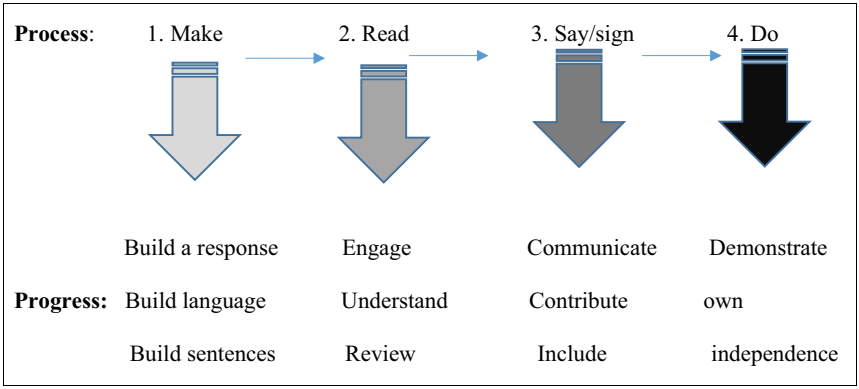
Designed as a progressive teaching process, the connectivity model provides a holistic whole-school approach to teaching and developing communication

Figure 2: Connectivity model



competence for children with NDD. It moves from sensory differentiation to equipping children with the fundamentals of communication towards being competent intentional communicators. Adopting and adapting connected learning interventions is recognized as key to engagement where progress through communication stages is consolidated through play. This connected

Figure 3: TALKS – A whole-school approach



approach, developed around the young person and their everyday routines, builds schemas for communication, and total augmented language and key skills (TALKS) emerged as an excellent process to guide whole-school planning and teaching for communication development (Figure 3).

Planning and connecting specific interventions using the four elements of TALKS – make, read, say/sign and do – provides a multi-sensory pedagogy to develop communication skills for children with NDD. First, making visual scaffolding for language building reduces the pressure on working memory by providing sequence structure. Second, enabling children to understand or 'read' how to communicate requires a functional symbol system, enhanced through visual modeling, to encourage participation in two-way communication processes. Third, skills in how to communicate (say/sign) need to be rehearsed and technology (such as microphones, iPads and Apple TVs) can enhance this (Aubrey & Dahl, 2014). The use of technical resources needs to incorporate motor development planning and ensure that access to core vocabulary is promoted through simplified operation of augmented resources (for example, through fixed located keys and fringe folder systems). Finally, enabling children to 'do' communication, through video-modeling and interactive visual learning expectations, promotes independence. The innovative creation of video models provides repetitive visuals for rehearsing both speech and life skills.

Connectivity across the curriculum enhances access to learning and creativity (play) provides opportunities to demonstrate and consolidate learning. Initial

hunches based upon a premise that freedom to play facilitates spontaneous play and communication were revised. Children with NDD require focused learning activities and scaffolding to build play confidence and to interact with objects or others. Encouraging schemas of play needs careful consideration to allow sufficient repetition to facilitate natural progression (Hännikainen et al., 2013). Creating the right classroom environment is crucial. Characteristics of effective early learning through open-ended play (role play, small world play) fosters learning power; encourages children to become confident, creative and motivated in exploring their immediate world (Louis, 2013); and most importantly, provides sufficient time to demonstrate spontaneous language. Incorporating 'how to play' sessions through modeling enables learning development and knowledge acquisition. As schemas of play develop, children make connections with the world around them. Increased variations in play behaviors facilitate developments in communication competence with exploratory, symbolic play being most beneficial in developing attention and the social aspects of communication. Connectivity and creativity are complementary processes in a holistic approach to teaching communication.

Whole-school approaches to promoting communication were identified. Colorful semantics was agreed as the visual scaffold to develop language from early years through the key stages to ensure continuity across the school. Video-modeling was innovative in supporting language rehearsal supporting arguments for an ambitious curriculum and providing support and time to learn essential knowledge and skills (Ofsted, 2020).

Conclusion

Neurological differences impact learning in numerous ways. Children with NDD atypically develop in both communication and play, leading to struggles with or the avoidance of social interaction, a lack of empathy and/or problems with interpreting nonverbal cues. Sensory processing difficulties in relation to perception, concentration, memory, co-ordination and control create barriers to successful learning, and children with NDD may act in ways that are counterintuitive to learning within a classroom. Equally, classrooms and methods of teaching need adapting to diverse ways of learning. Children with NDD may also lack intrinsic urges, be hard to motivate and adopt counterproductive strategies to avoid certain types/models of learning. In addition, assessing learning presents challenges where children with communication and physical needs require a longer time to show what they know.

With the intent to promote the communication skills of children with NDD, this action research progressed through three cycles of planning, doing and evaluating, and in doing so identified that enabling children to play is a delicate process requiring cultivation from the outset. Increasing spontaneous interactions and communication can evolve through individually structured routines promoted through play. Building communication competence through learning to play requires nurturing relationships between peers and staff alongside building familiarity with selected resources to promote free choice. Transitioning to free, unstructured activities demands reframing staff roles from directing to guiding. Opportunities to form working relationships with each other as a team and with the children need to be fostered first. Creating the right ethos for developing communication skills through play can present early challenges for both children and staff. However, the staff's skills as communication partners, modeling play and facilitating autonomy, are essential for children with retrieval and working memory difficulties. In addition, this action research identified that when children become engaged in play, classroom anxieties reduce and spontaneous communication increases.

Working from the premise that children with neurodiverse and sometimes complex needs (particularly children identified as having autism and/or Down's syndrome) are predominantly visual thinkers (Bird, 2016; Endow, 2016), learning needs to be structured around multi-sensory activities and facilitated through high-quality differentiated teaching. We conclude that to achieve inclusive practice and provide opportunities that enable children to reach their full potential (DfE, 2015) a connected and creative TALKS approach is worth exploring. The video-modeling element of TALKS offers innovative practice in developing communication.

This action research aided rewriting both the school's communication curriculum and their communication policy. Policy revisions included the connectivity approach, ensuring continuity across the setting and maintaining momentum through the later key stages. Video-modeling was embedded across the life skill curriculum, encouraging learning and retention of vocabulary and skills from early years to sixth form. Continuing professional development was written on the topic of play and was shared with all staff as the medium to assess spontaneity in communication and interaction in learners. An audit of the use of play across the setting is required to assess the impact of the continuing professional development.

Further research into comparative approaches to develop communication competence or to apply these approaches in different settings would help determine the effectiveness of the connectivity model. There are plans to monitor the implementation of TALKS in the school's primary department to aid the development of communication, self-help and independence in children with NDD. Play continues to be on the school development agenda in line with national agendas about how play can promote life skills, literacy skills (speaking, listening, reading and writing) and engagement (Rochford, 2016). Following hunches, thinking creatively and teaching connectively offers opportunities to progress learning to play into learning to talk for children with NDD.

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