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No time for silence, just repeat after me: A three study perspective on teacher and child interactions over time

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ABSTRACT

This paper examines data from three separate studies on teacher-child interactions for evidence of verbal and non-verbal semiotic resources across different times and contexts. Each study utilised qualitative methodologies, employing observations guided by the Classroom Assessment Scoring System® manual and teacher semi-structured interviews. Sociocultural perspectives frame the examination of teacher-child mediations of socially and culturally derived semiotic notions and are used to conceptualise findings. Critical Discourse Analysis highlighted how language and silences in interactions contribute to power structures. The study found that while time and context cannot be causal to change, they do correlate with an increasing focus on literacy and numeracy as well as teacher as expert, and a decrease in child agentic participation and instantiations of silence.

There is a plethora of literature asserting positive teacher-child interactions are the primary mechanism of child development and learning (e.g., Elias, 2006; Pianta, Paro & Hamre, 2008). Key facets of the teacher-child interaction that facilitate learning include warm relationships, teacher responsiveness, and classroom preparedness. Sociocultural theory conceptualises learning as a process that is co-constructed between more- and less-experienced people, hence, learning is viewed as being derived from social origins. Vygotsky (1978) stated all knowledge and higher functions appears twice: first, on the social level (interpsychological) and then inside the child (intrapsychological). The exchanges that occur in social contexts are facilitated by a more knowledgeable other who mediates socially and culturally derived abstract or semiotic notions (Vygotsky, 1978) using semiotic tools and/or signs (resources) with self and others (Wells, 2007). The difference in experience between more- and less-experienced people creates a sense of semiotic challenge which, in turn, motivates the child to redefine how they perceive the activity and come to accept the adult's activity definition (Forman, 2018). From this exchange, only the child experiences an enduring redefinition of activity, and it is this change that defines learning (Wertsch, 1984).

This current paper reports on observations made from three separate studies that examined teacher-child interactions and how these interactions contributed to children's learning and development. In addition to the research design, all three studies utilised the Classroom Assessment Scoring System® manual domain classifications ([CLASS] Pianta et al., 2008) to guide observations. The data reported in this paper are conceptualised through the works of Vygotsky (1978), Wertsch (1984) and Rogoff (1995, 2004). We found that while time and context cannot be causal to change, they do correlate with an increasing focus on literacy and numeracy and teacher as expert. Correspondingly, a decrease in child agentic participation was noted, but more noticeable was a decline in instantiations of silence.

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It is important to begin our discussions with some background on the education context in Western Australia (WA), and as time is key to this paper, a brief historical overview of changes in education is also presented. We then examine the literature that reports on studies investigating teacher-child interactions, with an emphasis on semiotic mediation and resources. The methodology section provides a brief review of the qualitative methodologies utilised in the three different studies and explains how they were used as a comparative in this current study.

1. Background and historical overview

In 2009, the Early Years Learning Framework (EYLF) was introduced to early learning centres (birth to five years) as part of the National Quality Agenda for Early Childhood Education and Care (Australian Children's Education & Care Quality Authority [ACECQA], n.d.). This framework promotes intentional teaching and play-based pedagogies (DEEWR, 2009). While many early years classrooms subscribe to this approach, some have reported a decline in play due to colleagues and leadership staff misunderstanding play-based learning and a "pushdown curriculum" caused by "the early focus on NAPLAN testing, as far down the year levels as kindergarten" (Barblett et al., 2016, p. 38). NAPLAN (National Assessment Program for Literacy and Numeracy) was introduced Australia-wide in 2008 to improve teaching standards across Australia. In 2010, the NAPLAN scores for each school in the years three, five, seven and nine were made publicly available on the *My School* website, which raised concerns about the data being used as league tables to rank schools and high stakes testing (https://www.abc.net.au/news/2010–01–28/my-school-site-can-be-used-for-league-tables/312102).

The EYLF recognises responsive teacher (educator) and child interactions as indicative of quality early childhood education (Department of Education and Workplace Relations [DEEWR], 2009). The framework specifically notes intentional teaching and how this emphasises that "learning occurs in social contexts and… interactions and conversations are vitally important for learning" (DEEWR, 2009, p. 15). It notes the flexibility educators adopt as they move in and out of different roles and their ability to draw from a repertoire of strategies to meet children's learning needs. This definition highlights the inextricable link between learning and the social or interpsychological space where a more knowledgeable other mediates abstract or semiotic notions that are socially and culturally derived (Vygotsky, 1978). In this manner, the adults' interactions are both instructive and intentional.

In 2016, the National Quality Standard ([NQS] ACECQA, 2020) was implemented in all three WA school sectors (Catholic Education WA [CEWA], Association for Independent Schools WA [AISWA], and Department of Education [DoE]) from Kindergarten to Year 2 through the provisions of the School of Education Act 1999. This document was designed to create a shared language and drive continuous improvement and quality provision of early childhood education and care (ACECQA, 2020; Barblett & Kirk, 2018). NQS in school contexts is unique to WA.

In WA, Kindergarten (children turning four by June 30) is non-compulsory and guided by the EYLF (DEEWR, 2009) and the Kindergarten Curriculum Guidelines. As Kindergartens in WA are attached to primary schools, they come under the School Education Act 1999 (Barblett & Kirk, 2018). In 2013, Pre-primary (children turning five by June 30) was made compulsory. This program is guided by the principles and practices of the EYLF and the Western Australian curriculum guidelines (School Curriculum and Standards Authority, n.d.). In WA, quality in both Kindergarten and Pre-primary is driven by the NQS (ACECQA, 2020). Fig. 1 summarises the changes in early childhood education over recent years and plots the points in time that data were collected.

The following literature review examines different views on teacher-child interactions beginning with an introduction to the sociocultural lens adopted for the study.

2. Teacher and child interactions: a sociocultural perspective

Situation definition is the way people (i.e., teacher and child) in a setting or context define (represent) that setting – it refers to their

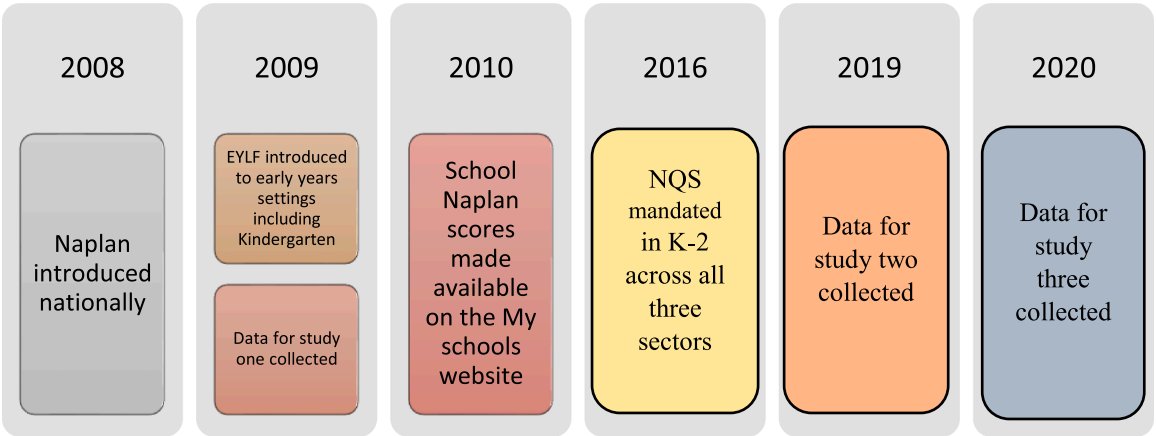

Fig 1. Changes in early childhood education between 2008 and 2020.

intrapsychological knowledge and is a subjective view (Wertsch, 1984). In the zone of proximal development ([ZPD] Vygotsky, 1978) there is a difference between the child's actual level of development and the adult's level of development which Adachi (2021) explains as the child having one situation definition, and the adult having another. To operate together, there needs to be a third situation definition created - the intersubjective situation definition, where the child and adult engage in mutually agreeable interactions that promotes and extends the child's ways of thinking.

Intersubjectivity takes place when the teacher and child share the same definition of an activity and know they share the same definition (Wertsch, 1984). To share the same definition, the teacher needs to accept an activity definition that is not their own, and with this adaption can moderate their interactions to support children to accept more mature expressions of the activity. It is a context where teachers are attuned to children's strengths and misunderstandings and respond accordingly. Ideally, the intersubjective situation is the typical teacher and child interaction, and is created through semiotic mediation (Wertsch, 1984). The ability to share children's perception of reality enable teachers to be responsive and "respectfully enter children's play and ongoing projects [to] stimulate their thinking and enrich their learning" (DEEWR, 2009, p. 15).

Semiotic mediation refers to the cultural mediation of internalising knowledge "through acts of semiosis" (Hasan, 2012, p. 80). This definition highlights the inextricable link between learning and the interpsychological space where a more knowledgeable other mediates abstract or semiotic notions that are socially and culturally derived (Vygotsky, 1978). Understanding culturally and socially derived semiotic resources and what they look like enable a structure from which to examine teacher-child interactions. These resources include language (Kress, 2009; Vygotsky, 1987), make believe play (Vygotsky, 1978), self-talk (Vygotsky, 1987), gestures (Basilio & Rodriguez, 2017; Kress, 2009), gaze, timing, (Kress, 2009; Rogoff, Paradise, Mejía Arauz, Correa-Chávez & Angelillo, 2004), haptics (Taylor, 2014), external objects to prompt memory (Vygotsky, 1987) and Interactive Whiteboards (IWBs) (Jones, Kervin & McIntosh, 2011). It is observed that the gaps and silences during semiotic mediation are "instantiations of the work of semiotic modes other than language" (Taylor, 2014, p. 401). Often during teacher-child interactions semiotic signs are made to support and facilitate meaning making in that moment, for that context (Kress, 2009).

2.1. Examining teacher and child interactions

2.1.1. Tools measuring semiotic mediators

The Classroom Assessment Scoring System® manual ([CLASS] Pianta et al., 2008) presents an instrument that is used internationally to assesses quality of teacher-child interactions in Pre-primary (5-year-old children) to Year 3 (8-year-old children) (e.g., United States, United Kingdom, Australia and Finland). The instrument is organised under three domains, Emotional Support, Classroom Organisation and Instructional Support. Under each of the domains are dimensions that contain a set of respective behaviours. In this paper our perception is that the behaviours identified in CLASS are semiotic resources and by viewing the manual through the lens of semiotic signs and tools, we can highlight certain insufficiencies of the CLASS instrument.

We suggest the organisation of these semiotic resources (behaviours) under the three discrete domains is inadequate in capturing interactions promoting higher order thinking. This is mostly apparent in the Instructional Support domain that is designed to examine "the ways in which teachers implement whichever curriculum they are using to effectively support cognitive and language development" (Pianta et al., 2008, p. 5). Instructional Support behaviours by which quality cognitive and language development support is rated, are almost exclusively reliant on verbal scaffolds, which in turn, may explain why many studies report lower than expected Instructional Support scores (e.g., Kirk, Knaus, & Rogers, 2022; Thorpe, 2021; Ying Hu, Fan, Yang & Neitzel, 2017). Wood, Bruner and Ross (1976) rationalized that teachers utilise semiotic resources to scaffold children's understanding in activities at times when the children could no longer work independently. Scaffolding was observed by Wood et al. as responsive to children's strengths, skills, and knowledge which enabled mature expressions of the activity to be practised. Noticing children's lack of understanding is mostly characterised as a non-verbal semiotic resource which is rated in Pianta et al. (2008)) CLASS manual under the Emotional Support domain. While silent, it ensures the appropriate scaffolding is given at the point of need, heightening the likelihood of understanding and learning.

There are many other silent, yet salient semiotic resources that play a crucial role in supporting cognitive and language development that are evident in both the Emotional Support and Classroom Organisation and omitted in the Instructional Support domain. These semiotic resources also aid in cognitive and language development yet are organised outside of this domain (Instructional Support). Moreover, none realise the importance of the silence needed when waiting for children to formulate their thoughts and responses to the questions or problems posed. This is discussed later in this paper when considering the works of Houen, Danby, Farrell and Thorpe (2016) and Houen, Danby, Farrell and Thorpe (2019).

2.1.2. Language as a semiotic resource

Vygotsky (1978; 1987) placed greater importance on language than other semiotic resources explaining that "through speech children free themselves of many of the immediate constraints of their environment" (1978, p. 126). Once internalised, speech becomes integral to higher psychological processes as it facilitates the organisation, unification, and integration many disparate aspects of children's behaviours, "such as perception, memory, and problem solving" (Vygotsky, 1978, p. 126). Pianta et al. (2008) recognise speech as a primary mechanism for facilitating children's learning. Chiefly, they examine language as is it is used to support analysis and reasoning, creating, integrating, connecting with the real world, scaffold, engage in feedback loops, prompting thought processes, providing information, encouraging and affirming, engaging in conversation, questioning, repeating and extending, using self and parallel talk and advanced language (Pianta et al., 2008). Collectively, these semiotic resources are classified in the CLASS manual as 'Instructional Support' and is often rated lower than the other the other CLASS domains (see Kirk, Knaus, & Rogers, 2022; Ying Hu

et al., 2017).

Situations enabling semiotic mediation, require purposeful experiences that engages both the adult and child. Two moments we will share here are sustained shared thinking (United Kingdom Effective Provision of Pre-School Education [EPPE] Project, Sylva, Melhuish, Sammons, Siraj-Blatchford & Taggart, 2004) and the adoption of 'I wonder …' formulations as described by Houen et al. (2019), 2022). The EPPE project (Sylva et al., 2004) examined effects of pre-school education (ages 3 and 4) through the primary entry testing (rising 5) and in Years one and two (ages 6 and 7). Overall, 3000 children participated in the projects, and 12 classrooms with exemplary child outcomes were studied intently. It was through these intensive cases the researchers found there were a select group of pre-schools that valued "educational and social development as complementary and equal in importance" resulting in children making greater developmental gains (Sylva et al., 2004, p. 56). Specifically, the researchers noted that in highly effective classrooms there was a consistent presence of 'sustained shared thinking'.

Sustained shared thinking (SST) is when "two or more individuals 'work together' in an intellectual way to solve a problem, clarify a concept, evaluate an activity, extend a narrative etc. Both parties must contribute to the thinking, and it must develop and extend the understanding" (Sylva et al., 2004, p. 5). Children in classrooms typified by SST were found to make the most progress. In a later study, Siraj-Blatchford (2009) found SST shared some theoretical similarities with the educator's support within the ZPD (Vygotsky, 1978), the notion of guided participation as described by Rogoff et al. (1993), scaffolding (Wood et al., 1976) and others including mutualist and dialectical pedagogy.

Houen et al. (2022) recognised the importance of rich conversational experiences between adults and children to promote children's learning and well-being. The authors underpin the notion of rich conversations with SST (Siraj-Blatchford & Manni, 2008), as well as dialogic- (Nystrand, 1997), or reciprocal- (Bateman, 2015) interactions. Their study consisted of a systematic review of published peer-reviewed studies with the intent of identifying "strategies to support educators in fostering rich conversations with children aged 2–5 years in ECE settings" (p. 3). Seven key strategies in rich conversations were identified a commonly recognised by the literature in the systemic review, which included using a range of strategies during an interaction; questioning, including closed and open ended as well as "I wonder … "questions; contingent responses to children's talk; tone and affect; pausing and pacing; personalising and co-authoring, and peer to peer communication (Houen et al., 2022). In an earlier paper, Houen et al. (2019) found that "I wonder…" questions were effective in disrupting the teachers' expert status and enhancing child agentic participation. Teachers in these situations asked a question without any preconceived knowledge, and as such, enter conversations.

2.1.3. Gaps and silences: semiotic modes other than language

Just as language is a powerful semiotic sign, so are tools and nonverbal signs necessary for enabling learners to "become more efficient in their adaptive and problem-solving efforts" (Vygotsky, 1978, p. 127). Gestures that accompany speech, for example, play an important role in supporting children to navigate increasingly complex communications (Stanfield, Williamson & Özçalişkan, 2014). Kress (2009) explained that an "ensemble of signs" (p. 58) work cohesively in meaning making, and in the process of making meaning, all signs and in all modes are important. He emphasised the importance of the 'prompt', e.g., a gaze, a gesture or touch that supported the sign maker (in this instance, the teacher) in making meaning explicit to the addressee (the children). As signs are made in situ, they are socially derived, and their meanings are shared by each of the social actors.

Rogoff et al. (2004) examined the use of active observation and listening in intent participation activities. *Intent participation* is contrasted with *assembly-line instruction* and how learning is organised under the roles taken by "more- and less-experienced people, the motivation and purposes of activities, the source of learning (observation in ongoing activity or lessons), forms of communication, and the nature of assessment" (p. 12). The authors state that assembly-line instruction, which is based on transmission of information from experts (audible semiotic resources), is more commonly researched as it is a more familiar education approach. The risk of an over-emphasis on one style of learning deemphasises the importance of lesser-known ways of learning including observation and listening-in. Indeed, Mazzei (2003, 2007) observed that qualitative research tends to emphasise voiced utterances at the expense of the non-voiced or silence, which it treats as non-data.

It is argued in this current paper that the rich learning contexts SST (Siraj-Blatchford & Manni, 2008) and the 'I wonder …' formulations (Houen et al., 2019, 2022) described earlier cannot be considered quality due to language alone; rather, quality is assured through a well-choregraphed interplay between verbal (language) and non-verbal (silence) semiotic resources that remains responsive to children's strengths, skills, and knowledge (Kress, 2009; Wood et al., 1976). The effectiveness of these contexts may be due to the interactions that afford responsivity. This responsivity facilitates the tailoring of sign making to meet the learner in ways that have meaning to them and in doing so creates the intersubjective situation (Kress, 2009; Wertsch, 1984).

Observation and listening-in lead to silences that Taylor (2014) identifies as a semiotic resource other than language. Many semiotic resources tend to be silent in nature yet are pivotal to meaning making. Although Taylor's study examined children in Year five in the UK, much of the observations made on semiotic resources in silences are transferable to younger children, possibly even more so as young children work to formulate their perceptions and ways of expressing their understanding. Certainly, an Australian study conducted by Houen et al. (2016) examining teacher-child interactions in nine Kindergarten classrooms (children 3.5 to 5 years) viewed silences or pauses as thinking time, which is like Taylor's perspective that considered silence as integral to mental space. Houen et al.'s study demonstrated the potential of punctuating the silence with an "I wonder …" question which downgraded the teacher's position of knowledge to create an interactional space that displayed the children's knowledge. Using Rogoff et al. (2004)) study to explain this shift, the teacher deviated the pedagogical style away from an assembly line product to an intent participation model where the child is called on to share the meaning they have made from their observations and listening-in. Houen et al. (2022) asserts that for young children, these silences are just as indicative of quality as questioning and feedback.

2.2. Summary of literature

The purpose of this literature review was to examine semiotic resources used in early childhood, particularly how they are represented in CLASS (Pianta et al., 2008) and examined in the literature. Specifically, it sought to delineate between verbal and non-verbal semiotic resources and argued for the relevance of both in the mediation of abstract or semiotic notions. This review highlighted the importance of non-verbal semiotic resources and how silence is essential for young children as they formulate their thoughts and understandings. The importance of verbal semiotic resources is well established in the literature and is more represented in research, which may be due to an uncertainty of how silence is interpreted coupled with the fact verbal semiotic resources are more easily identifiable. What is certain though, is silence can be indicative of quality instruction as teachers respond to children, but it is not catered for under Instructional Support domain in the CLASS instrument (Pianta et al., 2008).

3. Research design

This paper presents data from three independent studies. Common to each study was that they all examined teacher-child interactions in early childhood classrooms and utilised a qualitative case study domains, dimensions and behavioural indicators of CLASS (Pianta et al., 2008) and gathered data through semi-structured teacher interviews. Consequently, these similarities supported a comparison of teacher-child interactions over three different time periods.

The original studies were conducted in 2009 (Catholic Education Western Australia [CEWA] schools) by the lead author, in 2019 (Association of Independent Western Australia [AISWA] schools) (see Kirk, Knaus, & Rogers, 2022) and in 2020 (Department of Education [DoE] schools) by the two lead authors. Vignettes from each of the three studies representing teacher and child(ren) interactions are examined in this current study using a comparative case study approach. Comparative case studies facilitate the identification of patterns across several studies, examining the features of two or more instances of a specific phenomenon that differ in only one or two independent variables (Mills, Durepos & Wiebe, 2010). The case study design facilitated the exploration of complex issues in real-life settings (Crowe et al., 2011). The intention of the study was to examine the following research questions:

1 What verbal semiotic resources are evident across different time and contexts?
2 What non-verbal semiotic resources are evident across different time and contexts?

Vignettes demonstrating teacher and child(ren) interactions were selected from each of the three studies for analysis. The intention of this study was not to compare quality, but to examine differences in teacher and child interactions across time. All studies had ethics permission from the respective universities as well as CEWA, AISWA permissions from the school principals and DoE ethics approval.

3.1. Participants

3.1.1. Study 1

The data for the first study were gathered in 2009 as part of a larger study that examined five teachers (all female) and 130 Kindergarten (four-year-old program) children from five different CEWA schools. This larger study examined teacher and child interactions that supported children's social and emotional development. Data were collected using semi-structured interviews and observations that were framed by the CLASS domains, dimensions, and behavioural indicators (Pianta et al., 2008). In this study, although no CLASS ratings were made, the domains, dimensions and behavioural indicators facilitated comparisons between this study and the two later ones which also used CLASS to inform and guide observations. Data for Study 1 were collected over 10 months, and as

Table 1
Summary of participants categorised by year of study.

Year	Sector	School	Teacher	Students
2009	Catholic	St Matthews	Mia	30
		St Katherines	Kyra	25
		St Orville's	Olivia	31
		St Christopher	Claire	28
		St Hovea	Heather	28
2019	Independent	Everest PS	Kay	24
			Kelly	25
			Amber	22
		Stirling PS	Trish	15
			Jess	15
		Parkville PS	Shaye	13
			Elise	15
2020	Public	Gowan PS	Sonia	17
		Birmingham PS	Amanda	
		Cambridge PS	Jill	23
			Emma	23
		Beldon PS	Fiona	26
			Leanne	22

such only one day is selected for this study (data for Studies 2 and 3 were collected over one day per classroom).

3.1.2. Study 2

The data for the second study were gathered in 2019 and similarly to study one, was part of a larger project. This study examined seven teachers (all female) and 139 Pre-primary children from three different independent primary (AISWA) schools. This larger project also examined teacher and child interactions and data were collected using semi-structured interviews and observations framed by the CLASS domains (Pianta et al., 2008). The researchers in Study 2 were CLASS observer certified and had passed a CLASS reliability test (Kirk, Knaus, & Rogers, 2022); however, these ratings were not used in this current study, only the observations.

3.1.3. Study 3

Study 3 took place in 2020 in Department of Education schools, and like the previous studies the case examined was taken from a larger study. This larger project was designed similarly to the 2019 study and six Pre-primary classrooms (all teachers were female) from four schools participated. Once again, data were collected over one day in each classroom using semi-structured interviews and observations framed by the CLASS domains (Pianta et al., 2008). While CLASS ratings were made, only the observations are considered in this current study. Table 1 summarises the participants from the three studies. Pseudonyms are used to protect schools and participants.

3.2. Data analysis

Data were analysed using Critical Discourse Analysis (CDA) as this approach supports an examination of the relationship between language and educational practices (Rogers, 2004). The CDA approach focuses on power structures, including the power dynamics between teachers and students, and how discourse is influenced by society and culture. In this way, CDA is not concerned with language, but with the societal and cultural discourse that is expressed through language (Titscher, Meyer, Wodak & Vetter, 2000).

Examples of language and interactions typical to the societal and cultural discourses in each classroom were collected and presented as vignettes. Pitard (2016) uses vignettes in her study examining a teacher's cross-cultural awareness to reveal layers of awareness that may have otherwise gone unnoticed. Similarly, vignettes are analysed in this paper to examine the socially derived visible and invisible signs shared between the respective social players (Kress, 2009). Using Hence, by using CDA, the language signs (both non-verbal and verbal) present in classrooms that are indicative of top-down (assembly-line instruction) or flattened hierarchies (intent participation) begins to emerge (Rogoff et al., 2004). In relation to these, instances of the intersubjective situation (Wertsch, 1984), and verbal and non-verbal resources were examined. The intersubjective interactions were studied by looking for instances suggestive of sustained shared thinking (Siraj Blatchford, 2009; Sylva et al., 2004). The semiotic resources explored were made perceptible through the CLASS behaviours identified by Pianta et al. (2008) and the questions and silences described by Houen et al. (2016), 2019) (see Table 2).

Table 2
Examples of semiotic resources (those shown in italics may be both verbal and non-verbal semiotic resources). (Source: Houen et al., 2016; Pianta et al., 2008).

	Verbal semiotic signs		Non-verbal semiotic signs and tools
Instructional Support	Maps own actions with language	Emotional Support	Shows flexibility
	Back-and-forth exchanges		Incorporates students' ideas
	Expansion		*Allows choice*
	Specific feedback		Allows students to lead lessons
	Hints		Physical proximity
	Follow-up questions		*Matched affect*
	Clarification		Eye contact
	Asks student to explain thinking		Physical affection
	Connects concepts		Eye contact
	Problem solving		*Cooperation and/or sharing*
	Prediction/ experimentation		Anticipates problems and plans appropriately
	Brainstorming		Notices lack of understanding and/or difficulties
Emotional Support	*Encourages student talk*		Helps in an effective and timely manner
	Elicits ideas and perspectives		*Acknowledges emotions*
	Verbal affection		Provides individualised support
	Social conversation	Classroom Organisation	Provision of activities
	Respectful language		Students know what to do
	Seeks support and guidance		Subtle cues to redirect children
	Peer assistance		Range of auditory, visual and movement opportunities
Houen et al. (2016)	I wonder…(questions)		Interesting and creative materials
			Hands-on opportunities
		Houen et al. (2016)	Silence following I wonder…(questions)
			- Thinking time
			- Mental space
			- Silence/ pause

4. Results

Critical Discourse Analysis enabled an examination of non-verbal and verbal semiotic mediation that depicted assembly-line instruction (top-down) or intent participation (flattened hierarchy). These two traditions can be distinguished by contrasting the semiotic mediation incidences between more- and less-experienced people, within the motivation and purposes of activities, the source of learning (observation in ongoing activity or lessons), and forms of communication (Rogoff et al., 2004).

In Study 1, Mia from St Matthews appeared to be aligned with assembly line instruction, where the classroom curriculum tended to consist of conversational practices that prepared children for transmit-and-test formats of school such as:

4.1. Vignette 1

> Mia brought out the big book. When she opened the first page one of the girls, Sheryl, yelled out, 'I can see a question mark!' Mia asked the children if she needed to change her voice here, pointing to the quotation marks. 'Yes', they replied. 'Who do you think will be talking next?' Mia asked the children. 'The frog', they replied. Where do I start? And so on (Observation, 29/6/2009).

The St Matthews PS staff did not take a complacent view to their already competitive NAPLAN results, with Mia stating their scores were perceived as "not good enough" (Interview, 2/12/2009). This perception may have explained the more overt use of this assembly line instruction in comparison with the other schools from the 2009 study. However, during recess and lunch time, Mia engaged in more collaborative activity with children, responding to children's curiosities with invitations to co-research with them. For example,

4.2. Vignette 2

> Makenzie stood by Mia for a while until she finally walked over to the rear of the playground and picked up a broken handle. She raced back to Mia with her new find, prompting Mia to ask, 'What do you think it could be?' Makenzie suggested it was a bucket handle, and so together they went through the buckets in the trolley trying to find a bucket with a missing handle (Observation, 14/9/2009).

In St Katherine's PS, the interactions between more- and less-experienced people demonstrated collaboration with others in the social world and hence were more indicative of intent participation (flattened hierarchy). For example, in the following vignette through a well-positioned question Kyra (teacher) invited children into dialogic interactions, claiming an opportunity to promote the sharing of their collective expertise:

4.3. Vignette 3

> Kyra asked Kieran how many pieces of paper he thought he needed to rest his wet construction on. He said 'two'. Kyra nodded and Kieran went and got two sheets of paper and put them on the floor. Kyra asked him if he thought that was going to be big enough. Kieran looked unsure so Kyra suggested they measure. Kieran said he thought he needed one more sheet of paper and placed that down on the ground next to the other two. He tried to pick up his construction, but it was too large. Another boy walked over, and Kyra posed the question: 'what should *we* do?' The boys deliberated on how they were going to move the boxes (Observations, 2/6/2009).

By posing the question in a way that invited discussion, Kyra engaged others in authentic enquiry and modelled collaborative problem solving. Her role as co-researcher typified a flattened hierarchy where she honoured children's symbolisms in her communication with them. For example, the construction mentioned in Vignette 3 was compiled as a signifier of a large rocket (Kress, 2009) and as such, Kyra referred to it as it was signified – as a rocket. Similarly in another instance when a doll was left on the floor, she called out to one the children, "Your baby is crying, you better come and get her". She also acknowledged the symbolism the children attached to other items such as, whoever wore the scarf was the mum and the flowing skirt (from the class dress ups) was 'big sister. In this way, Kyra was observed entering children's play scenarios without interruption to the fluency of the children's interactions and play. Moreover, the signs that were made and understood in this classroom provided shared understandings that unified this social group, providing them with a deeper understanding of each other that an outsider, such as a researcher would not initially comprehend as Vignette 4 demonstrates (Kress, 2009).

4.4. Vignette 4

> Two girls Karen and Kate were sitting talking at the writing table. Karen wore the flowing skirt (hence, big sister) and Kate wore the scarf (mum).
>
> The silence that consumed the girls as they coloured was broken when Karen asked Kate, 'Connor or Jackson…which one would you like to marry?'
>
> Kate thought briefly and then replied, 'Well, I'm definitely not going to marry Jeremy. He's not handsome.'

Karen redirected her, 'Connor or Jackson?'

Kate clarified, 'Are you asking who I'm going to marry in real life or in the game?'

'In the game.'

Kate stated, 'In the game I'll marry Keith, because he's handsome.'

After a while I asked Karen who she would marry. She stared at me, with a look of shock. After a while of awkward silence, I asked who she would marry *in the game*. Once again Karen was uncharacteristically quiet. Finally, with a residual look of disdain, she pointed to Kate. Kate, recognising her cue casually explained, 'Only I get married because she's the big sister.'

(Observation, 12/11/09)

In Study 2 (2019), the three participating schools demonstrated quite different ways of interacting with children. Trish from Stirling PS had a well-prepared classroom where children were given opportunity to autonomously select their preferred activity. While they were engaged in the activity, Trish tended not to interact with them and as such for this time her interactions were neither intent participation nor assembly-line instruction. Later in the day when the two classes combined for literacy instruction, Trish's interactions grew in a more directive transit and test format, but in a way that was responsive to children, for example:

4.5. Vignette 5

Trish noticed the children did not understand the game of find the word, so she adapted it by reading through the words first, then by preparing them, saying "this word begins with a … sound" (Observation, 25/6/2019).

Everest PS (Study 2) also demonstrated transit and test format style interactions in a responsive manner. The following example made in Kay's classroom was typical to all three classrooms at the school:

4.6. Vignette 6

Kay prompts children's thinking by stating "We know this word 'the' we could all think of a sentence". She then looks to the child and asks for her sentence … taking her cue from the silence, she asks the child if she wanted to "phone a friend". After a few rounds around the circle, Kay asked students to turn to their partner and tell them the sentence they are going to write (Observation Everest PS, 11/6/2019 – Kirk, Knaus, & Rogers, 2022).

While the whole group sessions at this school followed transit and test format communication, the class was organised in such a way that there were times for children to break off into small group activities set up around the classroom. During this time, the teachers would walk around asking questions of the children based on what they were investigating.

For Study 3 (2020), all four schools demonstrated different variations of assembly line instruction. Some schools, such as Cambridge PS, also integrated similar small group activities based on children's interests (Study 2, 2019). While only Parkville PS from Study 2 was observed utilising the IWB as a tool for teaching, its use was more evident in the schools participating in Study 3. Using Cambridge PS as an example, Jill utilised the IWB for her literacy session, however, she also incorporated other modalities to engage the children such as encouraging a child to pull a letter out of a box for the others to write it on their mini whiteboards and using Freddie the puppet to introduce letters and sounds (Observation, 26/10/2020).

In Gowan PS, classroom activity was centred around the IWB for the first half of the day. The following was typical of this time:

4.7. Vignette 7

The children sat on the mat, behind them were groups of tables and chairs and in front of them an Interactive Whiteboard (IWB). Their teacher, Sonia, stood on the side of the IWB interpreting the statements that came up on the screen and prompted the children to imitate her. If the children's attention waned, Sonia would call them back with a playful 'aah hem' or pretend cough. After a while of listening and repeating, one child, Evan, stated he was hungry and needed something to eat. Sonia asked Evan if he had attended breakfast club to which he replied he had not. She then asked the Education Assistant seated at the back of the room to make him some toast. Evan sat at the back with the Education Assistant happily eating his toast watching the rest of the class on the mat listening and repeating (Observation Gowan PS, 30/10/2020).

The pace of teaching across the Study 3 schools appeared faster than what was observed in the previous two studies. To cope with this pace, Sonia said in interview that she gave the children a "*variety [of] 'brain breaks' throughout the day to ensure they are not being overloaded with information. I do this in many ways, such as through games, 'Go Noodle' or allowing them to talk freely with their peers" (Interview, 16/11/2020)*. Amanda from Birmingham PS explained that the curriculum was harried due to the extent of curricula to cover. However, all the teachers noted in their interviews the importance of incorporating children's interests to engage them in learning. In Study 3, this was evidenced in Cambridge PS where both Jill and Emma provided time and space for child chosen activities.

5. Discussion

This paper aimed to examine the use of semiotic resources between teacher and children in early years classrooms across time and contexts. The sociocultural theory used to conceptualise this analysis suggests that knowledge is internalised through meaningful teacher-child interactions. These interactions are examined and analysed in the following sections. As time and contexts are the key ideas for analysis, the discussion is organised chronologically.

5.1. Study 1: 2009

In 2009 the EYLF had just been released and NAPLAN had been introduced, but the performance of each school was not publicly available. While all teachers mentioned the importance of demonstrating academic outcomes, Mia (St Matthew's PS) experienced the most overt pressure. She commented on the parent and school expectations for strong performance in the NAPLAN test and tailored her classroom to meet these objectives. Subsequently, from the 2009 study Mia's classroom was ~~more~~ most aligned with assembly line instruction.

Vignette 1 demonstrates how Mia invited interactions with the children to create a space where she could potentially support children to accept mature forms of socially agreed upon text conventions (Wertsch, 1984). Strickland and Morrow (1989) suggest that the teacher-child interactions shown here are indicative of text analysis which proceeds the "reading of a whole text to the analysis of its parts" (p. 139). These interactions are indicative of verbal semiotic resources where the children freely contributed to the learning context with their observations of known reading conventions. The learning in this context is supported by the less obvious non-verbal semiotic resources that are evident through the shared activity and perceived student comfort (Emotional Support, Pianta et al., 2008). Contexts where children feel comfortable to freely participate are conducive to learning, not only because of their active participation, but also because teachers are able to frequently monitor children's knowledge and understanding and provide individualised support at the point of need (Pianta et al., 2008).

However, using CDA as a lens to examine Vignette 1, certain inequities became apparent. For example, Mia utilised verbal semiotic signs to test children's acquired knowledge. This was demonstrated by the 'who' and 'where' questions as opposed to utilising 'why' and 'how' questions that would probe and/or extend concept development (Instructional Support, Pianta et al., 2008). Further, the children's comments that were reflective of their knowledge and interests were not used to prompt thought processes. As such, while there were some intimations of an intersubjective space, according to sociocultural theory, the use of interpersonal interactions and SST would have further maximised learning (Siraj & Asani, 2015; Vygotsky, 1978).

Kyra also experienced some pressure to provide a more formal curriculum. However, she resisted believing that her approach supported children in learning how to learn. The data suggests that Kyra fluidly and seemingly naturally created the intersubjective situation definition. For example, in Vignette 2 Kyra (St Katherine's PS) used verbal semiotic mediation to communicate with children that she shared their situation definition (Wertsch, 1984). The question "what should we do?" disrupted Kyra's role as expert as she invited children who were nearby to assume this role to some capacity. She followed this invitation with a time of silence in which children could engage in planful thinking, proceeded with complex social negotiations as they formulated their solutions.

The silences and pace that typified this classroom facilitated sign making (Houen et al., 2019; Kress, 2009) and in doing so provided a shared language that supported and deepened children's understanding and agentic participation in classroom activity. In this way, we argue that even though the moments captured in Vignettes 2 and 3 were largely non-verbal and unquantifiable, they supported executive functioning and problem solving and honed essential skills such as planning and self-regulation (Drigas et al., 2019). The development of skills such as these in early childhood support future cognitive flexibility, collaborative and independent problem solving, and learning. Moreover, through shared symbolisms (e.g., scarf = mum; flowing skirt = big sister) an ensemble of signs worked synergistically to empower children to have a voice in their learning and the interactions they shared with their teacher, Kyra (Kress, 2009). However, had these moments been rated by CLASS it would not have been recorded as high-quality conceptual development. Indeed, this silence would be seen as a non-rateable event, and the practising of metacognitive strategies would have gone unnoticed (Pianta et al., 2008). The underrating of instantiations of modes other than language perpetuates a devaluing of silence and non-verbal signs and the contributions they make to learning (Taylor, 2014).

5.2. Study 2: 2019

By 2019, the EYLF had been in use for 11 years, and the NQS was driving early childhood quality in schools for three years. However, NAPLAN had also been advertised on the My School website for nine years and the pressure for improved literacy and numeracy skills was increasing. Kay from Everest PS resisted the 'pushdown curriculum' reported in Barblett et al. (2016) study as much as possible by instilling play-based experiences coupled with intentional teaching strategies. Recordings of classic instrumental music were played consistently in this classroom to support routines and children's thinking time and the classroom program was carefully and collaboratively planned with the two other Pre-primary teachers at the school. The significance of the classical riffs in this classroom was culturally shaped and had come signify a time to concentrate and write. This auditory sensory dimension formed part of the semiosis, and its pertinence to the learning could be felt by the participants and observers (Kress, 2009). Throughout the observation period, Kay did not use her IWB (Classroom Organisation, Pianta et al., 2008). Vignette 6 was of a literacy session that was similar to the other Pre-primary teachers during their sessions.

To some degree, Vignette 6 was indicative of an intersubjective space; however, the conversation was led and directed by Kay and in this way did not denote SST. To be SST, both parties contribute to the thinking and the prime objective of the interaction is to

"further opportunities for meaningful talk between adult and child, providing cognitive challenge that is manageable for the children" (Siraj & Asani, 2015, p. 413; Wertsch, 1984). While the challenge was present in the request to put the word into a sentence, the dialogue did not disrupt the teacher's expert status and even though the children participated, their participation was a requirement and not necessarily agentic (Houen et al., 2019). This is not to say the children did not want to participate; for the most part they did, but their participation was prompted by the teacher and the rules of the game.

Both non-verbal and verbal semiotic resources were evident in this vignette. Routines are an example of non-verbal semiotic resources. Before recording began, Kay had informed the children they were playing the popcorn game but did not tell them how to play. As this game had become a well-rehearsed routine, instructions were no longer necessary, which in turn expeditated the commencement of activity and maximised the children's time engaged in learning (Classroom Organisation, Pianta et al., 2008). Routines enable children's developed participation and silent ownership of an activity that promotes more mature expressions of the concepts being taught (Rogoff et al., 1993). More observable non-verbal semiotic resources evident in the vignette included Kay's gentle touch on the child's shoulder to redirect (Classroom Organisation, Pianta et al., 2008) and the moment when the child took longer than expected to form a sentence using the popcorn word. In this instance, Kay noticed the child's difficulty by realising the pause exceeded the usual 'thinking time' (Houen et al., 2016; Emotional Support, Pianta et al., 2008) and inserted a known support – phone a friend.

Verbal semiotic resources were also utilised, demonstrated by the prompt, "we know this word …" and using the support of peer assistance which was elicited through the *phone a friend* prompt (Emotional Support, Pianta et al., 2008). The verbalisation of a sentence using the popcorn word provided children with the opportunity to not only demonstrate their understanding of the word, but also to plan and produce a well-structured sentence with the intent to communicate (Instructional Support, Pianta et al., 2008). While some collegiate efforts within a community of practice were noted, the structure of this classroom was a flattening of the hierarchy, as opposed to a flattened hierarchy. The flattening was evident in the silence and agenticity afforded to the children when formulating their sentences, as well as in the mechanisms that were inserted to encourage peer support. The assembly-line remained evident through Kay's unchallenged role as expert.

5.3. Study 3: 2020

The study in 2020 was like 2019, in that the EYLF was established and the NQS was firmly within schools. At the same time, the demand for improved literacy and numeracy skills was highly evident, with this expectation dominating some classroom curricula. NAPLAN was now the most valuable currency and many schools adapted instruction to best improve outcomes by this measure. The teachers in 2019 and more so 2020 commented on curriculum overcrowding. This view was shared by many from this time and was reflected in an interview with emeritus Professor Dylan Wiliam who stated, "there is no doubt that there's far too much stuff in our curriculum – I've wondered about this, and my conclusion is that curriculum developers cannot bear the thought that any children might have spare time on their hands" (cited in Lough, 2020). This 'spare time' would at times be expressed as silence, and are essential moments where children are internally mastering their own mental capabilities. Equally, these times enable teachers' responsivity facilitating the intersubjective situation where signs are made between them and the children to facilitate learning (Kress, 2009; Wertsch, 1984). From this perspective, the 'spare time' provides scope for intent participation (flattened hierarchy). When this takes place in authentic activity, there is little power differential between teacher and children, allowing children to elect their own ways and pace of learning (Rogoff et al., 2004).

All schools observed in Study 3 used the IWB considerably more than noted in previous studies. However, Sonia from Gowan PS used her IWB the most. The literacy session that was orchestrated through the IWB occupied the day until just after lunchtime; Vignette 7 represents only 20 min of that morning. The level of teacher (and IWB) control created a space depictive of assembly-line instruction (Rogoff et al., 2004). It should be noted that Sonia had limited experience in schools, and the pedagogical approach taken by the school was her norm. The school aimed to improve NAPLAN scores in ways they deemed effective and appropriate.

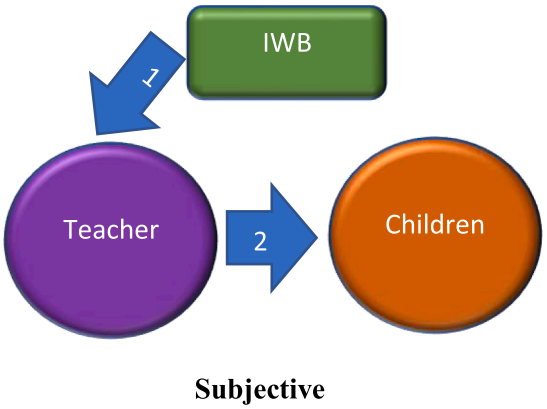

Fig 2. Not supporting intersubjectivity Knowledge flows from IWB to teacher (arrow 1) and then to children (arrow 2).

The way the literacy lesson was constructed, the children's situation definitions could not be identified and therefore the teacher was not required to subjugate her own definition to create an intersubjective space (Wertsch, 1984). The IWB was the semiotic tool used to mediate socially and culturally derived abstract or semiotic notions (Vygotsky, 1978), but without an ability to respond to children's understandings and/or difficulties, mediation could not be adjusted to ensure each child internalised the knowledge in ways that were meaningful. Moreover, without the social repertoire there was little opportunity for signs between social actors to be made and few indicators of ensembles of signs to support rich meaning making for young children (Kress, 2009). Jones et al. (2011) acknowledge that the IWB is a useful tool, but stress the intellectual involvement is the teacher's responsibility. Figs. 2 and 3 (below) illustrate how IWB could be used to support intersubjectivity when intellectual involvement is considered.

In Vignette 7 (Gowan PS), the IWB is the most distinct non-verbal semiotic tool. This tool generated the activity and mediated interactions between the teacher, Sonia, and the children; in this way, her involvement made the IWB a verbal semiotic resource. In their study of a literacy session, Jones et al. (2011) found there was a "flow of dialogue [that] took place between the children and the IWB" and the teacher was a "secondary Actor" (p. 57). While it did appear from Vignette 3 that Sonia played the secondary Actor, this current paper takes the position that "in a true dialogue, both sides are willing to change" (Thich Nhat Hanh cited in Hooks, 2003, pp. xv–xvi). Hence, there was little evidence of the dialogue Jones et al. observed. Rather, the interaction typified the *assembly-line instruction* described by Rogoff et al. (2004) where the intent for communication is to transmit information from experts. As the teachers' expert status was promoted, the children's agentic participation was reduced, which may explain why Sonia needed to constantly re-engage the children (Houen et al., 2019). The lesson, as it was constructed, did not support feedback loops nor did it prompt thought processes (Instruction Support, Pianta et al., 2008); therefore, the potential for concept development was limited.

Sonia demonstrated a top-down (assembly-line instruction) approach, which was exemplified by the explicit, direct instruction that she did not deviate away from throughout the three-hour observation period. It appeared at times that this approach did not align with Sonia's pedagogical philosophy as in interview, as she stated she believed in "incorporating the children's interests into as many lessons as possible" (Interview, 16/11/2020), which is more indicative of intent participation (flattened hierarchy) (Rogoff et al., 2004). The latter ideal was not observed, possibly because the explicit, direct instruction was a whole school approach.

In part, Sonia's reliance on this method when teaching the children could also be explained by what Pyle, Poliszczuk and Danniels (2018) found in their study on the challenges of promoting literacy integration in Kindergarten (Canadian 5-year-old program) programs. This was that teachers were hesitant about the efficacy of play as a context for literacy learning, and perceived direct instruction as having a more key instructional role. It may have also been due to Sonia's inexperience that she did not demonstrate multiple means of improving children's literacy skills. Nonetheless, Sonia's classroom was a positive environment created by her warm disposition and animated mannerisms.

While Cambridge PS also experienced the curriculum pushdown, there was support from the school's leadership team to protect intentional play-based learning. Consequently, the teachers Jill and Emma shared a similar approach that quarantined time for play and incorporated different modalities into the literacy session that engaged children.

6. Conclusion

This study aimed to examine the use of verbal and non-verbal semiotic tools across different contexts and times. Each study was taken from a larger study, where the other case studies were similar in part to the examples provided here, but they were also different. Hence, the factors of time and context cannot be causal regarding the changes observed in the vignettes. In summary, this study found four key findings that appeared to increase with time. These are: a growing pressure to perform well in literacy and numeracy; teachers being more reluctant to relinquish their expert status during literacy sessions; a reduction in instances of child agentic participation, and more noticeable absences of silence and instantiations of non-verbal semiotic resources being observed.

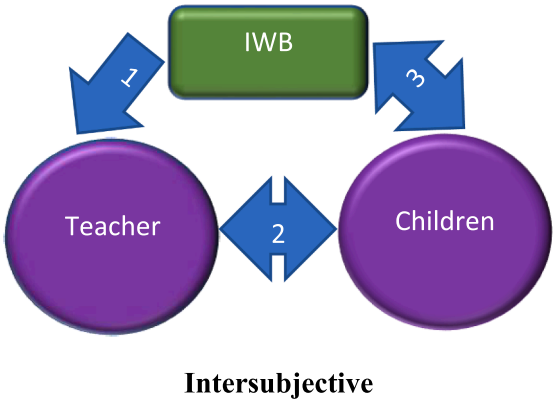

Fig 3. Supporting subjectivity
Knowledge flows from IWB to teacher (arrow 1) then between teacher and children (arrow 2 [intellectual involvement]) and then between children and IWB (arrow 3).

The increasing pressure to perform well in literacy and numeracy was noted more strongly in 2019 and 2020, which correlates with the advertising of NAPLAN scores on the My School website. The pedagogical approach taken to improve these scores was decided by each school, and this approach affected power orientations in the classroom, as well as child agency and use of semiotic resources.

In reference to the vignettes examining literacy sessions in each study, the data tended to support Pyle et al. (2018)) findings that some teachers are not confident play is a reliable context for literacy learning. An observation consistent with all three vignettes was the teachers were also not confident in deviating from their intent to transmit information (relinquishing their expert status). There was little evidence of teachers engaging children in meaningful dialogue that while departing from the teacher's script, could add depth of knowledge and increase understanding of the information provided. This intersubjective space is where teachers engage in purposeful conversation to create the semiotic challenge that is essential if children are to accept mature expressions of the processes and redefine the activity situation (Siraj & Asani, 2015; Wertsch, 1984).

Vignettes 1 (Mia) and 6 (Kay) demonstrated incidences of child agency; Vignette 1 when the children called out the punctuation they could identify and Vignette 6 when the children chose a peer to assist them and when they constructed a sentence. Child agentic participation was not observed in Vignette 7 (Sonia) as the IWB appeared to drive the session, omitting input from both teacher and children. Intersubjectivity is reliant on interaction between teacher and children, where conceptual challenge is created and shared. For this reason, this study supports Jones et al. (2011) in that the IWB is a useful semiotic resource when the teacher provides semiotic mediation and encourages active child participation.

More prevalent in Vignette 7 was the absence of silence. The teacher shared statements that the children echoed, did not allow for silence. The curriculum was created so no child had spare time on their hands and the words they spoke were that of their teachers. The absence of silence not only limited opportunities for children to formulate their thoughts (Houen et al., 2019) but also hindered opportunities for shared signs to be made and incorporated as non-verbal semiotic modes to further enhance learning (Taylor, 2014). Curricula that enable children to practise explicitly taught concepts in ways that are consistent with their current knowledge and understandings, are more likely to promote concept development and facilitate enduring learning.

Declaration of Competing Interest

We have no conflicts of interest to disclose.

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