

# **A Melange or a Mosaic of Theories? How Theoretical Perspectives on Children’s Learning and Development Can Inform a Responsive Pedagogy in a Redeveloped Primary School Curriculum.**

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## Introduction

We are living in a rapidly evolving society, where cultural, ethnic, religious, and linguistic diversity is the norm. Parallel to this changing societal zeitgeist is the development of an increasing awareness and understanding of society's responsibility to understand and accommodate individuals with diverse abilities. Education systems reflect the societal context in which they operate and consequently our primary schools are microcosms of this kaleidoscopic societal tapestry. Undeniably, we are living in a very different society to that which prevailed at the time when the *Primary School Curriculum* (1999) was developed (National Council for Curriculum and Assessment (NCCA) 1999). This welcome diversity enriches our classrooms and challenges us to craft a responsive pedagogy underpinned by a robust theoretical framework focused on what we know from research about children's learning and development. Importantly this diversity has implications for curriculum design, development and implementation.

The authors suggest that considering the vision for, and aims of primary education, which reflect the prevailing societal zeitgeist is an essential pre-cursor to identifying the theoretical perspectives which should underpin children's learning and development in a redeveloped *Primary School Curriculum*. Following an overview of the methodology adopted for this research paper, the concept of a responsive pedagogy will be explored and the vision for, and aims of primary education will be interrogated.

Finally, the following questions suggested by the NCCA (2018) will be considered:

1. What are the key theoretical perspectives on children's learning and development?
2. What do these theoretical perspectives say about children's learning and development?
3. How can and should these theoretical perspectives underpin children's learning and development?
4. What practical advice does contemporary literature offer teachers and schools

in interpreting and translating these theoretical perspectives?

5. What are the implications of these theoretical perspectives for curriculum design, curriculum development and curriculum implementation?

While the paper is structured with reference to these questions, the authors are concerned to point out that the answers to these questions should not be considered to be mutually exclusive but rather are inextricably linked and intertwined.

### Literature Review: Methodological Approach

A broad range of literature was reviewed for this paper relevant to the current range of theoretical perspectives on children's learning and development. These theoretical perspectives, summarised in Figure 1 were initially identified in collaboration with the NCCA and include: Bioecological Perspectives; Sociocultural Perspectives; Meta-Cognition and Self-Regulation Perspectives; Attachment Perspectives; Motivation Perspectives; Cognitive Psychology Perspectives; Neuroscience and Neurocognitive Perspectives and Multiple Intelligences (including Learning Styles) Perspectives.

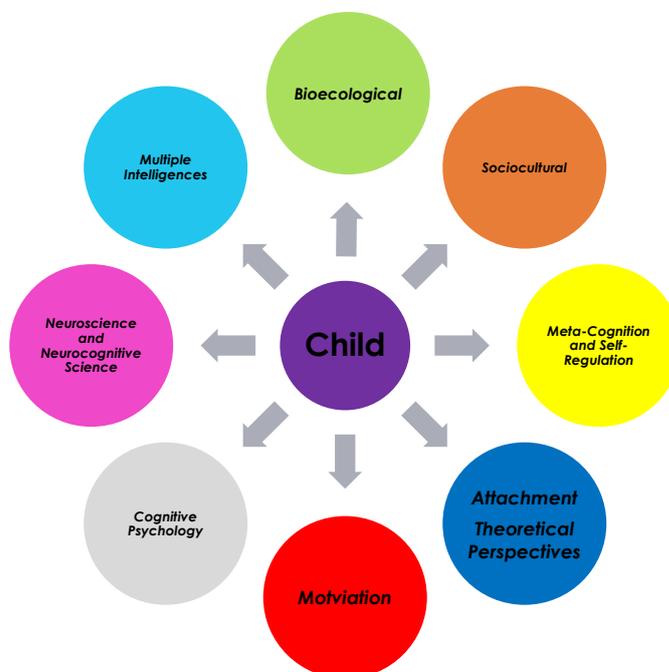


Figure 1. *Theoretical Perspectives on Children's Learning and Development*

A rigorous two-strand approach, focused on an empirical and an expert strand, was adopted in order to source the relevant literature associated with the range of theoretical perspectives identified (Gough 2007; Bond et al. 2013). A systematic search of electronic databases and web searches related to peer-reviewed studies was conducted for the Empirical Strand, while a focus on accessing articles; reports; reviews and guidance based on expert opinion/professional experience was utilised for the Expert Strand.

For the Empirical Strand, peer-reviewed publications published in English between 1990-2018 were identified using a computer-based search, which included the following electronic databases: PsycINFO; Science Direct; Scopus; ERIC and ProQuest. In addition web searches were undertaken using Google Scholar, Education-line and OECD Education at a Glance. The Expert Strand focused on identifying articles, reports, reviews and guidance based on expert opinion/professional experience published in English between 1990-2018. Where pre-1990 literature was identified during searches as relevant, this literature was also reviewed. Based on the publication of the *Report of the Review Body on the Primary Curriculum* (Department of Education 1990), 1990 was identified as an appropriate date to commence literature searches. The experience and expertise of the combined authorship of the paper also generated literature that was deemed to be relevant and was therefore also reviewed in the context of this paper.

In presenting the findings from the literature review, the authors have considered the four modes of explanation suggested by Tilly (2006) vis-à-vis providing accepted reasons for events and actions (conventions); simple cause and effect explanations (stories); rules and regulatory frameworks (codes) and systematic discipline-based empirical explanations (technical accounts). In interrogating theoretical positions therefore, these four modes of explanation are considered and theoretical positions dissonant with systematic discipline-based empirical explanations critiqued accordingly.

## **Towards Defining a Responsive Pedagogy to Enable Children's Learning and Development**

As teachers our pedagogy can simply be defined as how we teach, which is in turn influenced by our theoretical perspectives on children's learning and development and our beliefs about education. Pedagogy is inextricably connected to its own particular cultural context and its inevitable cross-fertilisation with a range of external influences, paradigms and practices (Mantovani 2007). The nature of pedagogy continues to evolve in accordance with emerging research and changing societal contexts. McIntyre (2000) observes that in ancient Greece, Socrates, equated good teaching with the art of asking good questions, which rather than being solely aimed at learning, were concerned with prompting the discovery of truth. Rousseau in the eighteenth century considered that his ideal student, 'Émile', should learn from experience and the consequences of his actions (Rousseau 1762/2013). The focus on experiential learning and providing experiences to foster children's natural development was further highlighted by Pestalozzi and Froebel (Flanagan 2006). Montessori emphasised the importance of observing how children learn in developing pedagogy, advocating for a scientific approach springing from observation rather than the 'abstract deductions of thinkers' (p. 42).

John Dewey, the great American educator and philosopher introduced the importance of grounding pedagogy in evidence-based practice at his laboratory school, established in 1884 at the University of Chicago, where teachers were encouraged to test their ideas, methods and values to improve both their own pedagogy and the child's learning (Camp Mayhew and Camp Edwards 1936; Pring 2014). In essence Dewey's laboratory school represented a radical departure from the principle that a definitive pedagogy existed, requiring only further refinement for practice, suggesting instead that a robust evidence base should underpin pedagogy. Dewey extended the concept of learning from experience to allocating the teacher a role in matching 'the child's initial exploration of the world with exposure to appropriate bodies of knowledge so that the former is not repressed and the integrity of the latter is not compromised' (Flanagan 2006, p. 146).). Echoing Montessori's concern that education be concerned with enabling human potentialities rather than the transmission of knowledge, Dewey

identified the aim of education as the development of individuals to their utmost potential, informed by a knowledge of how children develop (Montessori 1949, Dewey, 1902; 1934). However, while Dewey promoted the child as the starting point, the centre and the end, he simultaneously rejected the concept of unrestrained individuality, believing that an element of systematic organisation of activities and curriculum was central to enabling each child to reach his/her potential (Ring and O'Sullivan 2018; Irwin, 2018). Pring (2014) suggests that the curriculum promoted by Dewey represented a reconciliation between the direct transmission of a pre-determined body of knowledge and a curriculum connected to children's thinking experiences and interests. Dewey's rejection of stimulus and response; his championing of the role of the teacher as a co-constructor of knowledge with the child; his view of pedagogy as an evolving concept based on the role of teacher-as-researcher in the laboratory school and his linking of the concept of a democracy to pedagogy continue to be key influences on pedagogy today (Dewey 1915; 1916; Ring, O'Sullivan and Ryan 2018).

In crafting a responsive pedagogy, it is imperative therefore that we develop an understanding of how children learn. When we learn different types of things, we employ different types of learning strategies or brain approaches; learning looks different and works differently depending on what is being learned. There are many ways to categorise and differentiate between different types of learning. An early and still widely used characterisation of learning types was proposed by Bloom who proposed three major domains of development; cognitive, affective and psychomotor (Bloom and Krathwohl 1956). In 1992, Gagné and colleagues suggested an extended taxonomy of learning, which included intellectual skills, cognitive strategies, verbal information, attitudes and motor skills (Gagné, Briggs and Wager 1992). The assumption underlying these taxonomies was that different types of learning require different types of teaching and as such the purpose in distinguishing these different types of learning was to guide teachers in choosing appropriate pedagogical strategies.

More recently, an extensive report on how we learn conducted by the National Academies of Sciences, Engineering and Medicine (2018) has also recognised that there are different types of learning and that different situations and pedagogical strategies promote different types of learning. For example, promoting memory for the basic retrieval of facts requires different learning experiences than promoting knowledge that is transferrable; fact retrieval is enhanced by spaced practice and retrieval practice whereas transferrable knowledge is best supported by encouraging the learner to compare and contrast multiple instances of the concept, to reflect on information and spending time developing models (p.55). The report outlines six types of learning (Figure 2) moving from knowledge lean to knowledge rich respectively; (i) habit formation and conditioning, (ii) observational learning, (iii) implicit pattern learning, (iv) perceptual and motor learning, (v) learning of facts and (vi) learning by making inferences (The National Academies of Sciences, Engineering and Medicine 2018).

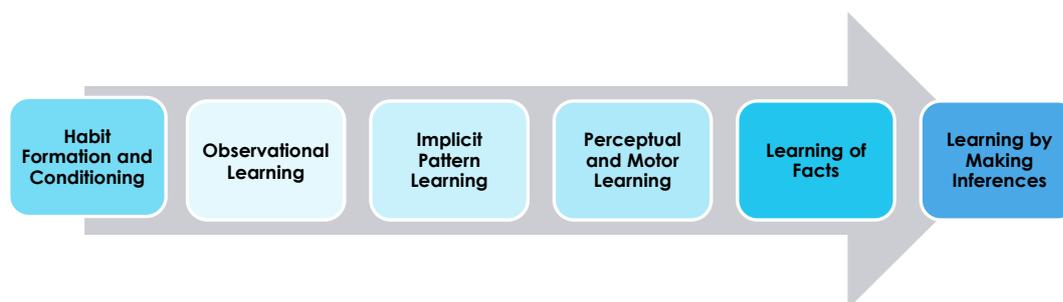


Figure 2. *Six Types of Learning: Moving from Knowledge Lean to Knowledge Rich* (adapted from the National Academies of Sciences, Engineering and Medicine 2018)

Habit forming and conditioning is essentially non-conscious learning that occurs through associations that are made through stimulus-response patterns such as operant or classical conditioning. At one stage it was believed by behavioural psychologists that all learning took place in this manner, however we now know that this is one of the most primitive means by which human beings learn. Observational learning is a much more advanced skill, rare among animals, and facilitates much faster learning than the trial-and-error conditioning type learning. Learning by observation involves imitation, interpretation and inferences; learners must observe something, understand it and figure out how to reproduce what they have observed. Observational learning does not require external feedback or rewards. Implicit pattern

learning, often called statistical learning, involves non-intentional learning of consistent patterns within an environment. Bybee and McClelland (2005) offer language learning as a good example of statistical learning, explaining that children can unconsciously use language regularities to produce their own utterances. This type of learning, which is modelled extensively using computer models involved in artificial intelligence (AI) research, is very gradual and requires extensive repeated exposure/experience for learning to occur. Another form of learning, perceptual and motor learning describes how children use their senses to learn about the world, for example, learning to swim, walk, play a musical instrument. While instruction can certainly support this type of learning, research has determined that there is no short-cut for skilled performance and that long hours of practice are required for fluency. Learning of facts rarely occurs without repeated encoding and opportunities to retrieve facts. However, if learners have substantial background knowledge they can rapidly learn facts related to this knowledge. Research suggests that learning of facts is generally more effective when learners go beyond rote memorisation; when learners group facts (chunking) or connect facts to previously learned information, recall is significantly more likely. Learners remember facts much more efficiently when they are presented within a rich structure. Learning by making inferences, or abductive reasoning, describes the learning that children demonstrate as they make logical inferences about the world around them. Children use evidence that they gather through experience and exploration of the world to make predictions, to guide their behaviour and to reason. Research suggests that this type of inquiry-based or exploratory learning is most likely to be effective when learners receive guidance and that the guidance should be tailored to the needs of the learner.

The reality of real-world learning is that most learning experiences involve multiple types of learning; for example, reading involves perceptual learning; implicit pattern learning; learning of facts and learning by making inferences. However, this delineation of different types of learning provides a valuable context when delving into the vast, diverse literature on Bioecological; Sociocultural; Meta-Cognition and Self-Regulation; Attachment; Motivation; Cognitive Psychology; Neuroscience and Neurocognition and Multiple Intelligences (including Learning Styles) perspectives on how children learn and develop. It is also useful when interpreting the literature to

remember that researchers within different disciplines often focus on one type of learning or may prioritise some types of learning over others. For example, behaviourists generally conceptualise learning as conditioning whereas cognitive scientists tend to conceptualise learning as learning of facts. This is not necessarily an overt bias within a discipline, but rather can result from the potential strengths and constraints of the preferred methodological approaches within the discipline.

The concept of what we equate as children's development is much contested in education with a threatening dichotomy emerging between development as being equated with measurable outcomes for performance in an economically driven society versus the development of autonomous cultural identities (Van Oers and Duijkers 2013). The definition of what constitutes development is inextricably linked to the vision for, and aims of education discussed below. Van Oers (2003, p. 10) refers to the 'social-engineering approach to development' in which an assumption is made that empirical science can generate infallible theories that will produce predictable developmental outcomes, equating development with test outcomes and effectiveness scores. Reflecting the concept of the development of the whole child in the *Primary School Curriculum* (NCCA 1999), Van Oers instead suggests that 'development is an integrative qualification of a person as an evolving human being and an agent in sociocultural activities. It is an open-ended holistic conception that can never be expressed in elementaristic measurements' (2003, p. 11). This concept of development is endorsed by the current authors in interrogating the theoretical perspectives for children's learning and development.

Therefore, in considering the literature analysed and discussed in this paper, it is important to recognise that findings associated with one type of learning may not be applicable to all types of learning. In the absence of sustained, meaningful collaboration across disciplines, a catch-all, universal theory of learning and development remains elusive. In the mean-time we have tried to harness a large body of diverse evidence in order to answer the question – how do children learn and develop? Ultimately, it is important for the reader to be cognisant of the fact that different disciplines offer different insights on different types of learning. In suggesting

a pedagogy that is responsive to the needs of all children in the context of a redeveloped *Primary School Curriculum*, this paper proposes to interrogate the key theoretical perspectives on children's learning and development that have emerged from research; identify what these key theoretical perspectives tell us about children's learning and development; indicate how these perspectives can be interpreted and translated into practice for teachers and schools and consider the associated implications for curriculum design, development and implementation.

### **The Vision for, and Aims of Primary Education**

Previous work by Irwin (2018) and Walsh (2018) has provided in-depth, powerful and considered insights on the vision for, and aims of primary education. It is therefore not intended to revisit these concepts in detail but rather to suggest that the clarity with which the vision for, and aims of primary education is expressed remains critical in ensuring their alignment with the theoretical perspectives on children's learning and development and the ultimate pedagogical operationalising of these perspectives by teachers. Concurring with Zucca-Scott (2010) that 'education without true appreciation for the uniqueness of each and every individual is an empty endeavour' (p. 32), the authors suggest that locating the wellbeing of the child as a stimulus for formulating the core vision and aims of primary education may be the most appropriate place to start (White 2011).

The *Introduction* to the revised *Primary School Curriculum* (NCCA 1999) opens with an articulation of a vision for primary education, followed by an explication of the aims, principles and features of the curriculum (Walsh 2018). The analysis feature in Quirkos (2017) was used to create a word cloud based on the text in this vision at Figure 3 below, suggesting that the vision for primary education is concerned to achieve a balance between providing for the unique and individual needs of each child and simultaneously enabling the child to participate in society.



(DES) 2015; DES 2016a). This direction reflects the broad aims suggested by Reiss and White (2013) that school education should equip each child to lead a personally flourishing life and to also help others to do so against a background of understanding of human nature, the evolution of life in society and the natural world. The authors suggest therefore that in a redeveloped *Primary School Curriculum*, the vision and aims will likely continue to maintain a focus on celebrating and accommodating the unique and diverse needs of each child; nurturing the harmonious development of each child; enabling each child to achieve his/her potential and supporting the child's participation in his/her family and in society both now and in the future.

It remains paramount that we are in a position to articulate theoretical perspectives on children's learning and development that are commensurate with this vision and these broad aims, when responding to the questions posed by the NCCA (2018) in the context of this paper.

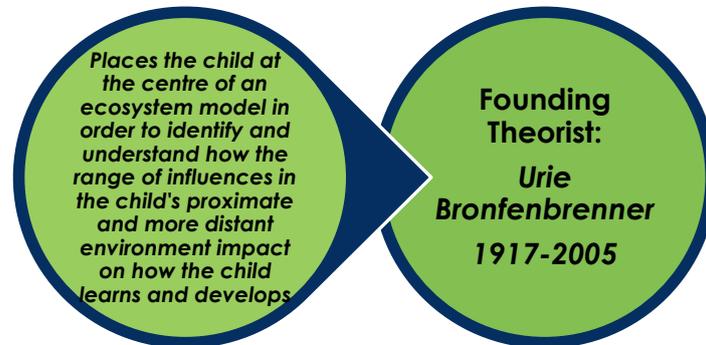
**What are the Key Theoretical Perspectives on Children's Learning and Development?**

**and**

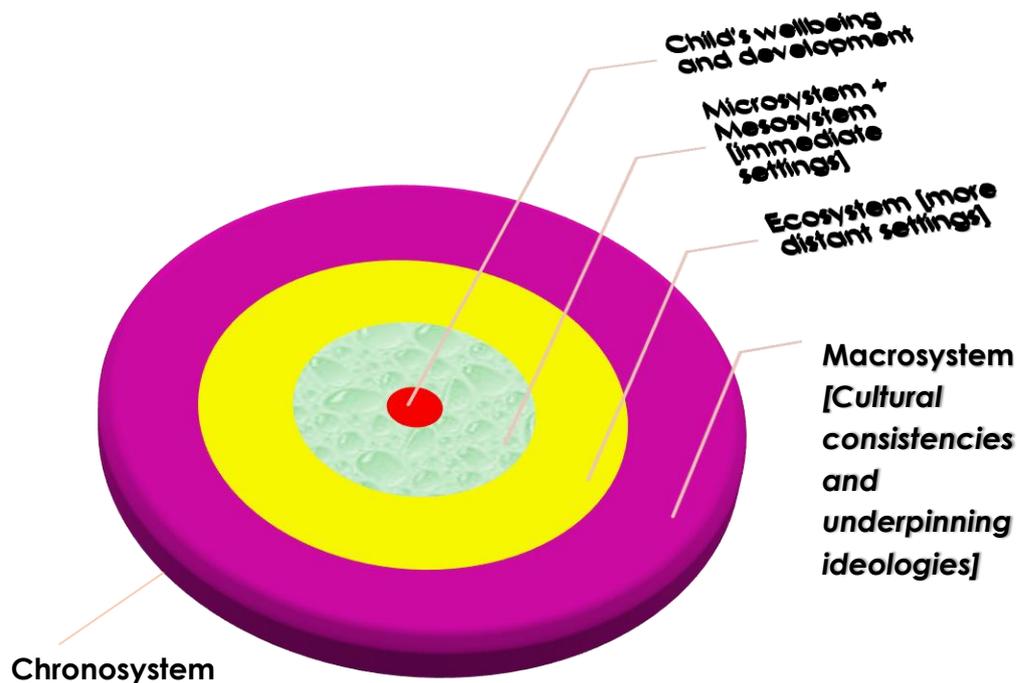
**What do these Theoretical Perspectives Say about Children's Learning and Development?**

In consideration of the indisputable inter-connectivity between Questions One and Two posed by the NCCA (2018), the authors elected to answer both of these questions collectively. Prior to discussing each of the individual theoretical perspectives below, a brief orienting synopsis is provided and key theorists associated with the perspective identified.

## A Bioecological Perspective on Children's Learning and Development



Stemming from the work of Bronfenbrenner (1979), the Bioecological Model of Child Development places the child at the centre of a complex interrelated ecosystem and seeks to understand the associated influences on children's learning and development (Bronfenbrenner and Morris 1998). Bronfenbrenner was concerned to disrupt the prevailing research models, which he believed focused excessively on the individual's behaviour and underestimated human capacities and strengths, in ignoring 'the remarkable potential of human beings to respond constructively to an ecologically compatible milieu' (1979, p. 7). Instead he conceptualised the ecological environment as a set of nested structures, which he compared to a set of Russian dolls as illustrated in Figure 4.



*Figure 4. Bronfenbrenner's Theory of Child Development*

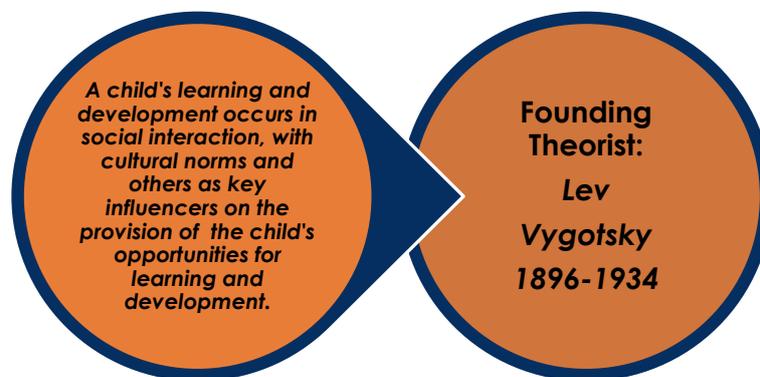
Each child has a unique ecosystem and is placed at the centre, surrounded by his/her immediate setting, which is referred to as the microsystem. The mesosystem captures the relationships between the individual settings in the microsystem. Bronfenbrenner argued that the interconnections between these individual settings can be as 'decisive for development as events taking place within a given setting' (1979, p. 3), observing that a child's reading achievement may potentially be dependent on the link between the home and the school. At the level of the exosystem, the child is influenced by settings in which he/she may not be present, for example parental employment settings. Finally, the macrosystem represents the consistency in the culture reflected in its constituent micro-meso and exosystems and the belief systems/ideology underpinning these consistencies. The chronosystem, which Bronfenbrenner subsequently added, provides a research model for determining the influence of change and continuities in the environment on a person over time (Bronfenbrenner 1986). In the overview of the model presented above at Figure 4, the interconnections in the mesosystem are reflected in the textured representation. The interconnectivity

between each of the systems identified by Bronfenbrenner is indicated in the model by the absence of defined borders between each of the systems.

The Bioecological Theory of child development, while acknowledging the influence of inherited genetic endowment, posits that environmental processes constitute the mechanism for realising genetic potential (Bronfenbrenner and Ceci 1994; Bronfenbrenner and Morris 1998). The model highlighted the family as the principal context in which human development takes place and identified the range of external influences that affect the capacity for healthy development within families (Bronfenbrenner 1986). Critically, the model encouraged research designs concerned with identifying influences on children's learning and development, between the variety of contexts in which human development occurs (Odom et al. 2004; Schweinhart et al. 2005; European Agency for Special Needs and Inclusive Education (EASNIE) 2017).

The Bioecological theory of child development has significantly influenced education and has provided a framework for focusing on the broad range of contextual factors impacting on children's learning and development (Odom et al. 2004; Ring et al. 2016). Importantly, it has highlighted the impact of the inter-relationships of these contextual factors with each other, and ultimately on the child. It is suggested that through allocating the child a central position in the ecosystem, an image of the child as a competent and confident learner, as espoused by Dewey and the pedagogy promoted by Reggio-Emilia, is created (Dewey 1916; Edwards, Gandini and Forman 2012). The model resonates with the concept of the environment as the 'third teacher' after the child and teacher (Edwards, Gandini and Forman 2012). The theoretical framework further highlights the key influencers on children's learning and development in terms of family and community contexts; the quality of the classroom environment; pedagogical practice and children's relationships with others; the relationships with other key influencers in a child's life and a responsive curriculum and policy context. These key elements have subsequently been identified as key factors influencing and shaping children's learning and development (Melhuish 2014; 2015).

## A Sociocultural Theoretical Perspective on Children's Learning and Development



Sociocultural Theory has had a profound influence on education in terms of promoting the significance of social relationships and cultural contexts for children's learning and development (Vygotsky 1962: 1978). While Piaget's work was essentially concerned with cognitive development and the unfolding of cognitive structures rather than learning theory, his research has been interpreted as supporting 'active' learning approaches. Specifically Piaget's work highlights the role of the child as an active learner; the marginal role of the adult and the importance of peer interaction and social relationships for children's learning and development, observing that: 'there are no...such things (as) isolated individuals. There are only relationships' (Piaget 1932/65). Piaget differentiated between adult:child relationships and child:child relationships, viewing the former as asymmetrical and characterised by unilateral authority, while the latter were balanced and reciprocal. He viewed the adult:child relationship therefore as 'instructional' and the child:child relationship as co-operative and conducive to creating new knowledge. Conversely Vygotsky believed that the asymmetrical relationships between the child and the adult or the child and more knowledgeable peers were the main propellers for the child's learning and development (Kutnick and Manson 2000). Veraksa and van Oers (2011, p. 5) have referred to the 'explosive growth in worldwide attention' to the 'cultural-historical approach to human development' initiated by Vygotsky and his colleagues. The

development of Sociocultural Theory can be traced to Vygotsky's social interactionist theory, whereby he observed that learning does not occur in isolation but rather through social interactions with others. Vygotsky observed that children's early cognitive development is enhanced through the use, and internalisation of cultural tools, for example, language and numeracy systems in participation with the 'expert' other such as a parent, teacher or older child (Newman and Holzman 1993; Urquhart 2000). Children thus internalise cultural tools through experiencing and participating in interactions with the 'expert' other. Vygotsky was clear that all higher mental functions originate in human interaction, observing that:

Every function in the child's cultural development appears twice: first on the social level and later, on the individual level; first between people (interpsychological) and then inside the child (intrapsychological). This applies equally to all voluntary attention, to logical memory and to the formation of concepts. All the higher mental functions originate as actual relations between people.

(Vygotsky 1978, p.57).

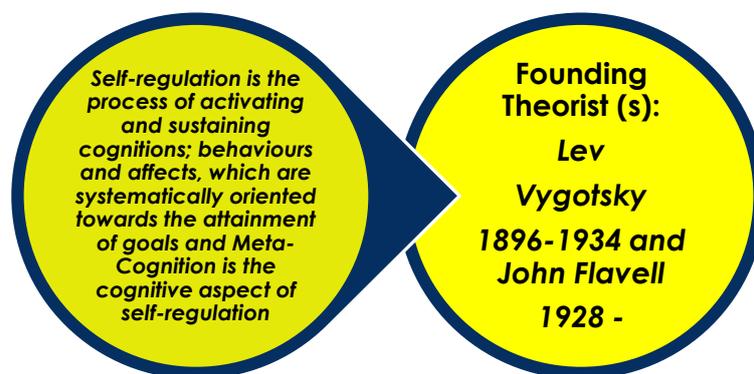
Suggesting that learning and development do not occur in isolation but rather in social contexts, Vygotsky (1978) introduced the zone of proximal development (ZPD) to capture the difference between what the child can do independently and what he/she can achieve in collaboration with others, observing that human learning is a social process which is most effective when instruction is aligned with the child's ZPD (1978). Through identifying the concept of the ZPD, Vygotsky underlined the complex and challenging nature of teaching (McIntyre 2000). In essence Vygotsky suggested that a child's prior knowledge and the quality of instruction are key determinants in optimising a child's learning. As observed by Bonfield and Horgan (2016), through harnessing the child's prior knowledge and providing the child with structured leads, prompts and pathways, the adult or more experienced other scaffolds the child's learning and bridges the gap between what the child can achieve independently and with structured assistance.

More recently, the application of sociocultural theory to enhancing children's learning and development through play has emerged. Vygotsky briefly discussed play in *Mind in Society*, noting that '...play is not the predominant feature of childhood but it is a leading factor in development' (1978, p. 101). Newman and Holzman (1993) observe that Vygotsky accorded play a centrally important place in his theory of child development. Research suggests that effective learning in early childhood can be conceptualised as 'a characteristic of a shared playful activity for children in which they are stimulated to use as many of the available resources as possible' (Van Oers 2003, p. 7; Hirsh-Pasek et al. 2009; Gray 2013). According to Van Oers, play may indicate quality provision, when contexts are created whereby play activity is focused on stimulating children's cultural learning processes and integrates the interests of both children and educators, in their role as cultural representatives. Critically, he observes that play, through allowing children some degrees of freedom to improvise and personalise the activity, represents an accomplishment of a sociocultural activity. However Van Oers (2003) identifies challenges in measuring the effectiveness of children's learning in contexts that employ a sociocultural pedagogy, suggesting the composition of developmental narratives as a way forward. The application of sociocultural theory can also be observed in the concept of the emergent approach to curriculum where, based on children's emerging interests, the adult extends the child's learning (Edwards, Gandini and Forman 2012; Wien 2008).

Recent Neo-Vygotskian theorists have extended these ideas further and highlighted the significant extent to which the processes of teaching, learning and cognitive development are connected by dialogue. (Mercer 2000; Siraj-Blatchford and Sylva 2004; Mercer and Littleton 2007). Empirical studies conducted on concepts such as dialogic teaching, exploratory talk and sustained shared thinking have demonstrated that well designed programmes of language-based classroom activities can make important contributions to the development of not only children's language and communication skills, but also to their reasoning and learning (Siraj-Blatchford and Sylva 2004; Mercer and Littleton 2007). Giving children explicit guidance on how to use language to reason together impacts positively on theory-collective problem solving, curriculum learning and intellectual development. Teachers play a crucial role in this process and can take an active role in guiding children's use of language and

modelling ways language can be used to think collectively. Children can be invited to give reasons to support their views, engage in extended discussions of topics, and supported in understanding that responding need not simply mean providing a 'correct' answer.

## **Meta-Cognition and Self-Regulation Theoretical Perspectives on Children's Learning and Development**



Influenced by Piaget, John Flavell introduced the term metacognition to capture children's knowledge and cognition in relation to cognitive phenomena and while the development of the concept of self-regulation stemmed from the work of Vygotsky (Flavell 1979; Vygotsky 1978). There is a growing appreciation that supporting children's self-regulation is critical to their overall success as learners (Blair and Razza, 2007; Whitebread, 2013). Schunk and Zimmerman (1994, p.309) define self-regulation as 'the process whereby students activate and sustain cognitions, behaviours, and affects, which are systematically orientated towards the attainment of their goals'. Theoretically, the study of self-regulation has evolved from research in the cognitive or Piagetian tradition which focuses on individual cognitive processes and research in the socio-cultural or Vygotskian tradition which emphasises the interpersonal processes supporting self-regulation (Whitebread, Pino-Pasternak and Coltman 2015; Robson 2016).

A number of longitudinal studies support the view that measures of self-regulation are a better predictor of long term wellbeing and academic success than more traditional measures of intelligence (McClelland et al. 2013; Blair and Raver, 2015). Given that self-regulation skills are highly sensitive to experience, strategies and interventions that promote self-regulation in the primary classroom can improve all children's achievement, particularly the achievement of children who may struggle academically (Perry 2013; Pino-Pasternak, Basilio and Whitebread, 2014).

### ***Metacognition***

Metacognition or the cognitive aspect of self-regulation incorporates both *metacognitive experience* and *metacognitive knowledge*. Metacognitive experience involves the range of planning, monitoring, control and evaluation strategies children employ to regulate activity during a task, and *metacognitive knowledge* is thus gradually developed in relation to: cognition in general; one's self and others as cognitive processors and of various cognitive tasks and strategies (Brown 1987; Nelson and Narens 1990; Whitebread et al. 2009; Whitebread, Pino-Pasternak and Coltman 2015; Slot, Mulder, Verhagen and Leseman, 2017). The self-regulated learner needs to develop and deploy mental strategies which are 'used increasingly appropriately in relation to tasks' (Whitebread 2010, p. 162). Recent metacognition research suggests that while skills such as monitoring, for example, a child verbalising that they are having difficulty completing a task, are largely maturational; ability and experience play a greater role in the development of control strategies such as adopting a different strategy to try and complete the task more efficiently (Whitebread et al. 2009; Bryce and Whitebread 2012). Through on-going metacognitive experience, therefore, children's metacognitive knowledge and understanding continue to develop (Whitebread 2013).

### ***Self-regulation: Socially Shared Processes***

As self-regulation skills are believed to first develop in the interpersonal sphere, interactions with others have a significant role in supporting children's developing abilities to regulate their cognition and behaviour (Mercer 2013; Whitebread 2013;

Robson 2016; O'Sullivan 2016). This is consistent with Vygotsky's seminal ZPD theory, as previously referred to (Vygotsky 1978; Karpov 2005). Socially shared regulation processes can involve other- or co-regulation (Iiskala, Vauras and Lehtinen 2004). Other-regulation refers to instances where one partner masters an element of a task and then instructs the other, who has not yet mastered the same task; for example, where one child demonstrates to another how to solve a problem in mathematics. Co-regulation involves co-constructing understanding, and is characterised by a more even distribution of regulatory activity between participants. It is often identifiable by the use of the 'we' rather than 'I' or 'you'; for example observing that 'we forgot to write the address on the envelope' (Iiskala, Vauras and Lehtinen 2004; Whitebread, Bingham, Grau, Pino-Pasternak and Sangster; Perry 2013). Socially shared processes can reduce individual cognitive load and require children to articulate internal representations, making internal thinking visible (Whitebread et al. 2007).

In addition to interaction with peers, sensitive and responsive interactions with teachers are also important for supporting children's metacognitive and self-regulation skills (Perry, 2013; Whitebread, Pino-Pasternak and Coltman 2015). Whitebread and Coltman (2011), suggest that certain aspects of pedagogy may be particularly important in supporting metacognitive and self-regulatory behaviours. These include the provision of emotional warmth and security, which supports children's perseverance; supporting children's feelings of control and thus enhancing children's sense of ownership of their own learning experiences and their learning environment; providing cognitive challenge, whereby the task is achievable with appropriate support through experiences such as child-initiated play and lastly, stimulating articulation of learning through engaging in reflection and extended conversations with children about their learning.

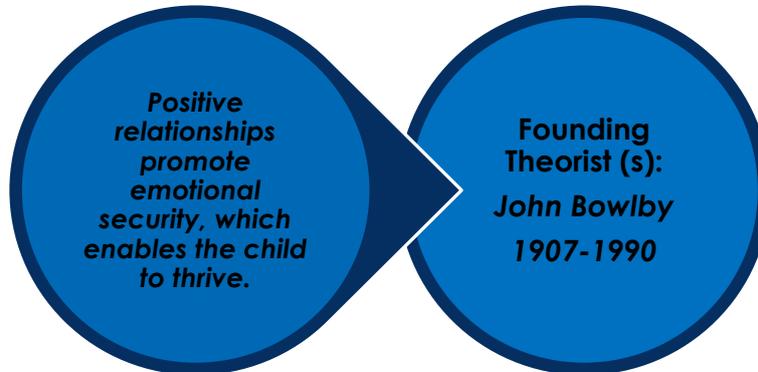
### ***Self-regulation: Emotional and Motivational Aspects***

In addition to the regulation of cognition, self-regulated learning is also dependent on children's ability to regulate emotional and motivational aspects of behaviour (Bronson 2000; Gilpin, Brown and Pierucci, 2015). Paris and Paris (2001) describe this inter-

relationship between the cognitive, emotional and motivational aspects of learning as the fusion of skill and will. Emotional self-regulation involves explicit understanding of emotions; the awareness and control of emotions; the ability to inhibit inappropriate emotions; responding appropriately in social situations, and the capacity to resolve conflicts and collaborate with peers (Bronson 2000; Whitebread et al. 2007; Perry 2013; Slot et al. 2017).

The self-regulated learner is also a motivated learner. Intrinsic motivation is recognised as an important disposition to develop in children as it is associated with higher levels of involvement, attention, persistence and achievement (Deci and Ryan 2008; Whitebread 2012; Stewart 2015; Slot et al. 2017). While meaningful tasks ignite children's initial curiosity and attention, interest alone may not sustain ongoing involvement, which requires persistence and self-regulation (Stewart 2015). Self-regulated learning requires monitoring of motivation, such as reminding learners that 'we are keeping going until the story is finished'. Control of motivation also contributes to learners completing tasks, through being able to ignore distractions and persisting; for example, continuing to build a structure that keeps falling down or self-encouraging or encouraging others (Whitebread et al. 2007). Findings from the Cambridgeshire Independent Learning (C.Ind.Le) study on self-regulation in nursery and reception classes suggest that events demonstrating emotional and motivational regulation tended to decrease as teachers became more involved in learning activities. It is proposed that this pattern may be a result of the tendency of teachers to assume responsibility for regulating behaviour and interactions when they become involved in activities such as solving a conflict rather than supporting the children to solve it themselves (Whitebread et al. 2007).

## Attachment Theoretical Perspectives on Children's Learning and Development



The whole child perspective adopted in *Aistear: The Early Childhood Curriculum Framework* (NCCA 2009) and the *Primary School Curriculum* (NCCA 1999), acknowledges the significance of emotional development for children's school success. Bowlby (1988), in his seminal work on attachment theory, made clear the significance of the infant-mother relationship and the short and long-term developmental consequences of disruption in this relationship for emotional development. As children grow and develop, their social network continues to expand to include a wide range of significant adults, including teachers. A wide range of research framed within an attachment perspective now provides evidence that the teacher-child relationship can powerfully contribute to the emotional security which children need to thrive in school (Howes 2011; Sabol and Pianta 2012; Verissimo et al. 2017). The need for relatedness is also a key feature of Deci and Ryan's (2008) self-determination theory (SDT). In school, children experience relatedness when they have opportunities to connect with others and when they feel valued by others (Whitebread 2013; Bingham 2015). As children with close relationships to teachers have been found to perform better academically, it is in everyone's interests that children experience warm and secure relationships with their teachers (Sabol and Pianta 2012). Essentially, as observed by Melhuish (2015), social interactions are the primary drivers of children's development. An attachment perspective provides an important lens through which the elaborate interplay between emotions and school

achievement can be considered. Such a lens emphasises the role of primary attachment relationships on children's learning and development and the significance of emotional ties with teachers for school relatedness and achievement.

While Bowlby's (1982) original focus was on the attachment relationship between mother and child, it is now accepted that children can have multiple attachment relationships, albeit of varying degrees of quality and influence (Howes 1999; Verissimo et al. 2017). Verissimo and colleagues (2017, p. 2), conclude that 'teacher-child relationships serve very important functions for children and are recognised as attachment-relevant, even if they do not meet the strictest criteria set by attachment theory for primary attachment figures'. The research suggests that the quality of children's relationships with primary attachment figures can influence the attachment-relevant relationships they form with others (Verissimo et al. 2017). Children's mental representations of attachment relationships are highly influenced by relationships with primary care-givers (Bowlby 1982; Howes 1999; Sabol and Pianta 2012). Children's representations of their primary attachment relationships contribute to a developing framework or internal working model (IWM) which shapes their views of self, their expectations of others and their behaviour in relationships with significant others, such as teachers (Howes 1999; Sabol and Pianta 2012). Consequently, less securely attached children may develop a representation of adults as inconsistent or unavailable and may find it more difficult to develop secure attachment-relevant relationships with teachers (Howes 1999; Sabol and Pianta 2012; Verissimo et al. 2017). On a more positive note, there is evidence to suggest that when relationships with attachment-relevant others provide sensitivity, continuity, consistency and emotional investment, this can ameliorate, somewhat, the influence of less optimal attachment relationships with primary care-givers (Howes 1999; Sabol and Pianta 2012; Whitebread 2012; Verissimo et al. 2017).

### ***Teachers Providing a Secure Base for Exploring, Playing and Learning***

Essentially, when teachers becomes an attachment-relevant figures, they demonstrate interaction qualities similar to those observed in primary attachment

relationships (Howes 1999; O'Connor and McCarthy 2006; Verissimo et al. 2017). The concept of secure base is a key feature of attachment theory and is considered a prerequisite to children engaging in exploratory behaviour (Ainsworth et al. 1978; Heard and Lake 1997). The provision of a secure base involves proximity to the attachment figure, and confidence in his/her availability and responsiveness (Bowlby 1982; Heard and Lake 1997). The absence of a secure base results in an increase in care-seeking behaviour which, quite naturally, interferes with children's capacity for exploring, playing and learning (Heard and Lake 1997). Secure base behaviour is not to be confused with over-dependency on teachers, however but rather the promotion of child autonomy and competence (Heard and Lake 1997). The attachment figure/attachment-relevant figure respects the child as an independent agent and supports developing competence through providing the correct level of support, somewhat similar to mediation in Vygotsky's ZPD (De Rosnay and Harris 2002; Meins 1999). Positive relationships with both parents and teachers have also been associated with social competence and social play (Howes 2011). Consequently, warm and secure relationships with teachers can provide a secure base from which children can competently engage with peers, which is significant given the role of peer learning in school success.

The degrees to which a teacher is established as a secure base is dependent on a number of child and teacher factors (O'Connor and McCarthy 2006; Sabol and Pianta 2012; Verissimo et al. 2017). From an ecologically-oriented systems perspective, 'children's relational models and individual characteristics, as well as context, jointly influence development and, as such, relationships within these contexts have important influences on children's development' (Sabol and Pianta 2012 p. 219). Teacher dispositions will clearly influence the relationships they form with children in their classrooms. Teachers are more likely to provide emotional security when they are 'responsive, playful and sensitive to children's emotional needs' (Whitebread 2012 p.33). Children's internal working models or mental representations of attachment relationships are highly influential as these mental representations guide children's expectations of adults in their social network (Howes 1999; 2011). There is evidence to suggest that children with insecure attachments are more likely to have lower quality relationships with teachers in the early years (O'Connor and McCarthy 2006).

Verissimo and colleagues (2017) also found that teacher ratings of children's secure base behaviour were associated with verbal ability. This may be because children with low verbal ability engage less with teachers or because teachers engage more with verbally competent children, or, a combination of both. Such a pattern would clearly have consequences for younger children, children with diverse abilities and children who may be learning English as a second language. Furthermore, Ahnert Piquart and Lamb's (2006) research in early childhood settings found that girls were more likely to develop secure relationships with teachers than boys. Taken together these findings underscore the varying quality of children's emotional connections with others before they ever enter school. They also suggest differences between certain groups of children in terms of the attachment-relevant relationships formed with teachers (Ahnert, Piquart and Lamb 2006; O'Connor and McCarthy 2006; Sabol and Pianta 2012). In addition to being sensitive and responsive, teachers need to be acutely aware of children's individual emotional needs and how these are expressed. It is also important that teachers tune into non-verbal communication, particularly when working with children with diverse verbal abilities. Critically, interactions require calibration in order provide children with the emotional warmth and security which they need to grow as confident and competent learners (NCCA 2009).

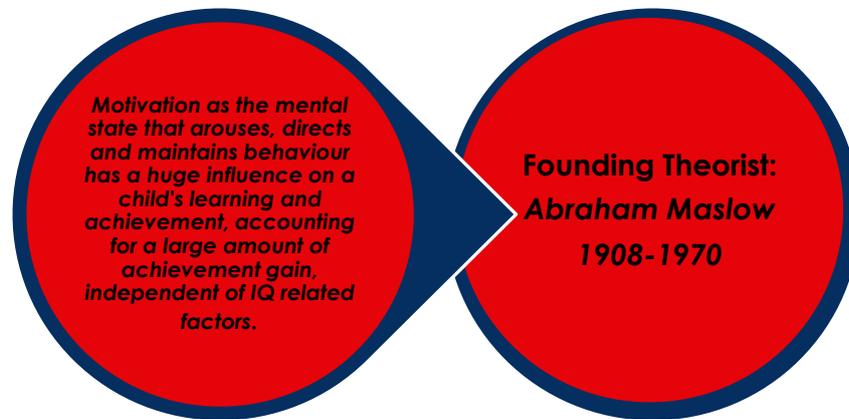
### ***Children Experiencing Emotional and Behavioural Challenges***

The teacher-child relationship may be particularly transformative for children who come to school having experienced inconsistent or negative care (Campbell 1995; Sabol and Pianta 2012). Such children often present with emotional and behavioural challenges and have difficulty regulating emotions (Campbell 1995). Emotional regulation can be defined as 'the ability to respond to the ongoing demands of experience with the range of emotions in a manner that is socially tolerable and sufficiently flexible to permit spontaneous reactions when needed' (Cole, Michel and O'Donnell Teti 1994, p.76). Children gradually develop the capacity to independently regulate their emotions within the context of secure attachment relationships when care-givers support the regulation of positive and negative affect and have the capacity to contain children's negative mental states without becoming overwhelmed

(O' Sullivan and Ryan 2009; McClelland and Tominey 2016). The securely attached child employs an extensive range of emotions, exhibiting a flexible style of regulation (Cassidy 1994; Cole et al, 1994; DeRosnay and Harris, 2002). Where the care-giver, for a variety of reasons, fails to support the shift from adult control to increasing internal control of behaviour and emotions, challenges during preschool and school years can be forecasted and may result in developmental deviations and behavioural difficulties (Wolfe 1987; Vondra et al. 2001; Dozier et al. 2002). The research suggests that children with externalising behaviour difficulties are more at risk of developing conflictual relationships with teachers. Sensitive relationships with teachers, however, are associated with a reduction in externalising behaviour and an increase in academic achievement for children with externalising behavioural challenges (Sabol and Pianta 2012). Taken together, the evidence suggests that for children who experience emotional and behavioural challenges, a positive teacher-child relationship can act as an important protective factor for school success, while interactions with teachers that are critical and unsupportive may further compound behaviour problems (Sabol and Pianta 2012; McClelland and Tominey 2016; Verissimo et al. 2017).

In addition to pervasive and persistent emotional and behavioural challenges, experiences such as separation anxiety, transition, parental separation, or the arrival of a new sibling can all have a significant impact on young children emotionally and behaviourally (O'Sullivan 2009). Whitebread (2012) suggests that how teachers respond emotionally to children's emotional and behavioural challenges is critical. Children will be supported to regulate their emotions and behaviour when teachers respond sensitively and consistently and make classroom expectations and limits clear. This is similar to the literature on parent-training programmes, which tend to emphasise the need for emotional warmth and security coupled with clear and consistent limit setting (Webster Stratton and Hancock 1998).

## A Motivation Theoretical Perspective on Children's Learning and Development



The earliest and most widely known theory of motivation was put forward by Abraham Maslow, who suggested that there was a five-tier hierarchical model of human needs comprising basic, psychological and self-fulfilment needs (Maslow 1943). While Maslow's pyramid is now considered somewhat passé and over-simplistic in academic circles his ideas have been very influential in the field of education and inspired many researchers to explore the relationship between motivation and learning. Motivation has been found to have a huge influence on learning and learner achievement and it accounts for a large amount of achievement gain, independent of IQ related factors (Murayama et al. 2013). Long and colleagues (2011) point to observational studies, which indicate that children work independently most of the time that they are in school, in making the case that learning achievement is likely to be heavily influenced by children's own motivation levels and effort. Learner motivation reduces classroom management challenges, as learner engagement is essentially incompatible with off-task behaviour. If we put most of our teaching energies into motivating children, we should have to expend little energy in managing behaviour. While people can be described in 'trait terms' as 'highly motivated individuals' or 'lacking in motivation', motivation has been found to be environmentally and situationally sensitive (Long et

al. 2011). Motivation and engagement are strongly influenced by the learner's interests, needs, beliefs and goals.

### **Needs**

Self-determination theory, the dominant modern-day, needs-based theory of motivation, suggests that humans not only have biological needs but also psychological needs. The theory posits that human behaviour is strongly influenced by three universal, innate, psychological needs: autonomy (the need to feel in control of decisions); competence (the need to experience success) and relatedness (the need to interact with, be connected to, and feel like you belong). Deci and Ryan, the proponents of this theory suggest that these underlying psychological needs explain human intrinsic motivation to learn (Deci and Ryan 1985; 2000; Ryan and Deci 2000). They argue that the act of learning is inherently intrinsically motivating as it fulfils humans' basic psychological needs. Referring to infants who learn an extensive repertoire of skills without any formal instruction, the authors explain that exploratory learning meets children's need to feel in control, to master their environment and to be able to interact and communicate with those around them. Intrinsic motivation is the experience of wanting to engage in an activity for its own sake because the task itself is sufficiently interesting and fulfils psychological needs. Learners who are intrinsically motivated to learn feel that they have a high degree of autonomy and engage in a learning activity willingly, rather than because of some external influence. Relatedly, research indicates that the opportunity to make meaningful choices during instruction, even if they are small, can support autonomy, motivation, and ultimately, learning and achievement (Patall, Cooper and Robinson 2008; Patall, Cooper and Wynn 2010). Offering choice has been found to be particularly effective for individuals with high initial interest in the task (Patall et al. 2013). Neuroscientific research has corroborated these findings and provides evidence to suggest that choice may be beneficial not only because it supports individuals' psychological need for autonomy but because it is related to the reward circuitry of the brain which positively impacts attention and learning (Hidi, 2015).

There is a lot of debate regarding the effect of external rewards on intrinsic motivation and the role of external rewards in classrooms. Research indicates that levels of

engagement with intrinsically motivating tasks decreases once external rewards are offered for the task (Lepper and Greene 1975; Deci and Ryan 1985). It is argued that external rewards can harm learner perceptions of autonomy and control and that initial task-related interest is superseded by the prospect of an extrinsic reward (Deci Koestner and Ryan 1999). More recent research is less conclusive. A series of studies by Goswami and Urminsky (2017) suggest that external rewards only reduce intrinsic motivation temporarily. Ryan and Deci (2000) concede that some learning tasks and behaviours are not inherently motivating and that in such cases external rewards, when accompanied by a rationale as to why the behaviour/task is important, can result in internalisation of the behaviour from extrinsic to intrinsic over time. Provided that the extrinsic reward does not undermine a learner's sense of autonomy and control, external rewards encourage engagement and persistence (Cerasoli, Nicklin and Nassrelgrawi 2016). More particularly, unexpected, intermittent rewards have been identified in both the neuroscientific and psychological literature as having positive motivational and learning influences (Hidi, 2015).

### ***Beliefs***

Our perception of our competence in a given domain, known as self-efficacy (Bandura 1986), is a significant predictor of academic performance. Experience of failure tends to reduce self-efficacy whereas success tends to increase self-efficacy. Repeated failures can lead to a learned helplessness whereby learners believe that there is no point even trying because they have little chance of success. All learners are susceptible to a learned helplessness effect. Research on how to improve self-efficacy for learning has shown the benefits of several strategies for strengthening students' sense of their competence for learning, including setting attainable goals, breaking down difficult goals into subgoals (Bandura and Schunk 1981) and providing learners with feedback about their progress, which allows them to attribute success to their own effort (Schunk and Cox 1986). When children feel competent, this can foster interest and motivation, particularly when students are given the opportunity to make choices about their learning activities (Patall et al. 2014).

Carol Dweck has built a significant body of evidence around beliefs about the nature of intelligence (Dweck 1999; 2006; Mueller and Dweck 1998). Her studies suggest that such beliefs have a significant influence on learner motivation. Entity or fixed views of

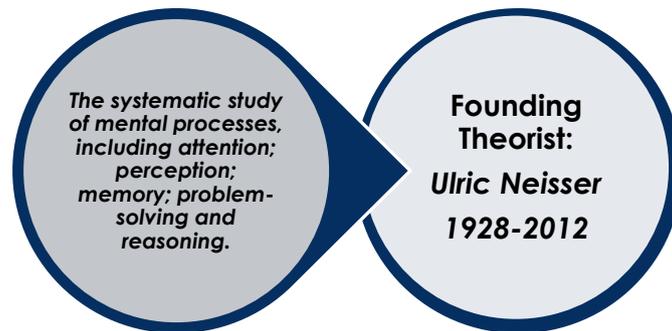
intelligence are associated with reduced motivation and performance whereas fluid or incremental views of intelligence are associated with the opposite. Illustrating the extent of the damage that fixed views of intelligence can cause, a recent study by Lee et al. (2018) found that learners who reported entity views of intelligence reported higher cortisol levels (associated with stress) when they experienced an inevitable grade decline on transition to high-school. Teachers have been found to convey fixed views unintentionally which are ultimately reflected in learners' beliefs. Promising research with regards to sharing neuroscientific research on brain plasticity with learners, which dispels notions of entity intelligence, has been shown to positively influence learning outcomes (Blackwell, Trzesniewski and Dweck 2007).

Learners are unlikely to persist with learning long enough to achieve their goals unless they value the learning activities and goals. Expectancy-value theories explain how learners choose goals depending on their beliefs about both their ability to accomplish a task (self-efficacy) and the value that they place on that task. Value can be reflected in learners' judgments about whether a topic or task is useful for achieving goals; the importance of a topic or task to the learner's identity or sense of self; whether a task is enjoyable or interesting, and whether a task is worth pursuing (Wigfield and Eccles 2000). Some studies suggest that task value is the strongest predictor of behaviours associated with motivation (Linnenbrink-Garcia, Tyson and Patall 2008). As learners experience success at a task or in a domain of learning, such as reading or mathematics, the value they attribute to those activities can increase over time (Eccles and Wigfield 2002). Teachers can employ strategies to ensure that all activities with which learners engage have a genuine value. Research shows that when the utility value of the learning is made explicit to learners, motivation and, subsequently, performance, increases (Canning et al., 2018). Incorporation of children's out-of-school interests into learning tasks has recently been shown to positively affect children's motivation and their performance (Bernacki and Walkington 2018). A further finding, not to be dismissed, is that interested teachers generally means interested children; known as the 'emotional contagion' effect, teachers who radiate enjoyment 'infect' children with excitement about learning (Frenzel et al. 2018).

## **Goals**

Goal setting is important because goals direct our attention to the task. Challenging goals energise effort, increase persistence and promote the development of new strategy learning, as learners strive to bridge the gap between current performance and goal performance. Goals are generally categorised as either performance-goals or mastery goals. Performance goals are associated with a desire to outperform others or to appear competent in front of others whereas mastery goals are associated with a focus on increasing understanding or competence. Performance goals are further categorised in *approach focus* and *avoidance focus* goals (Senko, Hulleman and Harackiewicz 2011). Those with performance-avoidance goals tend to avoid trying for fear of failing or looking silly in front of others. Those with performance-approach goals are more likely to improve their performance as their desire to appear competent and be the best will drive practice and investment of energy. The adoption of a mastery goal orientation to learning is likely to be beneficial for learning, while pursuit of performance goals is generally associated with poorer learning-related outcomes. However, it is also important to note that research regarding the impact of performance goals on academic outcomes, particularly performance-approach goals, has yielded mixed findings (Elliot and McGregor 2001; Midgley et al. 2001).

## **A Cognitive Psychology Theoretical Perspective on Children's Learning and Development**



Ulric Neisser is often referred to as the father of cognitive psychology, following the publication of *Cognitive Psychology* in 1967. His work stemmed from concerns with the limitations of the then dominant behaviourist paradigm. Cognitive psychology involves the systematic study of mental processes, including attention; perception; memory; problem solving and reasoning. Cognitive theories make a substantial contribution to our understanding of how children learn and, accordingly, how this learning may be best facilitated by teachers and schools. As a discipline, cognitive psychology requires extensive and robust testing of theories in empirical studies. Advocates of cognitive perspectives on learning claim that this research helps to dispel misconceptions around pedagogical approaches that have a limited or, indeed, no, evidence base (Kirschner, Sweller and Clark 2006). Cognitive perspectives also emphasise the effortful nature of meaningful learning. As Willingham (2004) makes clear, while we consider humans to be ‘thinkers’, thinking is not automatic, and requires significant cognitive effort.

Research exploring the connection between cognition and education has tended to focus on the capabilities and limitations of the human cognitive architecture. Cognitive psychologists typically distinguish between different forms of memory. Working memory<sup>1</sup> is particularly constrained in the amount of information it can process at a

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<sup>1</sup> Working memory can be broken into further core components (Baddeley 2001): the visuo-spatial sketchpad, which is specialised for visual information; the phonological loop, which holds speech based or auditory information; the episodic buffer, which helps to integrate information from the former

given time (Baddeley 1992; Miller 1994). While we are conscious of the information processed in working memory, the information held in long-term memory is less amenable to direct conscious access (Sweller, van Merriënboer and Paas 1998). However, this information forms the basis for permanently held knowledge and skills that are accessed, when necessary, via working memory (Kirschner 2002).

Based on the cognitive architecture of working and long-term memory, cognitive load theory (Sweller 1988) posits that learning experiences should not exceed the capacity of a learner's working memory. When this capacity is breached, learning is hampered (de Jong 2010). Learners who have more germane background knowledge in long term memory are less likely to encounter difficulties with cognitive load (Sweller, van Merriënboer and Paas 1998; de Jong 2010). This extensive background knowledge, alongside deliberate practice, is important for the development of expertise (Ericsson and Charness 1994; Sweller, van Merriënboer and Paas 1998). From a cognitive stance, critical thinking is not a universally applicable skill (Willingham 2009a). Knowledge is important for meaningful critical thinking to take place. Studies on the development of expertise make clear that critical thinking skills are domain-specific and hinge on domain-specific knowledge (Sweller 1988; Sweller, van Merriënboer and Paas 1998). Expert teachers and thoughtful curricula scaffold and support children in acquiring this knowledge prior to expecting children to apply it independently or in problem-solving scenarios (Rosenshine 2012). It is important not to underestimate the importance of the connection between prior knowledge and the higher-order skills that a curriculum may seek to develop.

In the coming period, it is likely that the use of multimedia resources will play an increasing role in the learning experiences of children in our schools. Significantly, the general learning principles espoused by cognitive psychology have been found to hold true in technological environments, as evidenced by studies conducted by Mayer (2009) on what he terms the cognitive theory of multimedia learning. In addition, affording due attention to individual variance in cognitive capacity can help to support

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components and long-term memory; and the central executive, which supports mental processing and attention.

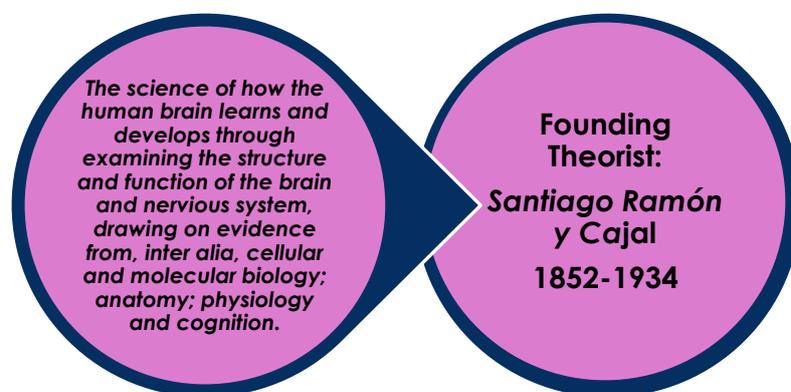
diverse learners in our classrooms. For example, children who encounter difficulties with working memory are far more likely to face challenges in learning across the curriculum; learning experiences founded on a sound understanding of human cognition can help to alleviate such challenges (Gathercole and Alloway 2008).

It should be noted that many of the recommendations stemming from cognitive psychology have parallels with studies in the area of direct instruction, an approach that emphasises the importance of clearly and explicitly building new learning on previous learning. A recent meta-analysis conducted by Stockard and colleagues (2018) found significant support for direct instruction in the 328 studies analysed as part of their review. Though constructivist and inquiry-led approaches to learning have garnered significant popular support in recent curricula, research in cognitive psychology would suggest that these approaches are less effective than conventional educational wisdom may espouse. This position is affirmed by Kirschner, Sweller and Clark (2006, p.77) when they state that 'any instructional theory that ignores the limits of working memory when dealing with novel information or ignores the disappearance of those limits when dealing with familiar information is unlikely to be effective'. Kirschner and colleagues go on to argue that while the view that knowledge is constructed by learners is correct, constructivist teaching approaches providing minimal guidance are not so. This has been termed the 'constructivist teaching fallacy' by Mayer (2004, p.14), who holds that 'the formula constructivism = hands-on activity is a formula for educational disaster' (p.17). While cognitive activity promotes learning, this is not synonymous with *behavioural* activity; discovery learning in its purest form is unlikely to be effective (Mayer 2004). As reiterated previously by Vygotsky, guidance is required for learning to take place. This guidance may be supported by frameworks that explicitly bridge the gap between direct instruction and independent application. For example, the gradual release of responsibility model (Pearson and Gallagher 1983) provides clear scaffolding for children when they encounter new skills and materials (Rosenshine 2012).

While there is significant empirical support for cognitive principles of learning, it must be noted that these findings are not beyond reproach. Owing to its epistemic

foundations and origins, much of the research in cognitive psychology has taken place in laboratory settings which may not always replicate the complexity of classroom settings (Daniel 2012). Nonetheless, cognitive theories have significant and substantiated implications for the principles of learning articulated in any curriculum document. For meaningful and effective learning to take place, the potential and the constraints of the cognitive architecture that underpins children's learning should be considered and understood.

***The Brain and Learning: Theoretical Perspectives on Children's Learning and Development from Neuroscience and Neurocognitive Science***



Santiago Ramón y Cajal, was awarded the nobel prize in physiology or medicine in a 1906, and is considered to be the founder of modern neuroscience. A gifted artist, his drawings of the brain suggested the possibilities inherent in visualising brain architecture and neural networks. With the technological advances over the past number of decades there has been an explosion of research in the area of

neuroscience and neurocognitive science which has sought to examine how the human brain learns and develops. There has been particular interest in how this research and knowledge could be of relevance to educators (Goswami 2004; Hall 2005; Blakemore and Frith 2005; Dubinsky 2010; Dubinsky, Roehrig and Varma 2013; Ansari et al. 2017). While there has been a lot of enthusiasm for brain-informed teaching amongst educators (Pickering and Howard-Jones 2007), numerous authors have been particularly sceptical of the potential of neuroscience to offer any new or practical information for educators (Bruer 1997; Willingham 2009b; Bowers 2016). Specifically concern has been expressed in relation to the dangers inherent in a the seductive 'science of the brain', which has led to the growth of 'brain-based' educational interventions, often grounded in neuromyths stemming from over-extrapolations of neuroscientific studies conducted on animals (Weisberg et al. 2008; Bowers 2016). It is therefore important for educators to be aware that neuroscience is a field is in its infancy and that there are significant limitations associated with its primary methodological tools in terms of generalisation to classroom learning realities. It is critical to note these caveats when interpreting brain based accounts of learning, which offer important insights, albeit not always novel, into children's learning and development.

***Learning = Forming Connections, Finding Patterns, Starting From What we Know***

The brain functions as a complex interconnected system of neural networks/patterns formed through paired and repeated activation. As learning takes place, changes occur in patterns of activation. When new information is presented as a once-off it is unlikely to be remembered but when new information is presented alongside previously learned information, the new input connects with the previously stored information/memories in a new neuronal pattern sequence so that the new memory is integrated into neuronal memory networks with previously stored memories. Later, if we try to remember either memory, both memories will be activated through the patterned integration that was created activating the related memory (Eldridge, Engel, Zeineh, and Knowlton 2005). Relational memory consolidation is facilitated by helping learners to see the patterns and connections between what they already know and what they are learning. Patterns connect new to prior experience, and prior experience

provides reference points for constructing new understanding. Patterns are paths for memories to follow (Willis 2010). Teaching is about increasing the patterns that learners can use, recognise, and communicate. Younger children benefit from activities that build their pattern recognition skills such as predicting activities or using graphic organisers. Not dissimilar from the educational advice offered by constructivists such as Piaget, our knowledge of the structural composition of the brain suggests that new knowledge should be presented in the context of previously learned information and that curricular content should be structured in a layered, related manner. As children build deep networks of knowledge and understanding about topics, their ability to learn more associated information and make better predictions is reflected in their long-term memory, concept formation, retrieval of stored information, and transfer of learning across contexts. Essentially children's brains work more efficiently and they can perform more complex tasks related to the relevant information (Willis 2010). Just as Benjamin Bloom suggested back in 1956, neuroscientific research highlights that learning needs to go beyond the rote memorisation of random facts if higher intellectual skills of analysis, evaluation and creativity are to be fostered.

### ***Multi-modal Teaching = Effective, Efficient Learning***

Highlighting the integrative nature of brain function, neuroscientific research has shown that circuits in the brain combine in diverse ways in different types of learning and that seemingly very different types of learning behaviour share brain circuitry (National Academy of Learning Sciences 2018). For example, when fully sighted adults are taught to read braille, it is the brain regions that normally process visual, not tactile, information, that experience the most significant reorganisation (Siuda-Krzywicka et al. 2016). This inter-connectivity helps us understand why using multi-modal approaches when teaching is important. With multi-modal teaching there is repeated stimulation of more areas of the brain. Presenting information in a variety of ways makes the information more likely to resonate with prior knowledge and is likely to lead to faster, more accurate recall because stored memories can be retrieved by a variety of cues (Willis, 2010).

## ***The Fine-Line between Encouraging Efficient Learning and Inhibiting Exploration***

The organisation of the brain suggests that structured, direct instruction from adults is likely to be a very efficient teaching approach. However, recent research from the Brain and Cognitive Sciences Lab in Massachusetts Institute of Technology (MIT) has identified that it is not only what the adult does that is important but *how the adult interacts* with the child. Laura Schultz and her colleagues have conducted a series of experiments, which indicate that if an adult demonstrates one function of a multi-functional toy, the observing child will only engage with that one function. However if the adult happens upon the demonstrated function by 'accident' the child is likely to continue exploration for themselves as they deem the adult to be a co-explorer rather than an expert. In considering these findings, Schultz (2012) argues that direct instruction is a 'double-edged sword', noting that while direct instruction promotes efficient learning by constraining learner hypotheses, a learning trade-off takes place. Schultz concludes that learners in direct instruction contexts are less likely than learners in non-pedagogical contexts to discover uninstructed information. Her findings suggest that a balance should be sought and that playful, rather than directive, adult interactions are most likely to support young children's learning without curtailing their creativity.

We know that not all learning requires adult-direction and feedback. Connectionist AI research has advanced knowledge with regards to pattern-based, unsupervised learning, such as learning without feedback. This research demonstrates that when exposed to experience, the brain slowly picks out repeated themes and actions which enable the child to navigate the world with increasing competence (Mano 2016; Pollo, Treiman and Kessler 2008). It has been suggested that unsupervised learning is driven by novelty seeking, as exemplified by self-directed, intrinsically motivated learning. Forestier, Mollard and Oudeyer (2018), looking at curiosity-driven computational models, designed the first real robotic experiment in which a robot succeeded in exploring and learning how to use tools to act on objects without any designed 'curriculum' or external feedback. According to the authors, when the robot monitored its own learning with the intrinsic rewards of success and novelty seeking, it automatically developed a learning sequence from simple to more complex.

### ***Creating Learning Environments that Make the Brain Happy!***

Examination of neurochemical responses, such as the release of neurotransmitters in the brain offers some further insights to help us understand the role of intrinsic reward and novelty seeking. Dopamine, associated with positive feelings, memory, motivation and attention, is generally considered to be a learning supportive neurotransmitter. Because the brain sees dopamine release as a type of reward, when a learning experience promotes dopamine release the learner is likely to persist with the learning task, exert a lot of effort on the task, repeat the task and remember the learning experience. The brain will release dopamine if a child answers a question correctly, encounters something novel, makes a correct prediction, or solves a problem. The brain favours and repeats actions that release more dopamine. The reduction in dopamine release that happens when a learner makes a mistake results in the brain altering the memory circuit to avoid repeating the mistake (van Duijvenvoorde et al. 2008). Therefore, the dopamine response influences whether learning will take place or not. In this context Willis (2010) highlights the importance of timely corrective feedback from the teacher in order to capitalise on the dopamine effect. Only children who actively participate and risk making mistakes will benefit from the dopamine effect on learning. Fear of making mistakes reduces active participation, therefore low-risk/risk-free classroom environments in which playful approaches are utilised, allow children to feel safe and more likely to participate in learning experiences.

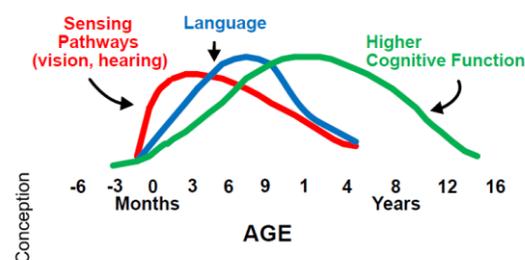
### ***The Plastic Brain and Life Long Learning***

Counter to prevalent notions of fixed, inherent intelligence extensive neuroscientific evidence indicates that the brain continues to undergo structural changes well into old age in response to learning and experience (Draganski et al. 2004; Lövdén et al. 2010). The term to describe this continuous re-organisation of the brain in response to experience is known as experience-dependent neuroplasticity. Examples from empirical research demonstrate how children's brains organise and re-organise in response to various teaching approaches. Shaywitz and colleagues (2004) found that an intensive evidence-based reading intervention brought about significant changes in the brain organisation of dyslexic learners such that the brain activation patterns following intervention resembled those of typical readers. Tang and colleagues (2006) found that Chinese- and English-speaking participants activated different areas of the

brain while computing and comparing Arabic numbers. The authors suggested that the distinctions could be attributable to differences in cultural ways of learning, such as visual and motor representations through regular use of the abacus among Chinese participants. Researchers have found that regions in the higher-level visual cortex of the brain, noted for processing print in adults, become sensitised to print as soon as children learn the associations between letters and speech sounds, offering further evidence that learning skills can lead to change in the way in which the brain responds to input (Brem et al. 2010). Neuronal plasticity is the result of a complex interplay between experience, biology and individual differences and therefore plasticity varies between individuals. This offers a neuron-level explanation as to why certain teaching approaches may work with some children and not with others.

### ***Sensitive Periods for Brain Development***

Infancy and early childhood mark a significant period for relatively rapid brain growth. Multiple and rapid brain changes in infancy and early childhood foster development in core areas of functioning; the brain reaches nearly adult size by the age of five, initial connections are laid down, and a multitude of experience-dependent changes support emerging individual differences in functioning (Melhuish 2015). Melhuish, citing Nelson (2000) in Figure 5 below, captures the potential of harnessing this period of rapid brain growth for children in the early years. A key insight to be gleaned from this research is the importance of language enrichment and building thinking skills in the early years.



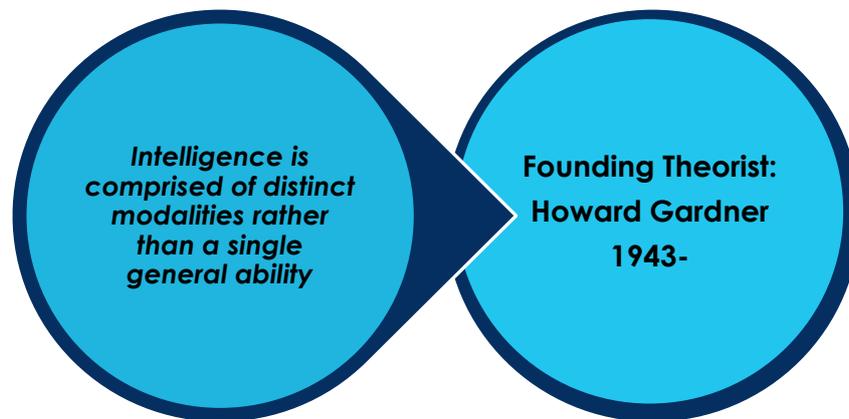
C. Nelson, in *From Neurons to Neighborhoods*, 2000

*Figure 5. Harnessing Rapid Brain Growth in the Early Years (Nelson 2000, cited in Melhuish 2015)*

Recent research has indicated that a second sensitive period of growth and change in the brain occurs from adolescence into early adulthood, which supports novel

areas of functioning related to the unique tasks that first emerge in adolescence (Furhrmann, Knoll and Blakemore 2015; Guyer, Perez-Edgar and Crone 2018).

## **Multiple Intelligences Theoretical Perspectives on Children's Learning and Development**



In 1983, Howard Gardner introduced the theory of multiple intelligences (MI), proposing that intelligence comprised seven distinct modalities rather than a single general ability. Based on the impact of brain damage on different abilities; the achievements of exceptional individuals; developmental processes; evolution anthropology and cultural studies, Gardner presented what he described as 'a pluralistic view of mind' (2006, p. 5), suggesting that individuals had different cognitive strengths and styles, manifested in seven relatively independent facets of cognition. Disrupting the orthodoxy of the existence of a single general measurable intelligence, Gardner described cognitive competence as a set of abilities, talents or mental skills, which he termed 'intelligences', and disputed that intelligence as measured by IQ tests accurately depicted an individual's potential (Gardner 2006). Initially he identified linguistic; musical; logical-mathematical; spatial; bodily-kinaesthetic; interpersonal and intrapersonal intelligences, subsequently adding naturalist intelligence and raising the

possibility of existential intelligence, related to pondering questions of existence, life, death and finitude (Gardner 1998/2004). Based on his research, Gardner suggested that all human beings possess all of the identified intelligences to some degree, with individuals differing in both degree and combination of these intelligences. Gardner's theory continues to provide a popular framework for understanding and responding to children's individual strengths in schools (Kershner 2000).

However the theory of MI has its critics in terms of the lack of validation of the theory, with Waterhouse (2006) advising that due to the inadequate empirical support and inconsistency with the findings of cognitive neuroscience, MI theory should not be applied in education. In distinguishing 'theory generation' from 'theory validation', Waterhouse (2006) cautions that MI theory may continue to have currency in education, because it tells a 'good news' story (p. 253). Furnham (2009) summarises three controversies around MI theory: the extent to which the intelligences are inter-correlated to provide evidence of general intelligence; the lack of a measurement tool and whether intra/interpersonal intelligences constitute social skills or personality traits. Critically Klein (1997) observes, that added to the lack of empirical plausibility of MI theory, both general intelligences and MI theories as theories of ability, have limited application to teaching, in terms of being too broad to be useful in suggesting specific educational tasks or the skills a learner needs in any domain.

Frequently associated with MI theory is the concept of Learning Styles, with MI theory having its roots in cognitive science in seeking to reconstruct the theory of measurable intelligence and Learning Styles emerging from the psychoanalytic genre (Silver, Strong and Perini 1997). Both theoretical perspectives suggest that the dominant ideology of intelligence represents a barrier to understanding human differences. Learning-style theory focuses on the process of learning in terms of how an individual absorbs, thinks about and evaluates information and maintains an emphasis on an individual's personality, believing that learning is the result of an individualised act of thought and feeling (Silver, Strong and Perini 1997). Based on the premise that we are all unique individuals and therefore prefer to learn through visual, auditory, reading/writing or kinaesthetic (VARK), there is belief that teachers should therefore

tailor teaching and learning to these preferences (Kirschner 2016). Kirschner and Merriënboer (2013) describe learning-style theory as one of the urban legends in education, which while intuitively plausible is inherently flawed and similar to the criticisms of MI, it has not been validated scientifically. Specifically Kirschner and Merriënboer observe that the sheer scale of learning styles reported suggests that individuals are different from each other on innumerable style dimensions and for each dimension to a variety of degrees, and therefore accommodating learning styles in teaching contexts is virtually impossible. Kirschner (2017) concludes that there is no scientific basis to suggest that a learner has an optimal learning style; that (s)he is aware of a personal learning style and/or this style can be reliably and validly determined.

While acknowledging the clear lack of empirical evidence for both MI and Learning-style theory, both positions have contributed to the acceptance of diverse learning abilities in classrooms and have expanded our concept of the essence of what constitutes intelligence. The multiple constituents of intelligence suggests that a wide range of learning and teaching approaches is necessary to support children in realising their potential in our classrooms (Kershner 2000). As noted by Rita Jordan (2017), these theoretical positions prompt us to adopt an individualised pedagogical approach in specific contexts, citing the need for more high-quality individual research designs that provide an evidence base for effective individual approaches to learning and teaching.

## **How Can and Should these Theoretical Perspectives underpin Children's Learning and Development**

**and**

## **What Practical Advice does Contemporary Literature Offer Teachers and Schools in Interpreting and Translating these Theoretical Perspectives?**

### **A Melange or a Mosaic of Theories?**

Given the preponderance of theories and associated research approaches that seek to explain how children learn, the quest for a unifying theory to support educators in implementing the curriculum is understandable. However the research conducted for this paper clearly indicates that, given the complexity of human learning, such parsimony, while desirable, may not be achievable. This is underscored by Klette (2011, p.5):

... there is no such thing as a well-established unified "theory of education" which is supported by the majority of educational researchers. On the contrary, different groups of researchers represent different schools of thought, some of which appear to be mutually incompatible if not directly contradictory.

The richness that multiple theories can bring to children's curriculum experiences has been endorsed in previous research reports underpinning both the *Primary Language Curriculum* (Kennedy et al. 2012) and the redeveloped *Mathematics Curriculum* (Dunphy et al. 2014). However, in endorsing an eclectic approach to the theories underpinning the curriculum, it is important to distinguish between those that have a substantial empirical research-base and those that do not. Relatedly, the research conducted for this paper demonstrates that some theories will be best placed to inform different aspects of learning within the curriculum and that the different disciplines represented in a curriculum may vary in their epistemic underpinnings and associated theoretical orientations.

While the theoretical perspectives reviewed in the previous section emphasise different and sometimes competing views of children's learning, nonetheless common principles across the varying perspectives are identifiable. The authors suggest that what emerges is a theoretical mosaic rather than a melange, to support teachers in

providing effectively for children's learning and development in the context of a redeveloped *Primary School Curriculum*.

### **A Mosaic of Theories**

Extrapolating from the extensive review of theoretical perspectives on children's learning and development, the authors are suggesting the following illustrative (rather than conclusive) principles that characterise the mosaic of theories:

- A full account of children's learning must attend to issues that are broader than curriculum *content* alone; classroom climate and relationships have a tangible impact on readiness and ability to engage with new learning. In effect, the relational aspect of pedagogy remains critical.
- Individual differences impact on children's learning, therefore the curriculum should enable teachers to account for and support such individual differences. However, while there is research support for many individual differences, for example, variation in working memory, such evidence is not available for other commonly cited theories of individual differences that are perceived to impact on learning, such as multiple intelligences/learning styles.
- Learning is supported by carefully planned and sequenced content that incrementally builds new knowledge and makes conceptual connections with prior learning. This is important at a classroom level, but also at a school level and has implications for purposeful curriculum sequencing that avoids disjunctures in conceptual development. Careful and deliberate practice supports the development of new skills and knowledge, while the prior development of *deep* conceptual understanding in a discipline supports subsequent critical thinking and problem solving.
- The importance of prioritising language-rich classroom environments where talk and discussion is valued is repeatedly reinforced. Teaching children to use language to reason together from an early age through the use of teacher modelling and carefully designed learning activities is essential.

- Learning is not a passive exercise; teaching that engages children in the active processing of new concepts is more likely to be successful. However, active learning should not be conflated with significant movement or ‘busy’ lessons; it requires active and engaged *processing*, not necessarily ‘activity’ in the conventional sense of the word. Viewed through a constructivist lens, the critical focus should be on the child’s thinking while she/he is engaged in the activity.
- Meaningful teaching that is grounded in children’s experience, and appropriately challenging, is more likely to lead to engaged learning.
- The teacher plays a pivotal role in learning in the classroom. While different perspectives vary in the degree to which they emphasise teacher- or child-led instruction, the importance of the teacher in orchestrating learning is indisputable.
- While acknowledging the key role of the teacher, children can be supported in regulating and planning aspects of their own learning in school. Essentially, capturing and including children’s voices promotes participation and engagement, which impacts positively on learning. Creating low-risk/risk free learning environments for children, where they are afforded opportunities to explore; experiment and discover remains critical.

A redeveloped *Primary School Curriculum* therefore may need to endorse common principles of learning stemming from the Mosaic of Theories that can be applied by teachers across a range of learning areas and contexts, while also acknowledging that a narrower range of theoretical approaches may be applicable to some aspects of learning. At Table 1. below, the authors have commenced the deconstruction of the Mosaic for application to practice in the classroom.

Table 1. Deconstructing the Mosaic of Theories for Application in the Classroom

Bioecological	Sociocultural	Meta-Cognition and Self-Regulation	Attachment	Motivation	Cognitive Psychology	Neuroscience	Multiple Intelligences
<ul style="list-style-type: none"> <li>○ Attention needs to be directed to individual child characteristics; family and community contexts.</li> <li>○ Quality of the physical; pedagogical and interactional classroom environment matters.</li> <li>○ Children's relationships with others are critical.</li> <li>○ Relationships and shared understandings between key people in a child's life are important.</li> <li>○ A curriculum responsive to each child's context is necessary.</li> <li>○ Responsive policy development ultimately impacts on a child's learning and development.</li> </ul>	<ul style="list-style-type: none"> <li>○ Providing enriched opportunities for children to learn with others.</li> <li>○ Exploring the potential of play-based learning.</li> <li>○ Considering the potential of the emergent curriculum and children's interests.</li> <li>○ Reflecting on the central role of the adult in guiding the child's learning and development.</li> <li>○ Providing the child with access to developmentally appropriate curricula.</li> <li>○ Creating a non-stressed context that takes cognisance of children's well-being and belonging.</li> <li>○ Considering the ZPD – socio dramatic play as a ZPD for self-regulation skills.</li> </ul>	<ul style="list-style-type: none"> <li>○ Providing activities which promote a child's autonomy and creating autonomy supporting classrooms where children are given opportunities to make choices; control challenge and self-evaluate learning.</li> <li>○ Ensuring curricular experiences are meaningful for the child, for example play is a meaningful activity for children.</li> <li>○ Including collaborative activities.</li> <li>○ Considering the role of mixed-ability groups in encouraging other- and co-regulation.</li> <li>○ Providing activities which allow children to articulate their learning.</li> </ul>	<ul style="list-style-type: none"> <li>○ Creating classroom and school environments that provide emotional warmth and security.</li> <li>○ Engaging in ongoing reflection on how as teachers we interact with children and remembering that 'interactions drive development'</li> <li>○ Developing meaningful partnerships with parents.</li> <li>○ Ensuring a consistent approach across teachers and across the school.</li> <li>○ Providing consistent boundaries sensitive to the child's individual needs.</li> <li>○ Understanding the implications of providing a secure base for children's learning and development.</li> </ul>	<ul style="list-style-type: none"> <li>○ Creating classroom environments where children are given opportunities to experience being competent; having choice, autonomy and relatedness leading to intrinsic engagement.</li> <li>○ Remembering that some learning tasks may not be intrinsically motivating – using external rewards with caution and always explaining the value the task and fading rewards.</li> <li>○ Offer learners challenging learning opportunities.</li> <li>○ Avoid activities likely to lead to repeated failure for some children .e.g spelling tests.</li> <li>○ Praise the effort not learner trait.</li> <li>○ Promote mastery rather than completion.</li> </ul>	<ul style="list-style-type: none"> <li>○ Learning is effortful and curriculum activities should be cognisant of the limits of memory.</li> <li>○ The cognitive load in learning can be reduced by careful sequencing of activities.</li> <li>○ Supporting children's learning through providing multi-modal representations can increase the child's capacity to process new information e.g. providing both auditory and visual explanations.</li> <li>○ Provide appropriate knowledge about a topic prior to asking a child to solve problems.</li> <li>○ Distribution of learning through interleaving; providing retrieval practice and allowing the child to articulate learning.</li> </ul>	<ul style="list-style-type: none"> <li>○ Effective pedagogy should elicit previous learning.</li> <li>○ Facts should not be presented in isolation but as broader concepts in a structured, meaningful way.</li> <li>○ Multi-modal teaching enhances memory.</li> <li>○ Direct instruction can be efficient for some types of learning</li> <li>○ Playful adult interactions guide learning and support exploration</li> <li>○ Children will learn best in encouraging, risk-free environments.</li> <li>○ Timely, corrective feedback is important.</li> <li>○ Individual differences can be met by alternative teaching approaches.</li> <li>○ Fixed intelligence is not supported.</li> </ul>	<ul style="list-style-type: none"> <li>○ While multiple intelligences and learning style theories continue to be popular in education, the lack of validation of these theoretical perspectives suggests that caution is required when interpreting what these perspectives tell us about children's learning and development.</li> <li>○ Harness the research related to multi-modal representations and motivation theory, suggesting that children's engagement increases through recognising the role of both cognitive and affective processes in learning.</li> <li>○ MI and learning style theories remind us of the need for an individual focus.</li> </ul>

### **Applying Caution: Making the Transfer from Theory to Practice**

If what we know from theory is to have a tangible impact on learning in classrooms, the curriculum must give careful consideration to what these theories might look like in practical terms. As Kelly (2004, p.214) makes clear, theory, in the absence of practice, may not have much impact in educational settings:

If there is one general lesson to be learned from the experiences of recent years, it is that in education, and probably in all other spheres too, theory and practice must go hand in hand and side by side if either is to benefit in any significant way.

Regardless of which theories, or combination of theories, ultimately underpin a redeveloped *Primary School Curriculum*, it is essential that classroom-focused illustrations of these theories are provided to support teachers in their application. However, we must continue to remain vigilant in relation to the acknowledged dangers of reducing theories to a 'what works' list, de-contextualised from the classroom context and teachers' professionalism (Cochran-Smith and Lytle 2009; Wrigley 2018). Given broader moves within the Irish Education System to a research-informed teaching profession (The Teaching Council 2011, 2017), and efforts to promote a promotion of reflection on practice at school level (Department of Education and Skills 2016), it is possible that learning from the theoretical underpinnings of the curriculum would be considered and contextualised most meaningfully at local level. Teacher professional knowledge, including knowledge of learners, is complex and multi-faceted (Shulman 1986) and requires concomitantly nuanced professional development that is cognisant of local factors. Supporting the application of theoretical understandings at the classroom and school level need not necessarily be driven entirely by 'received' theories or entirely locally generated theories. Evidence already exists to show that change informed by empirical studies and reviews, but tailored and contextualised at school-level, can lead to powerful learning in Irish primary classrooms (Kennedy 2010).

## **What are the Implications of these Theoretical Perspectives for Curriculum Design; Curriculum Development and Curriculum Implementation?**

The theoretical perspectives explored in this paper have a range of implications for curriculum design, development and implementation. Acknowledging the relationship between design, development and implementation, these implications are presented compositely below and are designed to stimulate further discussion rather than purporting to comprise an exhaustive list.

1. The theoretical perspectives on children's learning and development should support the vision for, and aims of primary education in a redeveloped *Primary School Curriculum*.
2. The curriculum should be informed by the broad range of theoretical perspectives identified in this paper and these should be explicitly articulated in curriculum documentation.
3. The curriculum should recognise children as competent and confident individuals with an innate learning capacity and desire to learn and master the environment. A redeveloped *Primary School Curriculum* should be focused on harnessing, protecting and nurturing this intrinsic motivation to learn and provide children with the skills and dispositions to become life-long learners.
4. The role and influence of parents and local community contexts should be recognised and utilised to support children's learning and development.
5. The curriculum should promote democratic classrooms that incorporate a pedagogy of voice and a pedagogy of listening. It is important that children have a voice within the curriculum and that their inherent desire to explore and to pursue answers to questions about the world around them is facilitated.
6. Flexibility should be provided in the curriculum for teachers to harness children's interests and emergent understanding.
7. Communication and language should be emphasised across all curricular areas and the role of play-based approaches in developing discipline-specific language, such as mathematical or scientific language highlighted.
8. The curriculum should recognise the importance of free-play for children's healthy development and wellbeing and its potential to foster self-regulation skills, social skills, confidence and independence. The curriculum should make clear that the role of the teacher within free-play is not free and present

possibilities for the teacher to harness this opportunity to learn about the children.

9. The benefits of collaborative learning opportunities for children's learning and development should be considered and the role of explicitly teaching children how to collaborate and discuss should be underscored (Kutnick and Blatchford 2014). Consideration might be given to identifying collaboration skills as curricular competencies with associated direction as to how to support the development of these skills. The potential of peer-to-peer learning, inter-thinking and dialogic inquiry should be harnessed and supported within the curriculum.
10. In considering curriculum content, cognisance should be taken of the importance of *knowledge*, as recognised across all theoretical perspectives. As such, the curriculum should consider extended, in-depth coverage of meaningful topics rather than cursory, once-off coverage of multiple topics which will lead to disconnected, fragile memory traces, which equates with poor learning. The curriculum should allow children to build up foundational knowledge about topics, layering knowledge in an integrated way and reflect the spiral approach to curriculum suggested by Bruner (1960).
11. The curriculum should ensure that the *skills* identified in a redeveloped *Primary School Curriculum* are practiced on a daily basis and link these skills in meaningful learning contexts for children.
12. The curriculum should recognise that disciplinary knowledge should not be disconnected from its associated skills; proficiency within a domain is not simply a matter of acquiring knowledge, it involves learners using knowledge within the context of discipline-specific activities and tasks.
13. The curriculum should consider assessment carefully and be cognisant of the risk-averse environments fostered by formal testing approaches which can stifle creativity, autonomy and motivation.
14. The curriculum should consider reframing self-assessment as a key competency rather than a method of assessment per se. Positioning self-assessment as a competency within a spiral curriculum would move the focus from performative evaluation to the development of metacognitive and self-regulation skills over time.

15. The curriculum should encourage guided play-based approaches to learning however, associated professional development should make sure to give equal emphasis to both pedagogical framing (planning learning activities) and pedagogical interactions (how the teacher interacts with the children to help them understand what they are doing during the activity). Providing formative feedback; encouraging reflection; extending children's responses and scaffolding theory development are essential if play-based and guided-play activities are to become valuable learning experiences for children.
16. The curriculum should support the teacher-as-researcher and recommended pedagogical strategies in supporting curricular documentation should not be presented or interpreted as prescriptions for practice: 'pedagogy should not be the prisoner of too much certainty but instead be aware of both the relativity of its powers and difficulties in translating its ideals into practice (Loris Malguzzi, cited in Edwards, Gandini and Foreman 1998, p. 58). As evidenced in the research conducted for this paper, different learning and teaching approaches can prove more or less fruitful for different aspects of learning, and accordingly, teacher professionalism is fundamental.
17. While acknowledging the importance of peer engagement; choice and children's voice within the curriculum, the role of the teacher in organising well-sequenced, meaningful and in-depth curriculum experiences remains crucial.

## Conclusion

The theoretical perspectives on children's learning and development interrogated in this paper provide a useful compass with which to begin crafting a responsive pedagogy for a redeveloped *Primary School Curriculum*. In the absence of a universal theory that encompasses all of the dimensions of children's learning and development, the role of the teacher-as-researcher in the classroom becomes critical (Ryan et al. 2017). A knowledge and understanding of the range of theoretical perspectives on children's learning and development combined with a disposition for authentic teacher enquiry constitute the essential precursors to a responsive pedagogy. Building on the concept of a professional as someone who defines and constructs problems within his/her daily practice and engages in the process of individual and group reflection to resolve dilemmas of practice, the teacher continues to identify practices that can meet the unique needs of each child in the classroom (Schön 1983;1987; Dozier 2007). In essence a key element of teacher professionalism in the context of a redeveloped *Primary School Curriculum* is focused on operationalising the philosophical and theoretical concerns that both shape the broader educational agenda and impact on children's learning and development (Sexton 2007). Critically, policy makers and school leadership must be convinced of the importance of supporting teachers in interrogating their practice; engaging in action research and generating knowledge that can be shared with the school community and wider education environment.

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