Theory of Mind and Teaching in ni-Vanuatu Children

Eva Brandl

Dissertation submitted in partial fulfilment

of the requirements for the degree of

Doctor of Philosophy

Department of Anthropology

University College London

May 2021

I, Eva Brandl, confirm that the work presented in this dissertation is my own. Where information has been taken from other sources, I confirm that this has been indicated in the thesis.

Abstract

While culture is common in the animal kingdom, cumulative culture appears to be limited to humans. Research suggests that this is due to (1) our advanced social cognition, in particular joint attention and Theory of Mind; and (2) our reliance on high-fidelity mechanisms of social learning such as teaching. However, some have argued that these mechanisms are themselves culturally transmitted, vary across cultures, and that contact with Western norms and institutions reshapes cognition in small-scale societies. These proposals require us to test whether developmental trajectories observed in industrialized populations translate to other societies. To this end, I examine the development of Theory of Mind and teaching among children living in rural areas of Vanuatu. In Chapter 2, I combine results from participant observations and informal interviews to explore the ethnographic context. I examine kinship systems, childrearing practices, and worldviews, and discuss how they relate to folk models of the mind and cultural transmission. In Chapter 3, I examine the development of Theory of Mind and mental state talk. Consistent with the idea that Theory of Mind is culturally learnt, the results diverge from Western findings. However, they also contradict earlier studies and point to methodological challenges, urging more caution in the interpretation of cross-cultural work. In Chapter 4, I examine the development of teaching. The results diverge from Western findings, with children's teaching reflecting local norms and perceptions of cultural transmission. This suggests that while teaching as such is developmentally reliable, specific teaching styles, along with the way we conceptualize teaching, may be culturally learnt. In Chapter 5, I explore various socio-economic and demographic trends associated with 'modernization', such as market integration, formal education, overseas travel, and household structure, documenting considerable heterogeneity. However, I failed to find support for the idea that transformations associated with 'Westernization' shift children's cognitive development.

Impact Statement

This thesis contributes to our knowledge of cross-cultural psychology, cultural evolution, and cognitive development, and how they are related to each other. Specifically, it provides insight on the extent to which cultural and other environmental factors influence children's development of Theory of Mind and teaching. My findings on teaching suggest that some aspects of teaching, along with the way we reason about teaching, may be culturally learnt. They also challenge the conflation of abstract communication with better teaching in developmental research. My findings on Theory of Mind suggest that some aspects of Theory of Mind may be culturally learnt, but they also conflict with earlier findings from the same ethnolinguistic context. This suggests that some tasks may not capture children's Theory of Mind accurately in this setting. My results therefore highlight the need for replications and follow-up studies in cross-cultural developmental research. This thesis also adds to our ethnographic knowledge about the South Pacific. Specifically, it provides insight on kinship systems, childrearing practices, moral values, and supernatural beliefs in two field sites in Vanuatu. It also provides insight on socio-economic transformations currently occurring in Pacific Islander countries, including trends related to formal education, market integration, seasonal labour, and household structure, and how they are related to each other. Contrary to representations of Vanuatu as remote and far removed from 'Westernizing' influences, this thesis demonstrates that rural populations are very heterogeneous in this regard, with considerable variation both within and between households. They further show that while some of these factors are correlated with each other, others are not. This demonstrates that 'Westernization' is not a linear trend where all these variables reinforce each other, instead showing more of a mosaic character. These findings highlight that cross-cultural developmental research should refrain from treating small-scale societies as homogenous, and to acknowledge cultural transformations.

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Acknowledgments

At UCL, I thank my supervisors Ruth Mace and Emily H Emmott for their advice and support. I also thank Henlyn Mala of the Vanuatu Cultural Centre for her help with my research permit and visa, and the German Academic Scholarship Foundation (Studienstiftung des Deutschen Volkes) for funding my research.

In Vanuatu, I thank all the communities that participated in the project: Paunangisu, Emua, Marius, Onesua, Launakarae, Suasu, Savaki, Manua, Napara, Samma, Siviri, and Undine Bay on Efate; and Hog Harbour, Lokalee, Lonnoc, Towoc, and New Site on Espiritu Santo. In particular, I thank all the people who assisted with various aspects of my research, including: Jane Marcel, Noelyn Kaltonga, Josephine Fred, and Rosemary Toara in Efate; John Toc and Paul and Tamar William in Hog Harbour; and Daniel Symons for assisting with data coding back at UCL. I further thank all the people who hosted me, including: Broux and Annie Kalfau in Paunangisu with all their relatives and Nellie Niala with Morten and Ivy at Hog Harbour. On Efate, special thanks goes to the principal of Manua Primary School, Mr Kaltonga Kalorong, the school board, and the teachers of the participating classes: Ms Lucy Gershom, Ms Monique Kalmar, Ms Esther Archie, Ms Leinearu Archie, Ms Juliette Naviti, Ms Belinda Wogis, Ms Edna Bebe and Mr Tony Raymond. On Espiritu Santo, special thanks goes to the chief and chief's council of Hog Harbour village, the principal of Prenter Primary School, the chairman of the school board, and the teachers of the participating classes: Ms Irish Kaven, Ms Marie Ismael, Ms Lydia Wass, Ms Marie Ali, and Ms Kathy George. On Efate, I further thank Pierre and Cecilia Kaloris, Kalfau and Leintamate Esly, and William and Janet Bunyan with all their families for their advice and conversation. On Espiritu Santo, the same goes to Anathiel and Loyalty Karpus, George Nial, and Elder Manase.

Last but not least, I thank my parents Horst and Gerda Brandl for supporting me through this journey.

1. Introduction

1.1 Cultural Evolution and Cumulative Culture

Until recently, 'culture' was thought to be unique to humans. The social anthropologist E.B. Tylor famously defined culture as "that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society" (Tylor [1871] 1903: 1). Many social scientists still think of 'culture' as belonging to humans, and 'nature' as belonging to other animals (Sommer & Parish 2010). In contrast, behavioural ecologists and evolutionary biologists have developed a more nuanced understanding of culture, where culture is a second inheritance system (in addition to genes) and a trait that is present in many different species (Whiten 2017). In this view, cultures are made up of traditions, which are "distinctive behaviour pattern[s] shared by two or more individuals in a social unit, which persist over time and that new practitioners acquire in part through socially aided learning" (Whiten 2005: 53).

Social learning refers to what we learn from others, as opposed to individual learning, which is what we learn by ourselves. Social learning can be adaptive (meaning that it generates fitness benefits for the learner) because it reduces the cost of individual learning: instead of having to painstakingly 'invent' or 'discover' all the relevant information about the environment and the attendant survival skills by themselves, social learners can piggyback off of what others are doing already (Boyd & Richerson 1985). This is particularly beneficial when the environment is stable – and the behavioural solutions that others have come up with are still relevant (Boyd & Richerson 1985). Socially learned behaviours can then provide individuals with solutions to commonly encountered survival problems and buffer them against natural selection (Boyd & Richerson 1985), although not all socially learnt traits are necessarily fitness relevant.

Social information can spread in various different ways such as vertical transmission (parent-offspring), oblique (older generation-younger generation other than parent-offspring) or horizontal (peer-peer, or within the same generation) (Cavalli-Sforza & Feldman 1981). The transmission process can also take various different forms such as local enhancement (where a learner's attention is drawn to an object used by another individual and then the learner interacts with the relevant object themselves), observation (where a learner observes another individual perform an activity), emulation (where a learner observes another individual perform some activity and then performs actions that achieve a similar effect), and imitation (where a learner observes another performing an

action and then copies the entire action sequence step-by-step) (Hoppitt & Laland 2013).

There is evidence of social learning in an ever-growing number of non-human animals such as elephants, Rhesus monkeys, rats, crows, finches, blackbirds, cowbirds, quail, guppies, and coral reef fish, in domains such as food choice, tool use, patterns of movement, predator avoidance, mate choice, and courtship behaviour (Galef & Laland 2005; Fishlock, Caldwell & Lee 2016; but see Mercado & Perazio 2021). This is also true of our closest living relatives. For example, bonobos (*Pan paniscus*) show cultural differences in prey preferences (Samuni, Wegdell & Surbeck 2020). While some groups prefer duikers (*Cephalophini*), others prefer anomalures (*Anomaluridae*) (Samuni, Wegdell & Surbeck 2020). Their sister species, the chimpanzees (*Pan troglodytes*), also show group-level cultural traditions in greeting conventions and grooming behaviours (Whiten et al. 1999). They also employ many different stick, leaf, and stone stools for drinking, termite-fishing, ant-dipping, honey-gathering, hunting, and nut-cracking (Whiten, Horner & Marshall-Pescini 2003; Whiten 2005; Haslam et al. 2009). These tool use behaviours appear to be genuine cultural traditions that differ between different chimpanzee groups, each with its own unique cultural profile (Whiten, Horner & Marshall-Pescini 2003; Whiten 2005; Haslam et al. 2009). Some of these tool-use traditions are shaped by features of the natural environment, such as the abundance and characteristics of prey animals (Koops, McGrew, & Matsuzawa 2013; Sanz et al. 2014) and challenges associated with surviving in forest *vs* savannah environments (Boesch & Boesch 1990).

However, like some aspects of human culture, chimpanzee cultural traditions also transcend ecology. In one famous example, nut-cracking techniques (in which chimpanzees use rocks and/or roots as hammers and anvils to open nuts with hard shells) form group-level conventions that withstand frequent female migration between groups (Luncz, Wittig & Boesch 2015; see also Lycett, Collard & McGrew 2007; Lycett 2010). In Côte d'Ivoire, nut-cracking is found West of the N'Zo-Sassandra river, but not in the East, and this is not explained by ecological or demographic factors (Boesch et al. 1994). Furthermore, while some nut-cracking troops adjust their selection of hammers in response to seasonal changes in the hardness of nuts, their close neighbours do not (Luncz, Mundry & Boesch 2012). 'Arbitrary' cultural differences in tool use traditions have also been found for ant and termite feeding behaviours (Luncz & Boesch 2014) and the use of leaves (Gruber et al. 2011; Mugisha, Zuberbühler & Hobaiter 2016). Chimps' tool modifications appear to be deliberate. Chimpanzees recognize functional

improvements in the tool materials they use (Lamon et al. 2018). Like bearded capuchins (*Sapajus Libidinosus)*, who also use nut-cracking, chimpanzees are sensitive to the hardness and other physical qualities of the hammer tools they use, although only chimps appear to modify them intentionally (Visalberghi et al. 2015).

The complex cultural traditions in great apes have generated interest in the foundations of human culture, and what makes human culture different from that found in other animals. Humans are generally thought to occupy a 'cultural niche', and our dominance as a species is often attributed to our strong reliance on social learning to solve ecological problems (Boyd, Richerson & Henrich 2011). The emergence and transmission of technical innovations has played a crucial role in the expansion of the human ecological niche, facilitating rapid adaptation to new environments by enabling humans to adjust their subsistence systems to various ecological conditions. This has enabled humans to carve out a 'generalist specialist' niche for themselves, where humans thrive in diverse environments and different human populations develop cultural adaptions that are specialized to the particular ecozones they inhabit (Roberts & Stewart 2018). This is due to our ability to create cumulative culture. 'Cumulative culture' refers to a process in which improvements on existing skills, tools, and techniques (or any other learned trait) are added to the behavioural repertoire of a population and retained across generations (Boyd & Richerson 1996). In order for culture to be cumulative, beneficial innovations need to be transmitted with high fidelity across generations (Muthukrishna & Henrich 2016). As cultural knowledge 'ratchets up' over time (Tomasello, Kruger & Ratner 1993; Tomasello 1999), it outpaces what any individual can create when left to their own devices.

This cumulative 'ratchet effect' may be what distinguishes human from non-human cultures. Evidence for cumulative culture in other primates is indeed very slim. In a transmission chain experiment, captive Guinea baboons (*Papio papio*) were presented with a pattern reproduction task on touch screens (Claidière et al. 2014). Subjects had to recognize and memorize grid patterns, with the output of one individual becoming the input for the next individual in the chain (Claidière et al. 2014). Performance increased across experimental generations and lineage-specific patterns emerged during the transmission process (Claidière et al. 2014). The authors attribute this to cumulative cultural evolution (Claidière et al. 2014). However, this result was obtained under very artificial laboratory conditions and to the best of my knowledge, there is no evidence that wild baboons possess cumulative culture. In another example, in the 1970s, some

Japanese macaques (*Macaca fuscata*) started to wash sweet potatoes and wheat grains in sea water (Kawai 1965). Some have argued that these behaviours may have become more complex and efficient over time (Schofield et al. 2018). This may meet a 'weakened', process-focused definition of cumulative culture, where the term simply denotes a gradual increase in the complexity of a cultural skill or technique (see discussion in Reindl et al. 2020). But due to its simplicity, it seems unlikely that this represents a 'ratchet effect' in the more conservative sense that the term 'cumulative culture' is usually used. In the latter, a cultural trait is only really cumulative if a naïve individual (meaning an individual who is not familiar with the technique) cannot reinvent it from scratch (see discussion in Reindl et al. 2020).

Complex, multi-tool techniques in chimpanzees are the best candidates for cumulative culture because they can be considered as rudimentary combined tools, which is evident in the use of hammers and anvils for nutcracking. This skill takes years to master by young chimps. Juveniles acquire nut-cracking skills during an extended period of master-apprenticeship based on observational learning and social tolerance from adults (Matsuzawa et al. 2001). This is only energetically viable due to food sharing between mother and infant (Boesch & Boesch 1990). Accordingly, food sharing may be a prerequisite for the acquisition of cognitively and motorically demanding skills through social learning (Boesch & Boesch 1990). Furthermore, there is a critical period for the acquisition of nut-cracking skills between the ages of 3 and 5 (Biro et al. 2003). Between the ages of 8 and 14, the youngsters' gradual increase in performance levels off and stabilizes (Biro et al. 2003). Once this time window has passed, chimps who have not been exposed to nut-cracking do not acquire this technique anymore, which has been taken to mean that social learning is necessary to maintain it (Biro et al. 2003). Finally, the Oldowan tradition (the earliest known evidence of intentionally modified stone tools in hominin evolution) dates back to around 2.5 million years ago, but unmodified stone tools may have been present in the last common ancestor of *Homo* and *Pan* (Panger et al. 2002). Archeological records show that knapped stone tools were already present half a million years before *Homo*, indicating that the earliest stone tools were created by early hominins or extinct apes (Carvalho & Beardmore-Herd 2019). Accordingly, hammer-and-anvil techniques used in West Africa might have built on and improved earlier pounding techniques and unmodified tools shared with the last common ancestor of hominins. Additionally, some have argued that ecologically unconstrained, community-level variation in cultural techniques such as termite fishing constitutes cumulative

culture (Boesch et al. 2020). However, this remains speculative – and highly controversial.

Rather than being cumulative, ape cultures may form 'latent solutions', meaning that apes typically acquire 'cultural' techniques through individual learning, which is mediated by social factors (Bandini et al. 2020a). Accordingly, simple forms of social learning may shape the *frequency* of 'cultural' behaviours in ape groups, but the *form* of these behaviours is determined by individual learning (Bandini et al. 2020a). Observational and experimental research shows that many animal species can acquire their species-typical tool-use skills through individual learning (Bandini & Tennie 2020). Recent experiments demonstrate that this includes many ape cultural traditions. For example, naïve orangutans (*Pongo abelii*) can spontaneously re-invent nut-cracking, one of the most complex ape technologies, as long as they are provided with the necessary raw materials such as hammers and nuts (Bandini et al. 2020b). Furthermore, naïve chimpanzees spontaneously re-invent stick pounding (Bandini & Tennie 2019). Finally, theoretical modelling has shown that cultural patterns observed in apes can be reproduced with socially induced reinvention alone (Acerbi, Snyder & Tennie 2020). Accordingly, ape cultures are probably not cumulative in the stricter, product-focused sense of the term (for definitions see Reindl et al. 2020), and do not have the 'ratchet effects' that characterizes genuinely cumulative culture. This is also consistent with archeological data. Primate archaeologists have conducted analyses of use-wear patterns in stone tools used by chimps today, enabling us to discriminate between active and passive pounding in lithic assemblages (Benito-Calvo et al. 2015). Archeological sites attributed to apes in Côte d'Ivoire show that nut-cracking in its present form is ancient in this region, dating back to at least 4,300 years ago, with little change since (Mercader et al. 2007).

1.2 Social Cognition

So why do human toolkits for foraging, hunting, and food processing show so many signs of cumulative change and improvement, whereas this appears more limited (and controversial) in our closest relatives? There are two major hypotheses. The first one holds that culture is an extension of general intelligence (*g*) – domain-general reasoning abilities that can be applied to social, ecological, and technical problems. Taken together, these abilities afford behavioural flexibility and the capacity to solve complex problems. Proponents of this view hold that social learning, innovation (the ability to create new solutions to existing problems), and tool use have co-evolved in

the most 'tooly' primate taxa, including humans (Reader, Hager & Laland 2011). This is supported by the fact that social and ecological intelligence are correlated across primates and *g* correlates with neocortex ratio (i.e. the size of brain regions involved in higher-order cognitive functions, relative to the other parts of the brain) (Reader, Hager & Laland 2011). Accordingly, the 'accumulation gap' between human and ape technologies may come down to a set of traits such as enhanced hand-eye coordination, executive control, and manipulative abilities, combined with social factors such as enhanced cooperation and communication (Vaesen 2012).

In contrast, the second hypothesis holds that human intelligence is adapted for the acquisition of culture, which is thought to be an extension of social intelligence – our ability to navigate and reason about relationships with other people (Herrmann et al. 2007; Moll & Tomasello 2007). This is in line with the 'social brain hypothesis, which holds that social cognition has played a decisive role in primate evolution (Dunbar 1998). This argument is tied to the expansion of the neocortex in primate brain evolution. Neocortex size is thought to limit the number of long-term social relationships a member of a given species can sustain (Dunbar 1992; 1993; 2003). In anthropoids, neocortex size and ratio correlate with various social characteristics such as group size, grooming clique size (then number of individuals who regularly groom one another, which is an indicator of social bonding), tactical deception, and social play (Dunbar 1992; 1993; 2003). Chimps can maintain complex social relationships that involve the formation of alliances and contested dominance hierarchies. Chimps also form lasting ties with groupmates based on homophily in personality and trust (Massen & Koski 2014; Engelmann & Herrmann 2016). However, proponents of this second hypothesis argue that due to the competitive nature of chimp society, chimps' social cognition differs significantly from that of humans. Specifically, they argue that social cognition in non-human primates is primarily adapted to competition, whereas human social cognition is 'Vygotskian' and thus primarily adapted to cooperation (Moll & Tomasello 2007).

They attribute this to the emergence of collaborative foraging (Tomasello et al. 2012) and communal breeding (Burkart & van Schaik 2010) in human evolution, which promoted cooperation. Unlike chimps, humans occupy a 'risky foraging' niche (where foragers rely on hunting as an important source of food but returns from hunting trips are unpredictable and can fluctuate considerably). As a result, humans came to rely on cooperative hunting and frequent food sharing to buffer themselves against fluctuations

in the availability of food (Jaeggi & Gurven 2013). For example, Agta hunter-gatherers in the Philippines form food sharing clusters made up of groups of households (Dyble et al. 2016). This social structure facilitates sharing among kin and reciprocal exchange, allowing individuals to buffer themselves against energetic shortfalls (Dyble et al. 2016). Like adults, Hadza hunter-gatherer children in Tanzania routinely share food they have foraged based on kinship or reciprocal relationships and begin to form their own sharing networks at a very young age, although sharing increases as they get older (Crittenden & Zes 2015). Furthermore, due to their large and energetically costly brains, humans give birth to highly altricial offspring (who are very helpless and need a lot of care and feeding to survive). As a result, humans have come to rely on communal childrearing or allomothering (where people other than the biological mother act as 'helpers at the nest' by helping to look after children), which buffers mothers against the costs associated with caring for dependent offspring (Hrdy 2011). As a result, humans have come to cooperate with each other in all domains of life and frequently share resources, collaborate in food procurement and processing, and provide mutual aid in child rearing (Kaplan et al. 2000). Foragers not only share food and care, but also ecological knowledge. For example, Mbendjele BaYaka pygmies in Congo share medicinal plant knowledge with kin and affines (a spouse's relatives), and knowledge of food plants and plants associated with various social beliefs with their camp co-residents (Salali et al. 2016). The social ties that foragers build also cross community boundaries. For example, among the Hadza and the South American Aché, men maintain far-reaching social networks with individuals in other camps, and these include relationships with affines and non-kin (Hill et al. 2014). Due to their far-reaching social networks, foragers experience high connectivity. For example, Aché and Hadza men encounter ten times as many distinct individuals in their lifetime as male chimps and therefore have many more opportunities for social learning (Hill et al. 2014). Finally, comparative analyses of forager populations have revealed a uniquely human social structure characterized by the frequent co-residence of many genetically unrelated individuals (Hill et al. 2011). This derives from a multi-local residence system in which males and females have equal say in determining post-marital residence (Dyble et al. 2015).

In the Vygotskian model, the evolutionary pressures that favoured this high level of sharing and cooperation also selected for prosocial psychological dispositions such as trust and social tolerance. Proponents of this view hold that cumulative culture then emerged from a package of these prosocial traits such as teaching (collaborative learning

in which knowledgeable individuals actively help others acquire information), imitation (where a learner directly copies an action performed by another individual), and intersubjectivity (mutual reflective perspective-taking), which are thought to increase the fidelity of social learning (Tomasello, Kruger & Ratner 1993; Dean et al. 2012). For example, Tennie, Call and Tomasello (2009) have proposed that, while chimp cultures reflect local behavioural biases produced by founder effects and emulation learning, human cultures are based on high-fidelity imitation and a unique form of prosociality that enables active teaching and joint attention. This is thought to promote the 'ratchet effect' in which cultural modifications are accumulated over time (see also Tomasello 1999). According to Tomasello, Kruger and Ratner (1993), human social learning is unique in its reliance on intersubjectivity, which enables high-fidelity transmission of information on a scale that is impossible to achieve with other learning strategies.

These claims are borne out by the results of some laboratory studies. In a puzzle box experiment presented to human children, chimps and capuchins, subjects had to solve three problems that yielded increasingly desirable rewards (Dean et al. 2012). While chimps made many failed attempts to retrieve the higher-level rewards, children outperformed both chimps and capuchins (Dean et al. 2012). Children imitated each other more often, communicated about the task, helped each other, provided instructions, and shared rewards (Dean et al. 2012). Children who received a lot of social support performed better than children who received little (Dean et al. 2012). And in experimental tests of social and physical cognition, human children only outperform adult apes in the social domain (Herrmann et al. 2007). Additionally, when presented with a reward retrieval task on which subjects had received information from a model that conflicted with individually acquired knowledge, children attended more often to the model than chimps (van Leeuwen, Call & Haun 2014).This suggests that species-level differences in prosociality and cooperative problem-solving are responsible for – or at the very least contribute to- the cultural gap between humans and other apes, and that the propensity for social learning is over-developed in human children. In the same vein, some have argued that teaching, and specifically language-assisted teaching, was a key factor in the evolution of cumulative culture (Fogarty, Strimling & Laland 2011; van Schaik, Pradhan and Tennie 2019). Teaching thus merits further attention in the cultural evolution literature.

1.3 Teaching

'Teaching' refers to learning interactions that are cooperative, for example, when a knowledgeable individual modifies their behaviour in a way that helps a naïve individual learn (Caro & Hauser 1992). This may occur in a variety of ways. For example, teaching may occur through social tolerance, in which a teacher allows a learner to closely observe their activities, tolerating physical proximity and intrusive behaviours such as touching (Kline 2017). In opportunity provisioning, a teacher modifies an activity to make it less difficult or less dangerous for the learner to participate in (Kline 2017). In evaluative feedback, a teacher provides verbal feedback or non-verbal reinforcement, which may be positive (praise) or negative (criticism, warning, or punishment) (Kline 2017). In local enhancement, a teacher draws the learner's attention to an object or activity, which may happen through gesture (pointing) or verbally (commands) (Kline 2017). Finally, in direct active teaching, a teacher uses abstract communication or demonstration (Kline 2017). Some forms of non-verbal teaching are present in non-human animals. These include meerkats (*Suricata suricatta*) (Thornton & McAuliffe 2006), tandem-running ants (*Temnothorax albipennis*) (Richardson & Franks 2006), pied babblers (*Turdoides bicolor)* (Raihani & Ridley 2008), superb fairywrens *(Malurus cyaneus*) *(*Kleindorfer et al. 2014), and golden lion tamarins (*Leontopithecus rosalia*) (Troisi et al. 2018). Teaching may also be present in felines such as cheetahs (*Acinonyx jubatus*) and domestic cats (*Felis catus*), domestic fowl (*Gallus gallus domesticus*), and honeybees ((*Apis mellifera*) (evidence reviewed in Hoppitt et al. 2008). While some non-human animals appear to use evaluative feedback, other methods such as demonstrations and drawing the learner's attention appear to be very rare (Gärdenfors & Högberg 2017).

As teaching is a form of cooperation, it evolved under the same dynamics as cooperation more generally. Cooperation, or helping behaviour, can evolve when the costs to the helper are outweighed by the benefits to the helped, adjusted for the level of relatedness between them ($rb > c$) (Hamilton 1964). Accordingly, teaching can evolve when the costs incurred by the 'teacher' are outweighed by the benefits received by the 'learner', adjusted for relatedness (Caro & Hauser 1992; Thornton & Raihani 2008; Fogarty, Stremling & Laland 2011). This is the case when teaching (1) benefits the teacher's inclusive fitness, and (2) if other forms of learning are insufficient to acquire the relevant skill (Hoppitt et al. 2008). The first point is borne out by the fact that teaching is not limited to but is more common in cooperative breeders (where many related

alloparents, i.e. individuals other than biological parents, help with provisioning offspring), probably because the average level of relatedness between individuals in a group is high (Hoppitt et al. 2008). High relatedness favours cooperation in general, and also teaching in particular, because it creates indirect benefits to cooperative individuals' fitness. Alloparent-teachers may also derive direct benefits from teaching because juveniles who learn foraging skills more quickly and achieve higher levels of competence can transition to independent foraging earlier, reducing provisioning costs for the alloparent (Hoppitt et al. 2008). These dynamics are evident in Callitrichids, who, unlike other primates, receive prolonged care and provisioning from both parents and alloparent-helpers, even after weaning (Rapaport 2011). In this context, golden lion tamarins (*Leontopithecus rosalia*) produce food calls that encourage juveniles to accept food that is being provided to them (Rapaport 2011). The frequency of these food transfer calls declines as juveniles begin to forage more independently, but adults then begin to use the same calls when they direct them to hidden prey, which improves their capture rates (Rapaport 2011). On a more general, cooperative breeding selects for a range of psychological adaptations, including greater prosociality and enhanced social cognition (Burkart, Hrdy & van Schaik 2009). In the human lineage, these may have been added to a more ancient and simpler form of social cognition shared with extant great apes, which was capable of processing some mental states in competitive contexts (Burkart, Hrdy & van Schaik 2009). The evolution of prosocial motivations enabled shared intentionality, which in turn facilitated the emergence of uniquely human culture (Burkart, Hrdy & van Schaik 2009). This echoes an earlier argument, namely, that the evolution of cooperative breeding in the early Pleistocene may have promoted increased sociability, which in turn facilitated teaching and thus early technological ratcheting (Pradhan, Tennie & van Schaik 2012).

The second point is borne out by evolutionary models, which show that teaching is favoured when naïve learners cannot easily acquire information through individual learning or copying alone (Fogarty, Strimling & Laland 2011). This is evident in experiments that have demonstrated spontaneous ratchet effects in humans. Skills associated with the construction of paper planes and spaghetti towers show cumulative improvement of performance across experimental generations, which are created by regularly removing and replacing participants (Caldwell & Millen 2008). Whether teaching contributes to this effect depends on task complexity. In simple tasks, low-fidelity mechanisms of social learning such as emulation (the learner merely copies the

end results of an activity by paying attention to the general functional relations of the task) and local enhancement (the learner's attention is drawn to a particular object, upon which he rediscovers the relevant skills by himself) suffice (Caldwell & Millen 2008; 2009). Active teaching is not necessary to achieve this effect for simple tasks (Caldwell & Millen 2009), and neither is imitation (the learner copies an entire action sequence by paying attention to the process itself) (Caldwell & Millen 2009). In contrast, more complex tasks such as complicated knotwork are more efficiently transmitted through active teaching than through other mechanisms (Caldwell, Renner & Atkinson 2017). In transmission chain experiments, teaching only provides an advantage if the relevant tools are complex (Lucas et al. 2020).

Task complexity may play a role in the relative of absence of teaching among chimpanzees. An early paper claimed to have identified some instances of active teaching among wild chimps in Côte d'Ivoire. Mothers facilitate learning for their offspring by stimulating tool use in infants and facilitating the latter's nut-cracking activities (Boesch 1991). They allow infants to use their own hammers, provide them with nuts, manipulate the latter's tools in order to facilitate successful nut-cracking, and occasionally demonstrate the correct technique to struggling infants (Boesch 1991). Boesch (1991) argues that mothers adjust these behaviours in response to the skill level attained by the infant. However, to the best of my knowledge, such clear-cut evidence of teaching has not been observed elsewhere. Others have argued that tool transfers are a form of teaching in wild chimpanzees (Musgrave et al. 2016). In these exchanges, skilled adults, especially mothers, transfer brush-tipped termite fishing probes to naïve learners, usually dependent offspring, after manufacturing them from raw materials (Musgrave et al. 2016). It has been argued that these exchanges meet the criteria for teaching because donors suffer opportunity costs to their own termite foraging, improve the learner's foraging, and only occur in the presence of such learners (Musgrave et al. 2016). Furthermore, teaching depends on task complexity, with more transfers made in locations with complicated, brush-tipped tools made from specific raw materials than in locations with simpler tools (Musgrave et al. 2020). However, these claims are controversial, and teaching is generally held to be absent in chimpanzees (Hoppitt et al. 2008). Given naïve individuals' ability to reinvent various tool use behaviours from scratch, it might be that the techniques involved in chimpanzee cultures are not sufficiently opaque to require teaching (Moore & Tennie 2015).

Conversely, in the human lineage, teaching may have evolved along with the

emergence of complex technologies beyond ape level. For example, some have argued that language originally evolved to teach complex cultural skills such as stone tool manufacture to kin (Laland 2017). Language, teaching, and cumulative culture thus co-evolved within a cooperative foraging niche that relied on alloparenting in small foraging bands (Laland 2017). Similarly, van Schaik, Pradhan and Tennie (2019) have argued that language-assisted teaching was crucial for the evolution of cumulative culture. In the same vein, Csibra and Gergely (2011) have proposed that natural pedagogy, the transmission of cultural knowledge by communication, is an adaptation specific to humans. They argue that this form of pedagogy constitutes an independently selected cognitive system that facilitates the transmission of opaque skills, which cannot be learned by passive observation alone (Csibra & Gergely 2011). These skills include complex technologies whose modes of operation and adaptive functions are not intuitively obvious to the naïve learner (Csibra & Gergely 2011). *Homo docens* (the teaching man) may have started off with simple forms of teaching such as giving evaluative feedback to a learner, drawing the learner's attention to something, and demonstrating a skill, none of which require symbolic communication (Gärdenfors & Högberg 2017). Human teaching then incorporated more abstract forms, including the ability to communicate abstract concepts and to explain the relationships between those concepts (Gärdenfors & Högberg 2017). It has been argued that the cultural transmission of Oldowan stone tools (which are relatively primitive and associated with *Homo habilis*) required demonstration, whereas the more complex, late Acheulian hand axes (associated with *Homo erectus*) required the communication of concepts (Gärdenfors & Högberg 2017). It follows that teaching may have evolved before *Homo sapiens* entered the scene, but after the split with the great apes (Gärdenfors & Högberg 2017).

Some of these ideas are borne out by research in experimental archaeology. For example, stone tool making is more efficiently transmitted when participants are allowed to use verbal communication and active teaching (Morgan et al. 2015). Accordingly, some have argued that that complex technical skills, high-fidelity cultural transmission, and language have co-evolved in humans (Lombao, Guardiola, & Mosquera 2017). However, the extent to which language was involved in this process remains unclear. In other stone tool experiments, participants who only received verbal instruction (without gestural teaching) performed worse than people who had received purely gestural or gestural combined with verbal teaching, casting doubt on the idea that verbal teaching was necessary for early stone-tool making (Cataldo, Migliano & Vinicius 2018). Furthermore,

participants instructed in Levallois flaking with verbally assisted demonstrations did not perform better than participants who had only observed non-verbal demonstrations (Ohnuma, Aoki & Akazawa 1997). In experiments using core biface manufacture, participants who went without verbal teaching even produced more efficient flakes than those who had access to it (Putt, Woods & Franciscus 2014).

Accordingly, it remains controversial when teaching first appeared in human evolution, but given the complexity of human cumulative culture, teaching should be present across human cultures. However, whether or not teaching is present among hunter-gatherers and other non-industrialized societies is controversial. Some biological anthropologists have has argued that adults teaching children is a human universal that occurs across cultures (Kline, Boyd & Henrich 2013; Kline 2015). In contrast, some social anthropologists have claimed that teaching, specifically direct active teaching and teaching involving abstract communication, is limited to Western societies and those that have been impacted by Westernized models of formal education (Lancy 2015a). And indeed, observational studies have documented a high degree of cross-cultural variation in caregiver-child communication. In some small-scale subsistence societies, adults rarely talk to young children. For example, among Tsimane forager-horticulturalists in lowland Bolivia, child-directed speech is rare, especially for toddlers under 4 years of age, who receive less than a minute of 'talking time' per daylight hour (Cristia et al. 2019). Furthermore, across cultures, much enculturation occurs through 'guided participation' – in which children learn cultural skills as they participate in the practices of their community while adults and older children are present, although this does not necessarily involve direct instruction (Rogoff 2003). Children often learn in informal ways in the context of their families and communities, by observing others and pitching in as they participate in everyday activities (Paradise & Rogoff 2009). This approach emphasizes "[l]earning 'by osmosis', picking up values, skills, and mannerisms in an incidental fashion through close involvement with a socializing agent" (Rogoff 2003: 323). Speech is often used in this process, although caregivers do not use it to impart lengthy lessons, but instead use it support the ongoing activities (Paradise & Rogoff 2009). Much observation occurs in social contexts that are familiar to children, and caregivers in many small-scale societies rely strongly on observation for cultural transmission (Gaskins & Paradise 2010). For example, among Congo basin hunter-gatherers, observation and imitation are the most common forms of social learning (Hewlett et al. 2011). Among Aka foragers, children engage in a lot of pretense imitation of subsistence activities,

which occurs away from adults in child-only play groups (Boyette 2016).

However, subtle forms of teaching are also present in small-scale societies. For example, caregivers often teach through task assignment – by directing children to complete a particular activity, often without explanation, and caregivers add more tasks as children get older (Rogoff 2003). While observational learning is more common than teaching, the latter is still present in hunter-gatherers (Boyette & Hewlett 2017). In a review of the ethnographic literature on hunting in foragers and mixed-subsistence societies, MacDonald (2007) found that children usually start to gain experience with hunting weapons at a young age as adults and older children provide them with toy weapons to play with. Real weapons are increasingly provided as they grow older (MacDonald 2007). Adults let children accompany them on hunting trips and sometimes facilitate learning by focusing on easy prey, explaining plant and animal knowledge, and providing them with opportunities to make their first kills (MacDonald 2007). Children also receive teaching in the form of instruction, negative feedback, and commands (Boyette & Hewlett 2017). Hadza and BaYaka adults often employ task assignment to teach children, for example by assigning them simple chores and providing them with tools (Lew-Levy et al. 2019). Among the Chabu in Ethiopia, children's play-hunting is often guided by older children, their fathers show them how to butcher meat, and during hunting trips, adults respond to questions, show them how to perform vital skills, tease them about mistakes, and correct them (Dira & Hewlett 2016). They also provide them with carcasses for mock kills (Dira & Hewlett 2016). Chabu children learn hunting skills from grandfathers, fathers, paternal and maternal uncles, other adults, older brothers, cousins, and other children (Dira & Hewlett 2016). Longitudinal data on social learning among Aka and Bogi hunter-gatherers suggest that social learning is primarily vertical (parent-offspring) until the age of 5, and then becomes oblique (other adult-child) and horizontal (peer-peer) from age 6 onwards (Hewlett et al. 2011). Parents are physically close to young children and infants, but older children are more likely to spend time around children and adults other than their parents (Hewlett et al. 2011).

Infants also receive teaching (Hewlett & Roulette 2016). Natural pedagogy, as measured by the caregiver using pointing, eye contact, and child-directed speech to draw the infant's attention to a skill, is common, and so are negative feedback and demonstrations (Hewlett & Roulette 2016). Natural pedagogy and demonstrations are often used to teach tool-related skills (Hewlett & Roulette 2016). Opportunity scaffolding, in which the caregiver provides the infant with an object to explore under

supervision, was also used in relation to tool use (Hewlett & Roulette 2016).

1.4 Development of Teaching and Relationship with Theory of Mind

The above studies have shown that active facilitation of learning occurs in one form or another across cultures, including hunter-gatherers, although skills are taught outside of a formal education setting. Unfortunately, the above studies often treat teaching as something that merely happens to children – asking whether teaching is present, who teaches, and how – without addressing how we come to teach in the first place. This is problematic because recent field studies have revealed that Hadza and BaYaka children receive more teaching from other children than from adults (Lew-Levy et al. 2020). If much teaching happens between children, it is particularly relevant to know how children learn to teach. Furthermore, archeological sites from the Pleistocene suggest that pre-historic hunter-gatherer children may have constructed play areas away from their campsites (Langley 2020). This suggests that children's exploration of material culture away from adults, as seen in modern-day small-scale societies, also shaped culture learning in the past. Accordingly, how children develop the ability to teach is a relevant but underexplored topic in the social learning literature.

In contrast, this topic has been investigated in developmental psychology, but with important conceptual and methodological differences. The above studies draw on behavioural ecology and employ naturalistic methods (see Kline, Boyd & Henrich 2013). As a result, most empirical research has black-boxed the neural and cognitive mechanisms involved in social learning (Heyes 2016a). Psychologists have criticized this approach, arguing that cognition-blind definitions of teaching cannot account for failed teaching (where a knowledgeable individual attempts to teach a naïve one but the latter fails to learn the skill) because they require that the learner change their behaviour (Frye & Ziv 2005; Strauss, Ziv & Frye 2015). In turn, these authors have proposed a 'cognitivist' definition of teaching. According to this definition, teaching is a species-typical trait of humans that develops 'naturally' during ontogeny, is ubiquitous in human cultures, and depends on an advanced Theory of Mind – the ability to read other people's minds, or to mentally represent the thoughts, feelings, and perceptions of other agents (Strauss & Ziv 2012).

Evolutionary theorists disagree about how Theory of Mind may have evolved. Some have proposed that mindreading evolved as Machiavellian intelligence, in the sense

that advanced social cognition was driven by the benefits obtained from the ability to socially manipulate group mates, which in turn favoured the ability to detect and resist such manipulations in a cognitive arms race (Byrne & Whiten 1988; Whiten & Byrne 1988). Others have proposed that mind-reading co-evolved with our propensity to cooperate with non-kin, by enabling us to detect cooperative (and deceptive) intent in other people (Barrett, Cosmides & Tooby 2010). Yet others have argued that alloparenting of altricial offspring created a social setting where youngsters had to ingratiate themselves with multiple caregivers, and this favoured youngsters who were adept at reading (and responding to) the mental states of those caregivers (Hrdy & Burkart 2020), which is more in line with Vygotskian intelligence (Moll & Tomasello 2007).

However, Theory of Mind may also be uniquely important for teaching. According to supporters of this view, the teacher needs to take the learner's perspective into account to transmit information effectively. In other words, the teacher needs to understand that the learner knows less than themselves or might hold False Beliefs (misconceptions that conflict with reality) about the skill that is being taught (Strauss & Ziv 2012). Representatives of this approach have argued that human teaching is a 'natural cognition' that children acquire 'automatically' without being taught how to teach (Strauss, Ziv & Stein 2002; Strauss & Ziv 2012). This line of reasoning defines teaching by the *intentions* of the teacher (Frye & Ziv 2005): "When someone is teaching, he or she has the purpose, goal or intention of getting someone to learn something […] it is the intention of bringing about learning that is the basis for distinguishing teaching from other activities" (Pearson [1989] 2016: Chapter 6, page 2). Some have argued that intentional teaching evolved in a series of steps requiring increasingly sophisticated communication and Theory of Mind (Gärdenfors & Högberg 2017). Recent work suggests that human teaching does indeed depend on a complex interplay of the learner's and the teacher's mind-reading. For example, when adults use rewards and punishments as teaching tools, they do not merely rely on reinforcement learning (i.e. instrumental conditioning), but take into account that the learner also reasons about the teacher's goals (Ho et al. 2019).

But how do we learn to teach, and how does teaching develop in children? Research in experimental psychology suggests that the age of 5 is an important milestone in children's ability to teach and form mental representations of teaching. This is significant because at ca. 4-5 years of age, children also start to pass verbal False Belief tasks, at least in Western countries (Wellman, Cross & Watson 2001). The most iconic task here is the so-called Sally-Anne test: children listen to a story where two characters

are playing with a toy. Then one character leaves – but before they exit the scene, they put the toy in a box and close the lid. While they are away, the other character removes the toy and hides it in another box. Now the first character returns – where (as in which box) will they look for their toy? (Baron-Cohen, Leslie & Frith 1985). While 3-year-olds say that they will look in the second box (which is where the toy is), 4- and 5-year-olds say that they will look in the first box (which is where they put it before they left) – anticipating that the character will act on a False Belief (Baron-Cohen, Leslie & Frith 1985). Associated shifts are also present in children's teaching behaviour. When teaching peers, 3-year-olds tend to rely on non-verbal teaching strategies (such as demonstrations or physically intervening in the learner's actions) combined with simple forms of verbal communication (such as short commands) (Strauss, Ziv & Stein 2002; Ziv et al. 2016). In contrast, 5-year-olds rely more on verbal communication, especially abstract communication such as explanatory statements (Strauss, Ziv & Stein 2002; Ziv et al. 2016). 5-year-olds are also better able to combine words and gestures to communicate with the learner, pay more attention to the learner's level of understanding, and are more flexible in adjusting their teaching in response to the learner's needs (Strauss, Ziv & Stein 2002; Davis-Unger & Carlson 2008; Bensalah 2011; Ziv et al. 2016). These shifts are correlated with children's Theory of Mind comprehension (Strauss, Ziv & Stein 2002; Davis-Unger & Carlson 2008; Ziv et al. 2016).

These behavioural shifts are also accompanied by cognitive changes, which are evident in children's developing reflection about teaching, which becomes more sophisticated during the preschool years. When reflecting about their own teaching, 3-year-olds only consider the content (what they taught), whereas 4- and 5-year-olds are also aware of the process (how they taught and communicated) and can reflect on the transmission process itself (Strauss, Ziv & Stein 2002; Davis-Unger & Carlson 2008). When reflecting about a learner's acquisition of knowledge, 3-year-olds tend to treat the fact that they taught as evidence that learning occurred, whereas 4- and 5-year-olds are more attentive to the learner's actual behaviour when determining whether they learnt a skill or not (Strauss, Ziv & Stein 2002; Davis-Unger & Carlson 2008).

Furthermore, unlike 3-year-olds, 5-year-olds recognize that teaching is an intentional activity and can therefore distinguish conceptually between teaching (where a knowledgeable individual intends to transmit information to a naïve learner) and imitation (where a naïve learner copies a knowledgeable individual in the absence of such an intention) (Ziv, Solomon & Frye 2008). In contrast, 3-year-olds define teaching by

outcome, and tend to judge that teaching occurred whenever there was a successful transfer of information between a knowledgeable and a naïve individual, regardless of intent (Ziv, Solomon & Frye 2008). Accordingly, it has been argued that children's developing understanding of intentions helps them to reason about different types of social learning situations, including teaching (Ziv, Solomon & Frye 2008). While these studies were initially confined to Western children, similar results have been obtained for Korean children, where 5-year-olds were more likely to understand the intentionality of teaching than 3-year-olds (3-year-olds correctly identified successful teaching and failed imitation but not failed teaching or successful imitation) (Jeong & Frye 2018). Additionally, children who better understood the intentionality of teaching were more likely to recognize teaching intent in playful situations they participated in (e.g. being taught words through a game) and had better learning outcomes in teaching interactions (Jeong & Frye 2018).

Finally, 3- and 4-year-olds already recognize that in order to transmit information, knowledgeable individuals should teach naïve ones (Ziv & Frye 2004; Bensalah, Olivier & Stefaniak 2012; Ziv et al. 2016). However, children that age do not recognize yet that teachers also act on beliefs about their own and the learner's knowledge level – be they true or false (Ziv & Frye 2004; Bensalah, Olivier & Stefaniak 2012; Ziv et al. 2016). Children's ability to recognize this only appears at the age of 5-6 (Ziv & Frye 2004; Bensalah, Olivier & Stefaniak 2012; Ziv et al. 2016), although Hong Kong children outperform US counterparts on such problems (Wang, Wang & Chui 2017).

More recent studies have extended this research programme, further confirming that age 5 is an important milestone in children's development of teaching. 5-7-year-olds consider both their own and the learner's utility when teaching, so they minimize the learner's costs and maximize the benefits from teaching (Bridgers, Jara-Ettinger & Gweon 2020). More specifically, 5-7-year-olds prefer costly, lengthy demonstrations for naïve learners but selective, shorter demonstrations for knowledgeable learners, but 4-year-olds do not make this distinction (Gweon, Shafto & Schulz 2018). This was also evident in children's own teaching behaviour, as 5-6-year-olds flexibly adjusted their demonstrations to the knowledge level of the learner (Gweon, Shafto & Schulz 2018). Furthermore, 4-6-year-olds tailor their teaching to the learner's goals and competence, providing more information when the learner wants to understand how a toy *works* (as opposed to just observing what it *does*), and providing more information when they perceive the learner to be of average intelligence (as opposed to being exceptionally

bright) (Gweon & Schulz 2019). These shifts may also be related to children's developing ability to reflect on their own learning and knowledge. When asked how long they had known new information which they had just been taught, 4-year-olds tend to report that they have always known that piece of information (Taylor, Esbensen, & Bennett 1994). This is less pronounced in 5-year-olds, who are better able to distinguish between novel and familiar bits of information and are thus more aware of their own learning processes (Taylor, Esbensen, & Bennett 1994).

Some have argued that infants perform a kind of proto-teaching. 18- and 24-month-old infants spontaneously intervene to correct an adult who is about to act on a False Belief (by pointing out the correct location of an object the adult is looking for or by informing them that the location contains an aversive material), suggesting that infants anticipate mistakes based on mental state attributions and intervene proactively with simple forms of teaching (such as pointing) (Knudsen & Liszkowski 2012a; 2012b). However, the evidence for infant mindreading is controversial (see Section 1.5, Cognitive Gadgets).

While developmental psychology has shed some light on the development of teaching in children, all of the above studies were conducted with children from Western countries such as France, Israel, and the United States or from urban, industrialized populations in East Asia such as Hong Kong and Korea. Unfortunately, not much is known about how children learn to teach in other cultures, such as small-scale societies with participatory teaching conventions that emphasize task assignment and guided participation over abstract communication. This is problematic because it remains unclear whether the patterns observed in industrialized populations generalize to other cultural settings. Social anthropologists have argued that teaching is itself culturally transmitted – a skill we learn from others (Lancy 2015a). Accordingly, we have reason to expect cross-cultural differences in the ontogeny of teaching, but these remain underexplored in the literature.

1.5 Cognitive Gadgets

Intriguingly, the view that social learning strategies (and the cognitive mechanisms that support them) are themselves socially learnt has received support from some cognitive scientists (see Heyes 2012). Most prominently, Cecilia Heyes has argued that culture learning is itself cultural in origin: namely, that there is little evidence that the cognitive and behavioural processes that enable cumulative culture, such as imitation, are genetic

adaptations (Heyes 2012). As a result, Heyes (2012) has proposed that while we acquire cultural *knowledge* about the world (grist) through culture learning, we also build cultural *transmission* processes and the cognitive mechanisms that make them possible (mills) through social learning. Heyes (2018) has argued that humans' capacity for culture does not rest on innate cognitive instincts or pre-specified modules that have evolved for specific tasks (such as cognitive mechanisms that evolved specifically for mindreading, imitation, or teaching). Instead, the genetic 'starter kit' that makes specifically human behaviour possible is made up of: (1) high social tolerance and prosocial motivations and attitudes, (2) an attentional bias towards other people, and (3) high associative learning abilities that enable humans to draw causal connections between all sorts of entities (Heyes 2018). On top of that, many human capacities are 'cognitive gadgets' that are constructed throughout childhood from social interaction, developmentally plastic, and subject to cultural evolution (Heyes 2018).

Heyes' account of the human mind contrasts sharply with 'nativism' as promoted in evolutionary psychology, which holds that "the human mind consists of a set of evolved information-processing mechanisms instantiated in the human nervous system" (Tooby & Cosmides 1995:24), that "these mechanisms, and the developmental programs that produce them, are adaptations, produced by natural selection over evolutionary times in ancestral environments" (Tooby & Cosmides 1995: 24), and that "many of these mechanisms are functionally specialized to produce behavior [sic] that solves particular adaptive problems, such as mate selection, language acquisition, family relations, and cooperation" (Tooby & Cosmides 1995: 24). They further hold that "to be functionally specialized, many of these mechanisms must be richly structured in a content-specific way" (Tooby & Cosmides 1995: 24), and that these mechanisms "generate some of the particular content of human culture, including certain behaviors, artifacts, and linguistically transmitted representations" (Tooby & Cosmides 1995: 24). Accordingly, "culture is the manufactured product of evolved psychological mechanisms situated in individuals living in groups" (Tooby & Cosmides 1995: 24). Culture is created "by an incredibly intricate, contingent set of functional programs that use and process information from the world" (Tooby & Cosmides 1995: 24). In contrast, in Heyes' model, culture is not merely a *product* of human cognition, but actively shapes the mind. In other words, culture not only affects the contents of people's minds (what they think), but also mental processing (how people think) (Bender, Hutchins & Medin 2010).

According to Heyes, these 'cognitive gadgets' also include capacities thought

fundamental to intersubjectivity, social learning, and teaching, such as Theory of Mind (Heyes & Frith 2014). In this model, infants may possess neurocognitive mechanisms that allow them to have accurate expectations about other people's behaviour ('implicit' mindreading), but 'explicit' Theory of Mind (deliberations about other people's mental states that we can share through verbal communication) is culturally acquired (Heyes & Frith 2014). The contention is that, while Theory of Mind is crucial to human social cognition, reading other people's minds is much like reading print, by deriving meaning from signs and by integrating interpretative (reading) and regulative (writing) functions (Heyes & Frith 2014). We further learn mindreading through social interactions with groupmates who share cultural conventions regarding how we communicate about mental states (Heyes 2020). In this way, explicit Theory of Mind is culturally transmitted between generations through verbal instruction (Heyes & Frith 2014).

Accordingly, mindreading is said to differ fundamentally from simpler cognitive processes such as colour categorization: while colour *terms* differ between languages and cultures, colour *perception* relies on highly specialized, genetically inherited neural structures (Heyes & Frith 2014). This view draws on the two-systems model of mindreading: infants and non-human animals rely on implicit cognitive mechanisms that track belief-like states quickly and efficiently but that are inflexible, whereas human adults additionally draw on an explicit, later-developing, and more cognitively demanding 'full blown' Theory of Mind (Apperly & Butterfill 2009). In a lot of social interactions, implicit rather than explicit mindreading is said to be used (Apperly & Butterfill 2009). Heyes' account has been described as a 'cultural empiricist' model, which holds that "infants rely on cultural scaffolding to acquire culturally evolved mindreading capacities. This cultural scaffolding consists in using domain-general mechanisms to learn from caretakers and the ambient culture more broadly" (Fenici & Zawidzki 2020: 3). Heyes' model contrasts sharply with the 'nativist' account of mindreading, which holds that "mindreading is the function of an innate module, naturally selected in human prehistory for accurately tracking conspecific mental states" (Fenici & Zawidzki 2020: 3). Due to her focus on socio-cultural factors, Heyes' model also contrasts with the 'individualist empiricist' account, which holds that "mindreading is (re)discovered by individual infants during ontogeny, largely unassisted, via domain-general, science-like theorizing and hypothesis-testing" (Fenici & Zawidzki 2020: 3). These 'theory theory' accounts of cognitive development hold that young children act much like scientists, by constantly building and revising theories about the world around

them (Gopnik & Meltzoff 1997). Nevertheless, Heyes does not provide a 'blank slatist' account of cognition, nor is her model cultural determinism of the type practiced in early cultural anthropology. For example, she has also argued that the neurocognitive systems that explicit Theory of Mind draws on – while not evolved 'for' mindreading – are nevertheless genetically inherited and the result of natural selection (Heyes & Frith 2014; see comments on the 'genetic starter kit' above).

The idea that advanced Theory of Mind depends on verbal communication is not new, nor is it limited to Heyes. There is a long-standing research programme indicating that the verbal input that children receive, and the conversational environment they participate in, affect their Theory of Mind development (Rosnay & Hughes 2006). For example, some have proposed a relay race role model for the development of Theory of Mind, which is thought to depend on phonological working memory and verbal ability (Hasselhorn, Mähler & Grube 2005). Specifically, phonological working memory is important in the preschool years and acts as a pacemaker for cognitive development during that stage, then verbal ability and vocabulary knowledge support (and constrain) further development by age 5 (Hasselhorn, Mähler & Grube 2005). Furthermore, bilingual children outperform same-aged monolingual peers on False Belief tasks, which may be due to their greater metalinguistic understanding and inhibitory control (Goetz 2003). Deaf people who learned Nicaraguan Sign Language by 10 years of age perform better on False Belief tasks than deaf people who learned to sign when they were older, although the latter are still able to communicate about some mental states (Morgan & Kegl 2006). Comparative studies of deaf children from deaf families, deaf children with cochlear implants from hearing families, and hearing children show that deaf children from deaf families perform on the same level as hearing children, but deaf children with cochlear implants perform worse (Meristo & Strid 2020). These results suggest that unimpeded communication with caregivers is crucial for Theory of Mind development, be it through verbal or sign language (Meristo & Strid 2020). Some have argued that Theory of Mind and language co-develop in children because their relationship is mediated by pragmatic markers (Rubio-Fernandez 2020). In this account, demonstratives establish joint attention in young children ('It's *this* dog here!'), and children then build on this when they add definite articles to track shared knowledge ('It's *the* dog we saw earlier!') (Rubio-Fernandez 2020). Finally, simulations indicate that language can co-evolve with mind-reading, given that language learners must infer not only the lexicon, but also the perspectives of the people they communicate with to understand meaning in

context (Woensegt & Smith 2020).

Some may point to Autism Spectrum Disorder, which impairs Theory of Mind (Baron-Cohen, Leslie & Frith 1985), as evidence against the cognitive gadgets account. However, developmental disorders (and even neural specializations) do not in and of themselves provide evidence against social learning because print reading – arguably a purely cultural skill- shows both of those characteristics (Heyes 2020). Specifically, neuroscientists have documented the cultural recycling of cortical maps, in which the learning of cultural innovations 'invades' neural circuits that originally evolved for other functions (Dehaene & Cohen 2007). During cultural neural reuse, the learning of cultural practices then causes the formation of new functional and structural brain networks (d'Errico & Colagè 2018). In other words, the brain can 'construct' new networks during the learning process without prior specification. This is the case for reading and arithmetic (Dehaene & Cohen 2007; d'Errico & Colagè 2018), and this may apply to other abilities as well. Finally, that Theory of Mind depends on communicative ability is also indicated by some research with Autistic children, which found that Autistic children with higher verbal ability and higher verbal mental age performed at the same level as younger, neurotypical children with lower levels of verbal ability – suggesting that some Autistic children 'bootstrap' verbal ability to pass these tasks (Happé 1995).

These language-based, cultural accounts have been challenged by a series of non-verbal studies that purport to show Theory of Mind in infants and great apes. These studies have used a range of paradigms, including violation of expectation (in which infants were found to look longer when observing subjects reaching for locations that they should hold False Beliefs about, indicating surprise) (Onishi & Baillargeon 2005) and anticipatory looking (in which infants were found to look at the location where they expected subjects to look for an object, based on the subject's False Beliefs) (Southgate, Senju & Csibra 2007). Similar results were obtained in spontaneous helping paradigms (where infants helped an adult retrieve an object while taking the adult's False Belief into account) (Buttelmann, Carpenter & Tomasello 2009). Based on these non-verbal tasks, nativists have argued that infants possess sophisticated False Belief understanding even in their first year of life (Scott & Baillargeon 2017). Spontaneous-response tasks with Salar Chinese, Shuar and Colono Amerindians in Ecuador, and Yasawa Islanders in Fiji also indicated early False Belief understanding (Barrett et al. 2013). Based on these results, it has been argued that Theory of Mind is an early-developing psychological adaptation – and not culturally acquired through domain-general learning (Barrett et al.

2013). Gaze-tracking tasks were also used with captive great apes, apparently showing False Belief understanding (Krupenye et al. 2016). These results were taken to confirm earlier suggestions that apes possess mindreading abilities (Premack & Woodruff 1978; Call & Tomasello 2008), and to refute models which proposed that apes track what other agents are aware of but do not represent False Beliefs (Martin & Santos 2016).

However, more recent studies cast doubt on this idea, and on the validity of implicit Theory of Mind tasks more generally. For each paradigm (violation of expectation, anticipatory looking, and interactive helping), positive findings have been followed by failed replications (Baillargeon, Buttelmann & Southgate 2018). For example, conceptual replications implementing realistic stimuli and controls for potential confounds cannot replicate results from anticipatory looking designs (Kulke, Johannsen & Rakoczy 2019; Kulke, Wübker & Rakoczy 2019). Neither can direct replications using the original stimuli and procedures, finding no evidence of action anticipation (Kampis et al. 2020). This suggests that action anticipation paradigms may not reliably assess Theory of Mind (Kampis et al. 2020).

Another line of evidence supports the contention that the mechanisms that support 'implicit' Theory of Mind are separate from the ones involved in explicit Theory of Mind (Heyes & Frith 2014). Longitudinal research has found that children's anticipatory looking only shifted to correct gazing (predicting a character's actions based on their False Belief rather than the real location of the object) by the age of 4, while younger children performed at chance levels (Grosse Wiesmann et al. 2018). Furthermore, 3- and 4-year-old children's performance in verbal False Belief tasks does not correlate with their performance in anticipatory looking designs, and only the former is associated with children's syntactic understanding and executive functioning (Grosse Wiesmann et al. 2017a). This is further supported by neuroimaging work, which has shown that implicit and explicit False Belief tasks activate mutually independent neural networks (Grosse Wiesmann et al. 2020). Specifically, 'implicit' mind-reading, as measured in gaze-tracking experiments, does not, in fact, recruit neural regions involved in executive function or higher-order cognition, whereas the neurocognitive mechanisms involved in explicit mindreading (which is verbally mediated) do (Heyes & Frith 2014). Neuroscientific evidence further suggests that 'implicit' mind-reading emerges from the motor system (Stout & Hecht & 2017). In contrast, explicit mind-reading emerges from the medial frontal and lateral temporoparietal cortex, which also contributes to other abstract cognitive processes such as future planning, introspection, and narrative

comprehension (Stout & Hecht & 2017). These regions are close to other association areas and away from the peripheral motor system, which suggests that they are developmentally plastic and thus responsive to learning (Stout & Hecht & 2017). Finally, the emergence of False Belief understanding in 4-year-olds is associated with white matter maturation in the brain, and specifically, with changes to the medial prefrontal cortex, temporoparietal regions, and connectivity between temporoparietal and inferior frontal regions (Grosse Wiesmann et al. 2017b). However, to the best of my knowledge, no equivalent shifts are documented for younger children. Accordingly, the notion that children under 4 years of age understand False Belies may be mistaken, and implicit and explicit False Belief tasks may measure different things rather than measuring the same thing in different ways.

Furthermore, validation studies have found no evidence of convergent validity in different kinds of non-verbal Theory of Mind tasks (Dörrenberg, Rakoczy & Liszkowski 2018). Specifically, it was found that the results of some paradigms do not replicate, and that measures of looking time and pupil dilation were consistent with False Belief understanding, but that this was dependent on the order in which the tasks were presented (Dörrenberg, Rakoczy & Liszkowski 2018). Furthermore, the different types of tasks were not correlated (Dörrenberg, Rakoczy & Liszkowski 2018). As a result, gaze-tracking designs used in apes and pre-verbal infants may not measure advanced Theory of Mind, or the ability to represent mental states, but instead a simpler form of social cognition, 'vicarious representation', in which people attribute other-centred properties to material objects (Nanay 2020).

Heyes (2020) has argued that even if they are real, gaze-tracking effects can be explained without an inborn propensity for mindreading and might instead be caused by domain-general cognitive mechanisms such as attention. Heyes (2014) has further argued that 'implicit' mentalizing in both children and adults is in fact *sub*-mentalizing (cognitive processes that do not represent mental states directly but produce behaviour that looks as if it were guided by mentalizing). Sub-mentalizing is enabled by domain-general cognitive mechanisms such as attentional orienting or spatial reasoning (Heyes 2014). For example, experiment participants may simply represent the number of dots on one side of a room, rather than directly representing the number of dots an agent can see (Heyes 2014). Instead, the direction an agent is facing triggers participants to shift their attention in the same direction (Heyes 2014). Replacing an agent with a non-human symbol (such as an arrow) triggers the same attentional orienting, suggesting that no

direct mentalizing is involved (Heyes 2014). According to Heyes (2014), these 'sub-mentalizing' processes may allow people to navigate social situations without directly representing the mental states of others, which requires more costly neural processing. These sub-mentalizing abilities are probably shared with many non-human animals and may be what gaze-tracking experiments actually measure. As a result, Heyes (2015a) has argued that the bar for what counts as evidence of mindreading is set too low – for example, by confounding an animal's understanding of body orientation with mentalizing – and that apes 'submentalize' (Heyes 2016c; but see Kano et al. 2017 for a defense of ape mindreading; see also Kulke, Johannsen & Rakoczy 2019 for a study that failed to find clear evidence that sub-mentalizing could explain failed replications in anticipatory looking designs with humans). In sum, 'full-blown' mind-reading may involve more learning, instruction, and effort than commonly acknowledged, and advanced Theory of Mind emerges later in children's development than claimed by nativists (Heyes 2019).

Heyes' model is not only relevant for mindreading, but also teaching. As stated above, 'natural pedagogy' holds that humans have a suite of cognitive mechanisms that are adapted for the transmission of culture through communication, and that these mechanisms form an independently selected cognitive system (Csibra & Gergely 2011). This has been taken to imply that infants are born with a genetically inherited package of specialized cognitive adaptations that make us receptive to pedagogical communication (i.e. teaching) (Csibra & Gergely 2011; see also review in Heyes 2016b). These include infants' sensitivity to ostensive signals (such as infant-directed speech and eye contact), their propensity to engage in turn-taking or contingent reactivity, and their tendency to follow gaze cues (i.e. eye movements), all of which they are inclined to interpret as communicative acts that convey shared knowledge (Csibra & Gergely 2011; see also review in Heyes 2016b). Conversely, human caregivers are naturally inclined to initiate these interactions (Csibra & Gergely 2011). Human infants are indeed highly attentive to communicative cues from their caregivers, such as eye contact and verbal communication (see review in Legare & Harris 2016). Cross-cultural comparative analyses have further identified acoustic regularities in infant-direct vocalizations in both urban and small-scale societies (Moser et al. 2019). For example, infant-directed speech systematically differs in pitch, rhythm, and timbre from adult-directed speech (Moser et al. 2019).

However, Heyes has argued that infants' receptivity to pedagogical cues is supported by broadly applicable genetic adaptations that are not specifically 'for' teaching, but instead relate to social bonding, prosocial interactions, and communication

more generally (Heyes 2016b). For example, infants (and adults) are indeed highly attentive to eye contact, but it does not follow that attentiveness to eye contact was selected for specifically because it furthered teaching (Heyes 2016b). Second, contingent turn-taking (in which mothers stimulate infants with movement or verbal communication when they fall silent or stop an activity they were previously engaged in) is shared with precocial birds and probably relates to social bonding more generally rather than human teaching specifically (Heyes 2016b). Likewise, infants' inborn preference for high-pitched speech is also found in many non-human animals, and thus a conserved trait that probably did not evolve to facilitate human teaching specifically (Heyes 2016b). Finally, Heyes has argued that gaze cuing may be supported by domain-general learning mechanisms, in which infants learn to associate caregivers' eye movements with the presence of valuable, interesting, or pleasurable people, objects, and events, especially when eye movements are also accompanied by ostensive cues such as eye contact and infant-directed speech (Heyes 2016b). During ontogeny, infants' receptivity to eye contact, turn-taking, speech, and gaze cues then starts to accommodate teaching events through domain-general learning processes such as reinforcement learning, which is propelled by caregivers' ostensive communication (Heyes 2016b). In this manner, caregivers gradually mould infants to become more teachable, whether they are aware of it or not (Heyes 2016b). This process occurs in specific socio-cultural environments, and in this sense, Heyes has proposed that we engage in cultural, rather than natural, pedagogy (Heyes 2016b).

If there are no cognitive specializations 'for' children's receptivity to teaching, there may be none for teaching itself either. This would imply that teaching 'bootstraps' from communication more generally, along with prosocial motivations and socially biased attention combined with other cognitive gadgets such as Theory of Mind. If this is true, we should expect that teaching is not only developmentally plastic, but itself socially learnt. This 'plasticity friendly' argument has received some, though only tentative, evidence. For example, in a hunter-gatherer study, infants who more frequently experienced natural pedagogy also imitated more, and most instances of imitation occurred after receiving teaching (Hewlett & Roulette 2016). Infants who received more teaching also engaged in more practice play (Hewlett & Roulette 2016). Additionally, a screen-based study showed that 5-year-olds can adapt their teaching behaviour to the (presumed) age and competence of the learner, spending more time at relevant game locations when believing that the learner was a toddler than if they believed them to be a

same-aged peer (Stolk et al. 2013). Children who had spent more time in daycare were better able to take the learner's presumed age and ability into account (Stolk et al. 2013). This suggests that early social experiences with peers may shape children's perspective-taking in teaching situations. Caregivers' stimulation also affects children's tendency to engage in various forms of social learning. 5-11-year-old children of Mexican heritage whose caregivers have had more experience with indigenous practices pay more attention to and learn more from observing activities directed at other children than peers whose caregivers have experienced more formal education (Silva, Correa-Chávez & Rogoff 2010). US infants copied more when they were taught during their first session of a learning experiment than when they just observed (Shneidman, Gaskins & Woodward 2016). In contrast, Yucatec Mayan infants -who do not receive as much stimulation by their caregivers as US children- did not copy more when taught compared to when they just observed (Shneidman, Gaskins & Woodward 2016). This suggests that child-directed teaching does not 'automatically' hold pedagogic value for infants, and infants' copying behaviour depends on past interactions with their caregivers (Shneidman, Gaskins & Woodward 2016).

This suggests that children's learning and teaching behaviour is responsive to caregiver input, along with social norms and conventions, from an early age. This may be related to children's developing ability for metacognitive representation. Heyes has argued that most social learning strategies rely on domain-general cognitive mechanisms, but on top of that, humans also employ higher-order, metacognitive reasoning when they take learning decisions, which depends on explicit decision rules that allow us to adjust our learning (and presumably, our teaching) to different social contexts (Heyes 2015b; 2016a). For example, this may be done by taking a conscious decision to copy domain experts when oneself is uncertain in that domain, enhancing the specificity and accuracy of cultural transmission (Heyes 2016a). We acquire these rules through social learning and verbal communication in a specific sociocultural environment and they should therefore vary across cultures (Heyes 2016a).

1.6 Limitations of WEIRD psychology

Outstanding questions about the cultural evolution of teaching and Theory of Mind are best clarified with cross-cultural research. The relevant theorists have recognized this as well. For example, Heyes' cultural evolution model of Theory of Mind suggests that the

ontogeny of mindreading may vary substantially across cultures, and she has called for more cross-cultural work on the matter (Heyes & Frith 2014). Likewise, Strauss has called for more research on the development of teaching across cultures, specifically to examine if and when developmental trajectories diverge between children from different backgrounds (Strauss, Ziv & Frye 2015). Legare and Harris (2016) have also called for more research in 'non-Western' cultures to study the ontogeny of cultural learning, and the impact of culture on cognition in children's development. Specifically, they have called on researchers to examine to what extent children from different cultural backgrounds draw on the same social learning strategies, and to what extent culture itself shapes children's social learning (Legare & Harris 2016).

The need for cross-cultural research has become particularly evident in recent years. In a landmark paper published a decade ago, Henrich, Heine and Norenzayan (2010) argued that most behavioural science relies on studies performed on WEIRD societies (Western, Educated, Industrialized, Rich, and Democratic), to the exclusion of other populations. On top of that, much psychology research focuses narrowly on American samples (Arnett 2008). This sampling bias in favour of Western populations is also present in developmental psychology (Nielsen et al. 2017). This raises the problem that findings on cognitive development obtained in Western societies may erroneously be taken to be universal (Nielsen et al. 2017). However, despite researcher's 'post-WEIRD' awareness of this issue, most samples (72%) in the evolutionary human sciences remain 'generic' convenience samples based on industrialized, usually Western, populations (Barrett 2020). In fact, behavioural scientists regularly make sweeping claims about the human mind based on a small and -as it turns out- highly unusual subset of the human species (Henrich, Heine and Norenzayan & 2010). Not only is there substantial cross-cultural variability in visual perception, spatial reasoning, categorization, self-concepts, and perceptions of fairness, but Western samples are often outliers when compared to other populations (Henrich, Heine and Norenzayan & 2010).

More specifically, it has been suggested that Western countries are psychologically peculiar compared to other populations, and specifically compared to kin-based societies with subsistence lifestyles (Schulz et al. 2019). This is evident in child-rearing practices, and thus the socio-cultural context of children's cognitive development. Attitudes to child-rearing and associated practices in rural subsistence populations differ considerably from parenting ideologies in Western countries (see Morelli et al. 2018 for a review). The latter often rely on attachment theory and ideas

about ‘positive parenting’ which is ‘sensitive’ to the child’s emotional needs (Morelli et al. 2018). This typically involves intensive one-on-one communication with the primary caregiver (usually the mother) that emphasizes verbal communication and eye contact, combined with child-centred interactions where caregivers focus on the child’s interests and give them choices, ask questions, and offer praise (LeVine et al. 1994; Morelli et al. 2018). These norms are already present in infant care. For example, Western mothers focus on stimulating the infant in social exchanges and proto-conversation, with the explicit goal to promote alertness and exploration (LeVine et al. 1994). Western mothers increase active caregiving during toddlerhood, in tandem with the child’s developing verbal communication (LeVine et al. 1994). These practices are wrapped up in a ‘pedagogical’ model of childrearing, where caregivers are primarily concerned with behavioural development (as measured in cognitive milestones) and preparing the child for formal education (LeVine et al. 1994). To this end, middle-class Western caregivers often model ‘school-like’ interactions and literate discourse with children (e.g. through question-and-answer conversations when playing together) (Rogoff 2003).

Children are further taught to view themselves as individuals, and to use their own point of view as their primary reference when they relate to others (Morelli et al. 2018). This likely reflects these societies’ individualistic value systems emphasizing personal autonomy, choice, and the idea that every person has a unique self (Greenfield 2013). In the same vein, some have argued that middle-class Westerners employ an ‘independent’ model of parenting which conceptualizes people as autonomous individuals (Keller et al. 2006). The socialization strategies associated with this model emphasize self-enhancement or self-fulfilment, which is reflected in an emphasis on mental states and the child’s personal qualities (Keller et al. 2006). Finally, children’s rights often take precedence over parents’ rights (Morelli et al. 2018). Many Westerners view children as ‘cherubs’ – innocent and in need of protection from the world of adults, subject of much emotional investment, but not obligated to pay back their caregivers’ labour (Lancy 2015b). In the same vein, Western families have been described as child-centred ‘neontocracies’ (Lancy 2015b).

These parenting conventions differ starkly from child-rearing norms in rural subsistence societies. Overall, mothers from subsistence agricultural communities (such as the Kenyan Gusii) tend to employ a ‘pediatric’ model of child-rearing, where they are primarily concerned with the infant’s physical growth and survival (LeVine et al. 1994). In the early months, mothers focus on body contact through soothing and holding infants

rather than face-to-face interaction (LeVine et al. 1994). However, Gusii mothers reduce infant care after a few months, leaving the child to be cared for by older siblings and other alloparents while resuming agricultural work, and begin to invest in the next pregnancy (LeVine et al. 1994). Extended one-on-one communication and play between adults and children is uncommon, children spend much of their time playing with older siblings and other children instead, and after weaning, children may spend more time with other community members than with their mothers (LeVine et al. 1994; Morelli et al. 2018). Children are often not viewed as individuals who are distinct from their families in any meaningful sense, and they are primarily expected to integrate into their household, kin group, and community (LeVine et al. 1994; Morelli et al. 2018). Children are expected to meet social obligations, to not monopolize their caregivers' attention, and to display a respectful and obedient demeanour (LeVine et al. 1994; Morelli et al. 2018). Socialization strategies focus on instilling norms and hierarchies, along with the proper functioning of the family unit (Keller et al. 2006). As a result, Gusii mothers, to give just one example, rely on commands when they communicate with small children, not questions or praise (LeVine et al. 1994). Furthermore, in some small-scale subsistence populations, caregivers emphasize restraint on part of the children and discourage child-led questioning (Rogoff 2003). These practices reflect an 'interdependent' model of parenting, which emphasizes the individual's embeddedness in social relationships with others (Keller et al. 2006).

These cross-cultural differences are partly explicable in terms of quantity-quality trade-offs, where mothers maximize the number of surviving offspring or alternatively invest heavily in the development of just one or two children (LeVine et al. 1994). On the proximate level, moral values and cultural conceptions of childrearing also matter (LeVine et al. 1994), and these are likely linked to broad differences between 'individualistic' or 'communal' worldviews. More specifically, these small-scale, rural populations tend to embrace moral ideologies that favour social obligations, belonging with one's local kin group or community, and respect for authority (Greenfield 2013). While some foragers practice egalitarian relationships between adults and children, many other small-scale societies are 'gerontocratic', i.e. they have a social hierarchy favouring elders and adults over youngsters (Lancy 2015b). Many agrarian societies view children as chattel – desired as commodities for their labour contributions to the household, the ability to earn an income for their parents, and their potential to continue the family line (Lancy 2015b).

These broad cultural differences in individualistic vs 'communal' social norms have been traced back to the diffusion of Western Christianity, which transformed kinship in medieval Europe by weakening family ties and encouraging the formation of nuclear family households after the prohibition of cousin marriage (Schulz et al. 2019). Some have argued that this transformation ultimately favoured individualism, lower levels of social conformity, and more impersonal social relationships (Schulz et al. 2019). Cross-cultural differences in this regard appear to affect people's social cognition, and specifically their reasoning about Theory of Mind. For example, cross-cultural studies have found that Westerners focus more on object properties, whereas East Asians use more 'holistic' reasoning by paying more attention to the totality of the relationships between objects (Nisbett et al. 2001). As a result, East Asians are less likely to explain behaviour in terms of an individual's internal dispositions and attributes and tend to emphasize the social context that persons are situated in (Choi, Nisbett & Norenzayan 1999; although some recent replication studies have cast doubt on this claim, see Carstensen et al. 2021). Additionally, when making moral judgments, Westerners tend to emphasize people's mental states (e.g. whether someone knowingly and intentionally committed an offense or whether it was an accident), whereas people from various small-scale societies emphasize the outcome (i.e. whether a person's action caused harm or not, regardless of intent) (Barrett et al. 2016). Kinship-intensive cultures (where kin groups play a prominent role in the social structure and most everyday interactions are with kin) place less emphasis on mental states in their moral judgments (Curtin et al. 2020). Conversely, it has been argued that the individualism and weak kin ties that characterize contemporary Western societies favour people's prominent focus on mental states there (Curtin et al. 2020). This is also evident in the moral reasoning of people from different religious backgrounds. People from religions that emphasize mentalizing through orthodoxy (i.e. correct beliefs), such as Protestantism, judge unintentional violations less harshly than people from religions that emphasize orthopraxy (i.e. correct behaviour) such as Hinduism (Laurin & Plaks 2014).

These psychological and cultural evolutionist accounts converge with insights from social anthropology. Social anthropologists have long emphasized that many societies operate 'holistic' notions of the self and the person that differ radically from the more individualistic conceptions held by Westerners (and by extension, Western philosophers, psychologists, and cognitive scientists) (Dumont 1986). For example, Marilyn Strathern has famously argued that Melanesians conceive of persons as

'dividuals', "constructed as the plural and composite site of the relationships that produced them" (Strathern 1988: 13). Cross-cultural comparative studies show that societies differ in their ethnopsychologies, i.e. their cultural models of the mind. For example, some cultures subscribe to the 'porosity of the mind', which is

> the idea that the boundary between "the mind" and "the world" is permeable. Intuitions that wishes or curses might come true, that strong emotions might linger in a room to affect others, or that some people might be able to read minds ….. ideas about how a person might receive thoughts, emotions, or knowledge directly from outside sources (e.g., through divine inspiration, divination, telepathy, or clairvoyance) and ideas about how thoughts and feelings might have a direct causal impact on the world (e.g., through witchcraft, healing energy, or shamanic powers) (Luhrmann et al. 2021: 1p).

This differs starkly from the idea that thoughts and emotions originate in mental processes, and thus in a 'bounded' or 'buffered' self (see discussion in Luhrmann et al. 2021). This affects cultural conceptions of language and speech. Based on her field research with the Ilongot, a former head-hunting population in the Philippines, the linguistic anthropologist Michelle Rosaldo has pointed out that

> Whereas most modern theorists think of language as a tool designed primarily to "express" or to "refer," Ilongots think of language first in terms of action. They see commands as the exemplary act of speech, displaying less concern for the subjective meanings that an utterance conveys than for the social contexts in which utterances are heard (Rosaldo 1982: 203).

As a result, Western psychological conceptions of speech

> can be criticized for undue emphasis upon the speaker's psychological state, and corresponding inattention to the social sphere. The fact that "we " stress propositions whereas llongots see directives as a paradigmatic act of speech reflects, I think, our relatively individualistic (and sociologically, problematic) view of human sociality and communication…certain of our culturally shaped ideas about how human beings act have limited our grasp of speech behavior, leading us to celebrate the individual who acts without attending to contextual constraints on meaning. Ilongot views of language – and, in particular, their emphasis on commands – suggest alternatives to the philosopher's account of referential, individually deployed, systems of speech (Rosaldo 1982: 227p).

When it comes to cross-cultural variability in mentalizing, one region of particular interest is the Pacific. Social anthropologists have argued that many Pacific Islander societies follow an Opacity Doctrine, which is defined as

> the assertion, widespread in the societies of the Pacific, that it is impossible or at least extremely difficult to know what other people think or feel. We have called this idea the doctrine of "the opacity of other minds." [...] the opacity doctrine is unusually well developed in many of the cultures of the Pacific, where it is not so much a matter of

> episodic personal reflection as it is a widely shared and taken-for-granted fact about the world, and one that shapes normative orders and everyday practice. In Pacific societies where the opacity doctrine is present, for example, people are often expected to refrain from speculating (at least publicly) about what others may be thinking, and penalties for gossip about other people's intentions are often very high […]. For related reasons, people tend to put little store in the veracity of what others say about their own thoughts, rarely expecting that they can take such reports as reliable guides to how those who make them will behave in the future (Robbins & Rumsey 2008: 407p).

As a result, Robbins and Rumsey (2008) have argued that "Pacific assumptions about the impossibility of knowing the minds of others fundamentally contradict social scientific models that assume […] that gaining such knowledge stands universally as a regulating ideal for human beings in engagement with their fellows" (Robbins & Rumsey 2008: 408). They concluded that this "ought to force a rethinking of some fairly settled approaches to topics such as the nature of theories of mind, the role of intention in linguistic communication and social interaction more generally, and the importance of empathy in human encounters" (Robbins & Rumsey 2008: 408).

Cross-cultural differences in offspring investment, child-rearing practices, and notions of the person and the mind may have developmental consequences. For example, Gusii children -who were raised in the 'pediatric' rather than the 'pedagogical' model- exhibit slower socio-cognitive and behavioural development in skills that are enabled by social interactions (LeVine et al. 1994). This illustrates the shortcomings of developmental models that assume "a single "average expectable environment" for the human infant [or child in general], with universal prerequisites for normal development" (LeVine et al. 1994: 273). Cross-cultural research suggests that these cultural factors affect children's development of Theory of Mind. While children everywhere eventually acquire the ability to understand False Beliefs, the age at which they do so differs across cultures (Slaughter & Pérez-Zapata 2014). Cultural differences in 'mind-mindedness' – how much attention caregivers pay to their child's mental life, as opposed to general behavioural or physical characteristics – may affect cross-cultural differences in children's Theory of Mind (Hughes, Devine & Wang 2018). For example, UK children outperform Hong Kong children in Theory of Mind, and UK caregivers also show more mind-mindedness than their Hong Kong counterparts (Hughes, Devine & Wang 2018).

In this context, Vanuatu (a Melanesian archipelago in the South Pacific) is of particular interest. In a recent study, children from Vanuatu showed a marked 'delay' in the performance of False Belief tasks (Dixson et al. 2017), at least when Western children are taken as the benchmark. In Vanuatu, a majority of urban children (66%) passed a

classic False Belief task by the age of 7 (Dixson et al. 2017). In rural areas, however, pass rates never crossed the 60% mark, and this remained true for older children (aged 9-12) and adolescents (aged 13-14) (Dixson et al. 2017). A marked delay in False Belief reasoning was also found in Samoan children (Mayer & Träuble 2013; 2015). This contrasts starkly with the pattern observed in other populations, where children typically pass those tests at around 4-5 years of age (Wellman, Cross & Watson 2001). This pattern has been attributed to Pacific ethnopsychology, which emphasizes interdependence and conformity, and discourages speculation about the mental states of others (Dixson et al. 2017). This interdependence is also evident in the fact that ni-Vanuatu tend to hold a more 'porous' model of the mind than Westerners, as beliefs in witchcraft and other spiritual influences on the mind are prevalent (Luhrmann et al. 2021). These results support Heyes' view of Theory of Mind, or at least 'full-blown' explicit Theory of Mind, as a cultural gadget (Heyes & Frith 2014). Alternatively, Dixson et al.'s (2017) data might not reflect a true delay, but children's unfamiliarity with formal testing, reluctance to voice their own thoughts, or simply failure to understand the task – issues that have yet to be clarified.

At the same time, Vanuatu is of interest to the teaching literature. Even at very young ages, ni-Vanuatu caregivers engage children in ways that differ considerably from child-rearing norms in Western societies. Ni-Vanuatu caregivers use more physical interaction, whereas US caregivers use more visual cues when engaging their infants (Little, Carver & Legare 2016). Ni-Vanuatu caregivers also teach differently when interacting with older children. An experimental study where caregivers taught a puzzle game to a child found that both American and ni-Vanuatu caregivers use a combination of verbal and non-verbal teaching strategies and flexibly adjusted their teaching strategies to the learner's age and the difficulty of the task (Clegg et al. 2021). However, American caregivers relied more on direct active teaching and caregiver-led interaction (such as guiding the learner and praising them), whereas ni-Vanuatu caregivers relied more on shared interaction styles (e.g. by dividing the task between them and the child), reflecting their expectation that children should learn from collaboration and observation (Clegg et al. 2021). At the same time, not all of these childrearing practices appear to actually affect children's development. While ni-Vanuatu caregivers use less face-to-face contact than Western counterparts, 5-7-month-olds from Vanuatu still follow an adult's gaze shifts if they are accompanied by infant-directed speech (Hernik & Broesch 2019). This suggests that infants' gaze following, and thus their tendency to 'tune in' on caregivers' communication with them, is a universal behaviour (Hernik & Broesch 2019). However,

whether ni-Vanuatu cultural practices affect the development of children's teaching, and if and when it diverges from ontogenetic trajectories observed in industrialized populations, remains unexplored, as is children's developing awareness of and reasoning about teaching.

1.7 Limitations of anti-WEIRD Psychology

While most research on child development remains concentrated in industrialized countries, interest in small-scale societies has increased in the past decade (Amir & McAuliffe 2020). However, this line of work has its own problems. Cross-cultural developmental researchers tend to treat small-scale societies as static and homogenous, not acknowledging variability within those communities (Amir & McAuliffe 2020). This is problematic because 'remote' foraging and horticulturalist communities are not 'stuck in the past' and never have been. For example, Hadza hunter-gatherers in Tanzania have often been presented as remote hunter-gatherers pursuing an 'ancient', 'pristine' lifestyle, but this is a distorted picture of reality (Gibbons 2018). In fact, Hadza communities have been visited by anthropologists, missionaries, and increasingly even tourists for decades, most attend primary school, supplement foraging with other sources of income, and trade with neighbouring agriculturalists (Gibbons 2018). In fact, most peoples visited by ethnographers and cultural psychologists have been in contact with various colonial powers (and the independent national governments that succeeded them) for centuries (Wolf 1997). Furthermore, sociodemographic changes, such as moving from rural subsistence economies to urban, market-integrated environments with formal education, shift cultural values towards individualism (Greenfield 2009).

As a result, children's learning environments change, and some have argued that children's developmental pathways then start to approximate Western patterns, with a stronger expression of abstract cognition and independent social behaviour (Greenfield 2009). This has been demonstrated in longitudinal projects. For example, from the late 1960s to the early 1990s, Zinacantec Mayans shifted from an agrarian subsistence economy to a commercial economy (Greenfield, Maynard & Childs 2003). Within the same time period, the cultural transmission of weaving shifted from an 'interdependent' apprenticeship model (characterized by commands, scaffolding, observation, and imitation) to independent trial-and-error learning and innovation (Greenfield, Maynard & Childs 2003). At the same time, children's representation of visual patterns shifted from

reproducing concrete details to a strong reliance on abstract principles to categorize elements in a pattern, and a greater ability to reproduce novel patterns (Greenfield, Maynard & Childs 2003). Accordingly, children's developmental environments are dynamic – socialization practices shift in response to changing ecologies, and children's developmental trajectories shift accordingly (Greenfield 2009). In the same vein, Lancy (2015a) has argued that exposure to Western norms and institutions contributes to the adoption of 'Western' forms of child-rearing and cultural transmission in small-scale societies.

Researchers have raised fears that along with biodiversity, much cultural and linguistic diversity is being lost, and many cultural practices of small-scale societies are under threat of extinction (Cox 2000). In light of this, others have gone even further and argued that globalization, along with the spread of digital communication, will homogenize psychological processes in people across the world, making their cognition 'WEIRDer' in the process (Rozin 2010). While market integration appears to affect 'mentalizing' in adults (Curtin et al. 2020), it is less clear whether caregivers' exposure to socioeconomic transitions also affects children's Theory of Mind development. For example, Dixson et al. (2017) have suggested that exposure to aspects of 'modernization' such as formal education induces adults to endorse more Westernized, individualistic concepts of the mind, which emphasizes the development of independent viewpoints. Dixson et al. (2017) postulated that exposure to Western norms and institutions, such as formal schooling, then accelerates the ontogeny of Theory of Mind in small-scale societies. Their data are consistent with such a claim, in the sense that urban children showed accelerated Theory of Mind development compared to rural children (Dixson et al. 2017; see above). However, exposure to Western norms and institutions (such as formal schooling, wage labour, and markets) can vary substantially at the microlevel, including within small-scale societies and rural populations (see Amir & McAuliffe 2020). As a result, the WEIRD construct may lend itself to a too-facile dichotomization between WEIRD and non-WEIRD settings, concealing socioeconomic, demographic, and cultural transitions that occur piecemeal within populations. This is problematic because there is evidence that exposure to 'modernization' shifts parenting strategies – and thus the immediate socioecological context where children's development occurs. For example, urban, middle-class families from 'communal' or 'interdependent' cultures employ a parenting model of 'autonomous relatedness', which combines independent with interdependent values and socialization strategies (Keller et al. 2006). As Dixson et

al. (2017) did not assess these micro-level variables directly, it is unclear whether these socioeconomic changes are in fact producing developmental shifts in children or homogenizing children's cognitive ontogeny along Western lines.

1.8 Aims and Overview of the Thesis

In this thesis, I aim to gain insight on whether and to what extent culture has shaped key aspects of human cognition. Specifically, I investigate whether social cognition and the social learning strategies that support cumulative culture are themselves shaped by cultural evolution. To this end, I examine the ontogeny of (explicit) Theory of Mind, the tendency to communicate about the mind (mental state talk), and teaching among children in Vanuatu, and to what extent these are impacted by cultural factors.

To address these issues, I ask the following more specific questions:

First, does ni-Vanuatu children's development of explicit Theory of Mind conform to developmental trajectories that have been identified in other populations? Do ni-Vanuatu children hit developmental milestones in these abilities at the same age as children from other populations? Does the sequence in which different aspects of Theory of Mind are acquired conform to sequences that have been identified in previous studies? Is ni-Vanuatu children's mental state talk consistent with them possessing the relevant aspects of Theory of Mind? Or is their development of Theory of Mind really 'delayed' as has been claimed in the literature? Are these results robust to alternative experimental controls?

Second, does ni-Vanuatu children's developing teaching behaviour conform to the developmental trajectories that have been identified in other populations? Do ni-Vanuatu children hit developmental milestones in their teaching behaviour at the same age as children from other populations? And is children's developing teaching behaviour determined by their understanding of Theory of Mind?

Third, does ni-Vanuatu children's developing metacognitive reflection about teaching conform to the developmental trajectories that have been identified in other populations? Do ni-Vanuatu children hit developmental milestones in this ability at the same age as children from other populations? And is children's developing understanding of teaching determined by their understanding of Theory of Mind?

Fourth, does exposure to 'WEIRD' norms and institutions affect key aspects of human cognition, such as the development of socio-cognitive mechanisms that have been associated with cumulative culture? Specifically, does caregivers' exposure to different aspects of 'WEIRDness' (such as formal education, experience with wage labour, proximity to urban environments, and experience in WEIRD cultural settings) affect children's development of explicit Theory of Mind?

To answer these questions, I conducted 11 months of field research in Vanuatu, in rural areas on the islands of Efate and Espiritu Santo, from 2018 (April-June) to 2019 (April-December). I provide ethnographic background information about my study sites in Chapter 2, introducing their subsistence economy, social structure, child-rearing practices, conventions of cultural transmission, supernatural beliefs, and moral values. These data are drawn from informal conversations, in-depth qualitative interviews with key informants, and participant observation, which I relate to ethnographic accounts published by social anthropologists. I also provide demographic data collected during surveys. These data enable me to determine what variables of interest to cross-cultural research in teaching and Theory of Mind look like at my field sites. These include the role of kinship and 'kinship intensity' in the social structure, the practice of guided participation in culture learning, the presence of formal education, values associated with interdependence and authority, and folk models of the mind.

I then address my research questions in Chapters 3-5. In Chapter 3, I address the first set of questions by investigating the development of Theory of Mind in ni-Vanuatu children. Specifically, I examine the robustness of Dixson et al.'s (2017) findings. To this end, I administered a comprehensive Theory of Mind test battery with verbal tasks, which had been previously used by Dixson et al. (2017). I added control questions developed by Blijd-Hoogewys et al. (2008). These questions prompt children to justify their responses to the Theory of Mind scenarios and are designed to assess whether children understood the task. For example, after responding to a Sally-Anne task, the child is asked why they think that Sally will look for her toy in the location the child had just indicated. If the child responds with something like "She will look for it in location X because that's where she put it in the beginning", this indicates that the child understands the task and can distinguish between False Beliefs and reality. Conversely, if the child responds with "Sally will look for it in location Y because that's where it is now", this indicates that the child does not understand False Beliefs but understood the scenario and test question in

broad terms. If children are unable to justify their responses or respond with irrelevant statements that have little to do with the question, this may be taken as an indicator that the participants are confused by the task (see Blijd-Hoogewys et al. 2008). Including these controls helps ascertain whether the delay identified in Dixson et al. (2017) is an artefact of the test design or whether it presents independently of test design. If Dixson et al. (2017) are correct, the children I test should also show delayed development of Theory of Mind, especially in the understanding of False Beliefs, and these results should hold up to additional controls. Such a result would support the claim that the ontogeny of Theory of Mind differs cross-culturally, and thus bolster Heyes and Frith's (2014) contention that mind-reading is a cognitive gadget that has evolved culturally. Conversely, if Dixson et al.'s (2017) claim that Theory of Mind is delayed in this setting does not hold up to scrutiny, that is, if ni-Vanuatu children show the same overall trajectory, developmental sequence, and milestones that have been observed in other populations, then the cultural evolution model of mind-reading is not supported (see Heyes & Frith 2014). This would cast doubt on the cognitive gadget hypothesis (Heyes 2018).

In Chapter 4, I address the second and third set of questions by investigating the development of teaching in ni-Vanuatu children. To this end, I administered a peer teaching game employed in previous teaching studies (Strauss, Ziv & Stein 2002; Davis-Unger & Carlson 2008; Ziv et al. 2016), along with a Theory of Mind test battery. During this task, a child is trained to perform an age-appropriate game and is then tasked with teaching the game to a naïve child. Afterwards, I conducted short interviews with the children who taught the game. The questions were drawn from the same teaching studies (Strauss, Ziv & Stein 2002; Davis-Unger & Carlson 2008; Ziv et al. 2016) and are designed to assess children's metacognitive reflection about their own teaching behaviour. If teaching is indeed a 'natural cognition' (Strauss, Ziv & Stein 2002; Strauss & Ziv 2012), then cultural specificities should not impact children's developing teaching behaviour, or their metacognitive reflection about teaching, and the same overall trajectory that has been observed in other populations should be observed in ni-Vanuatu children. Conversely, if the development of ni-Vanuatu children's teaching differs from the trajectory documented in Western populations (Strauss, Ziv & Stein 2002; Strauss & Ziv 2012), this would bolster the idea that teaching, along with the way we reason about it, is itself culturally learnt (Lancy 2015a; Heyes 2012; Heyes 2018). Furthermore, if Strauss, Ziv and Stein's (2002) hypothesis is correct, then children's teaching skills

should co-develop with their emerging Theory of Mind. Specifically, children who perform better at Theory of Mind should also perform better at teaching tasks. If the ontogeny of children's Theory of Mind is 'delayed', the development of their teaching skills should be delayed as well. Such a result would bolster the mentalistic model of teaching (see Strauss, Ziv & Stein 2002).

In Chapter 5, I address the fourth set of questions by investigating caregivers' exposure to 'WEIRD' norms and institutions such as urbanization, wage labour, formal education, and direct exposure to Western cultural settings, and its relationship with children's Theory of Mind. To this end, I conducted structured interviews with the caregivers of children who had participated in the Theory of Mind assessment. This enables me to break up the WEIRD construct into its various components, to assess the variation in 'WEIRDness' between households, communities, and islands that participated in the study, and to correlate these with children's performance in classic Theory of Mind tasks. If Dixson et al. (2017) are correct in assuming that exposure to Western norms and institutions induces people to accept WEIRD folk psychology, and that caregivers' exposure to 'WEIRDness' impacts children's developing Theory of Mind, then children with 'WEIRDer' caregivers should express a developmental trajectory and milestone attainment that is closer to that of Western populations, compared to children with less 'WEIRD' caregivers. Specifically, children whose caregivers have more experience with Western norms and institutions should acquire Theory of Mind earlier and more quickly than their peers. Such a result would bolster the view that socioeconomic transitions associated with 'modernization' are having profound effects on social cognition in small-scale societies, making the world WEIRDer in the process (Rozin 2010).

I then provide a general summary of the results and discuss what they contribute to our knowledge about the cultural evolution of social learning and the cultural evolution of cognition more broadly. I also discuss future frontiers and challenges in cross-cultural developmental research.

1.9 Ethics Statement

This study received formal permission from the Vanuatu Cultural Centre, Port Vila (see research agreement in the Appendix). It also received ethical approval from the Department of Anthropology, University College London (Approval Code: ANTHPGR_2018_005) and the central Research Ethics Committee, University College

London (Project ID: 12951/001). Due to the nature of the project, both children and their caregivers participated in data collection, and I obtained verbal consent from both. Furthermore, multiple stakeholders were involved. Accordingly, I also obtained verbal consent from the participating children's school principals and teachers, from the chairman of the school board (the parents' representative), and from the children themselves. On Espiritu Santo, I further obtained verbal permission from the chief and chief's council of Hog Harbour village. During my stay, there was a dispute over the chiefly title at Paunangisu village in North Efate, which was only resolved after I had already arrived (see Chapter 2). Accordingly, the school principal was the highest formal authority at the time. In accordance with the research agreement with the Vanuatu Cultural Centre, I donated office equipment to the participating schools. At Hog Harbour, I also took on some administrative duties for the participating children's class teachers (such as typing lesson plans). Individual families did not receive incentives.

2. Ethnographic Background

2.1 Introduction

2.1.1 Overview

In this chapter, I give an account of the history and present-day lifeways at my field sites. To this end, I draw on notes from my field diary, qualitative interviews I conducted with informants, and some demographic data from survey interviews which I conducted for my Theory of Mind assessments (for survey methods and main results see Chapter 5). I also relate my primary data to findings from ethnographic and ethnohistorical publications and to concepts of interest to the evolutionary literature on teaching and Theory of Mind, including 'kinship intensity', interdependence, guided participation, formal education, and folk models of the mind.

Vanuatu, formerly known as the New Hebrides, is a group of over 80 volcanic high islands in the South Pacific. It belongs to the Melanesian subregion of Oceania and is located near Fiji, New Caledonia, and the Solomon Islands. Islands belonging to this archipelago range from 13°S to 21°S in latitude and lie between 166°E and 171°E longitude. Located near the Tonga branch of the Pacific ring of fire, Vanuatu is a site of frequent seismic and volcanic activity. Major islands include Tanna, Eromanga, Efate, Epi, Ambrym, Malekula, Pentecost, Espiritu Santo, Aoba, and Vanua Lava. Vanuatu enjoys a tropical climate. Annual fluctuations alternate between a long rainy season (December-April) characterized by hot, humid conditions with frequent heavy rainfall, and a shorter dry season (June-November) characterized by lower temperatures and less rainfall (CIA World Factbook 2021). During the height of the rainy season, Vanuatu is at risk of tropical cyclones (CIA World Factbook 2021), with devastating effects for local infrastructure. Most inhabited islands are marked by a wooded, hilly interior that steeply rises from a narrow coastal strip. Endemic fauna include flying foxes (*Pteropus anetianus*), but dogs, pigs, and cattle were all introduced by humans. Conversely, Vanuatu is rich in marine life with a great number of endemic molluscs and fish species. Marine mammals include dugongs (*Dugong dugon).*

Vanuatu was first settled around 3,000 years ago by sea-faring Austronesian peoples whose ancestors hailed from East and Southeast Asia (Lipson et al. 2018; Posth et al. 2018; Lipson et al. 2020). These settlers formed the Lapita culture (Lipson et al. 2018; Posth et al. 2018; Lipson et al. 2020). Starting ca. 1600 B.C.E., these proto-

Austronesians had begun to expand across the Western South Pacific. Their material culture was characterized by dentate-stamped pottery and obsidian, with evidence of large-scale exchanges. Lapita excavation sites in Teouma Bay, Efate, display not only this distinctive pottery style, but also a cemetery (Bedford, Spriggs & Regenvanu 2006). The bodies had been posthumously decapitated, with their heads reburied separately or replaced with cone shell rings and coral slabs (Bedford, Spriggs & Regenvanu 2006). Between 2,900 and 2,300 years ago this population was replaced almost entirely by a second wave of migrants composed of Papuan peoples originating in the Bismarck Archipelago (Lipson et al. 2018; Posth et al. 2018; Lipson et al. 2020). These settlers came to adopt the proto-Oceanic language of their Lapita predecessors, indicating a slow and incremental process of migration and replacement rather than a single incursion (Lipson et al. 2018; Posth et al. 2018). Others have argued that this period was marked by "relatively rapid and directed migrations followed by slow mixture between previously separated groups" (Spriggs et al. 2019: 2). Soon after the end of the Lapita period, ceramic traditions began to diversify, fragmenting into multiple regional traditions (Bedford & Spriggs 2008). But mobility remained a crucial factor after Papuan settlement. Vanuatu may have acted as a crossroads between the Solomons, New Caledonia, Fiji, and Polynesia (Bedford & Spriggs 2008). As a result, Polynesian influences were also present. For example, Efate experienced Polynesian genetic and cultural influences, which are present in Polynesian-speaking outlier communities such as Mele village and at archaeological sites associated with the historical chief Roi Mata (Lipson et al. 2020). Polynesian admixture is also present on Futuna and Aneityum in Southern Vanuatu, although this likely represents a separate migration event (Lipson et al. 2020). Trading, marriage, and exchange relationships, along with migrations induced by volcanic eruptions, also diffused cultural traditions between islands within the archipelago.

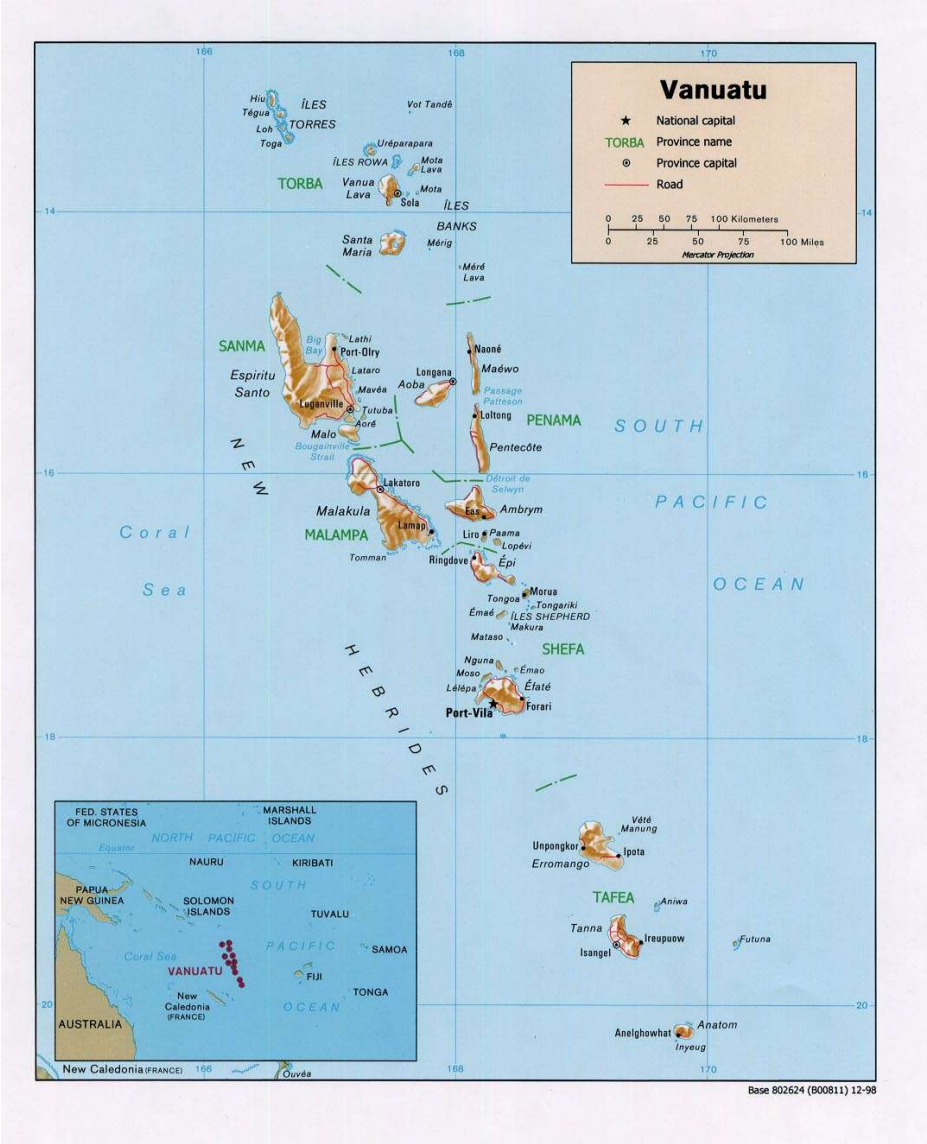


Fig. 2.1: Map of Vanuatu. Source: University of Texas Libraries.

Today, Vanuatu is home to a staggering variety of languages. François et al. (2015) list a total of 138 distinct indigenous languages spoken across all islands. Mapped onto a total landmass of only 12,189 km^2 and a population of 303,009 (CIA World Factbook 2021), Vanuatu is the most linguistically dense country per capita in the world (François et al. 2015). Vanuatu's many dispersed islands and hilly interiors have historically fragmented its many indigenous populations, producing stable language barriers between related groups. Since the colonial period, European languages and pidgins derived from them have been added to this historical language diversity. Bislama, a pidgin language derived from English, French, and Melanesian influences, serves as a

local lingua franca (François et al. 2015). An official language of Vanuatu, it is widely used in churches, schools, and government. Conversely, out of the indigenous languages, *Ethnologue* classifies 10 as dying and another 44 as endangered (Eberhard, Simons & Fennig 2021). All indigenous languages spoken in Vanuatu belong to the Austronesian language family, specifically to the Oceanic branch, where they are represented in the North and Central Vanuatu and Southern Melanesian sub-families (Hammarström et al. 2020).

Lacking a centralized political system until the colonial period, Vanuatu is also very diverse in cultural terms. Even otherwise blinkered colonial observers noted that "the habits of the natives of close-lying islands sometimes vary extraordinarily" (Somerville 1894: 2). For example, kinship and social structures vary considerably between islands, and sometimes between different locations on the same island. Both patrilineal and matrilineal descent systems are present. Across Melanesia, and also in Vanuatu, patrilineal cultures share strong similarities in social structure, ritual behavior, and politics: "agnation is closely linked throughout Melanesia with male cults entered via compulsory rites at or about puberty and their attendant stress on lineage solidarity, male strength or power in both the sexual and political arenas, and endemic warfare" (Allen 1981a: 13). Collective male initiations reinforce the solidarity of the male kin group, which also controls land ownership (Allen 1981a). This model contrasts sharply with the organization of ritual, politics, and descent in matrilineal systems. In many matrilineal cultures of Vanuatu, the descent system is somewhat decoupled from residence and territorial organization (Allen 1981a). Even though descent is traced through uterine kin, women predominantly live with their husband's relatives (Allen 1981a). Accordingly, the members of any one matrilineal clan or lineage are widely dispersed, scattered across multiple villages and even islands (Allen 1981a). Conversely, multiple clans are present in any one village (Allen 1981a). Rather than enforcing local solidarity, membership in matrilineal clans establishes far-reaching social networks (Allen 1981a). Compulsory male initiations are rare in matrilineal areas, whereas voluntary male associations are more common (Allen 1981a). Some ethnographers theorized that in the distant past, indigenous matrilineal institutions had become displaced by a patrilineal immigrant culture in some parts of Vanuatu, but this has been disputed (see Allen 1981a).

Complicating matters further, both types of system do not rely on descent alone to structure relationships between people. Like elsewhere in Melanesia, reciprocal exchange also plays a crucial role in establishing and affirming social relations.

Furthermore, kinship and exchange systems are connected with each other through the institution of bride price, in which the husband's relatives transfer wealth to the bride's family. These institutions have been elaborated in ritual, myth, and symbolic culture. Traditional political systems include both Melanesian and Polynesian elements. They range from informal leadership by charismatic big men, typical of much of Melanesia, to hierarchical chiefdoms with ranked descent groups (see Facey 1981). These more Polynesian-type systems recognize hereditary status distinctions between chiefly and commoner lineages and were historically common on the central islands (see Facey 1981). Other cultures possess hierarchical ceremonial societies in which men compete for status. Traditionally, most populations in Vanuatu have subsisted on shifting cultivation of roots and tubers in small garden plots, supplemented with hunting, fishing, gathering, and animal husbandry. Nevertheless, most populations produced a moderate surplus, which sustained feasting, ceremonial activities, and exchange cycles, especially through pig breeding.

2.1.2 Colonial History

Vanuatu was among the last corners of the planet to come within the grasp of colonialism. In 1606, the Portuguese explorer Pedro Fernandes de Queirós landed on what is now known as Espiritu Santo. He named the island Terra Australis del Espiritu Santo. His attempt to establish a colony there was foiled after only a few weeks by disease outbreaks, violent conflicts with locals, and mutiny (Harrison 1937: 85-101; as some of the citations in this chapter refer to very specific passages in book-length works, indirect quotations from books and archive materials are provided with page numbers). No further encounters are recorded until 1768 and 1774, when Louis-Antoine Comte de Bougainville and Captain James Cook visited the archipelago after their respective trips to Tahiti, but they never established colonies (Harrison 1937: 112-122). After the famous mutiny on the HMS *Bounty*, William Bligh drifted past the northern islands in 1789 and revisited in 1792 (Harrison 1937: 121p); further expeditions include one led by the Comte de la Perouse, who passed by in 1788 and was never seen again, and that of d'Entrecasteaux in 1793 (Harrison 1937: 122).

Sustained contact with Europeans did not develop until the mid-19th century, when sandalwood was discovered in the archipelago (Shineberg 1966). While traders had been active on Efate island from 1825 onward, these early contacts were intermittent and

minimal (Facey 1981). But from 1841 to 1865, trading vessels ventured on regular expeditions to the South Pacific to obtain sandalwood, which was in high demand on the Chinese market (Shineberg 1966). Locals also sold coconut oil, copra, pearl shell, sea slugs, and turtle shell (Harrison 1937: 227) in what was then becoming an increasingly global market. In exchange, natives initially obtained hoop and bar iron, metal fishhooks, tomahawks, adzes, iron pots, and glass bottles as well as glass beads and calico (Shineberg 1966). These were followed by other metal tools such as knives, scissors, and axes (Shineberg 1966). Ni-Vanuatu used these goods to support traditional subsistence activities associated with cultivation, fishing, house construction, and canoe building (Shineberg 1966). Imported iron tools quickly displaced traditional tools manufactured from stones, bones, and shells, significantly reducing people's labour expended on daily subsistence activities (Shineberg 1966). Natives also obtained luxury items such as cloth, drapery, tobacco, and pipes (Shineberg 1966). In addition, natives acquired muskets, rifles, and gun powder (Shineberg 1966). Later, some islands also began to demand traditional wealth items such as pigs and tortoiseshell (Shineberg 1966). Historians have stressed that ni-Vanuatu took an active role in this emerging trade and often succeeded in dominating encounters with Europeans (for a comprehensive account of the sandalwood trade see also Shineberg 1967).

The balance of power did not shift in favour of Europeans until the emergence of 'blackbirding'. This term refers to a form of labour trade in which ni-Vanuatu men were transferred to work on plantations in other areas of the South Pacific. Starting in 1857, men began to travel to New Caledonia, and from 1863 Fiji and Queensland became common destinations (Philibert 1981). Some labourers joined voluntarily. For example, colonial observers write of recruits who had found themselves in some trouble on their home island, then fled to work on a plantation elsewhere (Asterisk [1923] 1986: 58). Havannah Harbour (close to my field site in North Efate) experienced multiple incidents where women ran away from their husbands due to polygamy, abuse or adultery, or after committing adultery themselves, and joining recruitment ships (Macdonald [1875-1882] 2006: 21). Others were kidnapped or tricked into participating. For example, missionaries report that recruiting vessels regularly appeared along the coast of East Santo and employed various tricks to tempt locals into joining them, for example by handing out trade goods and then demanding indentured labour as payment (Miller 1990: 438). These interactions turned violent on occasion, with recruiters firing at natives (Miller 1990: 438). Mission publications also accuse recruiters of kidnapping natives (Jott. [9] 1895:

18). Locals sometimes responded to kidnappings by launching counterattacks on recruitment vessels (for an example from Espiritu Santo see Harrison 1937: 206).

Poor working conditions, minimal pay, and high mortality characterized the plantations for both groups of labourers (Philibert 1981). As a result, missionaries lobbied vehemently against the practice. Mission publications referred to blackbirding as "years of foreign bondage" (Jott. [5] 1894: 15) and the "[d]evil's [t]raffic" (Jott. [8] 1895: 19). They urged the public to ignore the "deviating ebullitions of planters and agents and captains interested to the utmost in the gold that is wrung out of the bodies of these poor black men" (Jott. [8] 1895: 19). They also accused the government of Queensland of spreading misinformation about the labour trade to discredit its critics (Jott. [5] 1894: 14). Missionaries called for the labour trade to be suppressed as it proved impossible to regulate (Jott. [5] 1894: 15). While blackbirding was outlawed in 1901, recruitment continued under oftentimes exploitative conditions with low financial returns for labourers (Asterisk [1923] 1986: 31p). The working conditions on plantations in the New Hebrides and abroad remained dire, involving long working hours, hard physical labour, little food, and physical abuse (Asterisk [1923] 1986: 49p). Some sources report almost slavery-like conditions, with planters gambling over years of labour owed to them by their recruits (Asterisk [1923] 1986: 142p).

On plantations, labourers encountered New Hebridians from other islands. For example, in the early 20th century a group of men from Espiritu Santo fled a cannibal raid and joined a recruiting ship, which transported them to work on other islands in the archipelago (Asterisk [1923] 1986: 222). Displaced labourers frequently entered into temporary marriages with other labourers and locals (Asterisk [1923] 1986: 58pp). It is in this context of colonial plantations and trading vessels that Bislama, whose name is derived from bêche-de-mer (a sea cucumber), emerged to facilitate communication between different language groups. By the time of WWI, Bislama was already in use between Whites and natives, among natives who spoke different languages, and between English and French nationals (Asterisk [1923] 1986: 26p, 185).

The first Europeans to settle on Efate arrived in the 1870s (Philibert 1981). They established plantations, where they grew cash crops such as cotton, coffee, cacao, and coconuts for the world market (Philibert 1981). Most of them were French citizens, although some British and Australian settlers were also present (Philibert 1981). The British government initially lacked interest in Vanuatu, even as Australia pushed for its annexation out of fear that French penal colonies would be established there (Philibert

1981). When the French military occupied parts of Vanuatu and refused to leave, Britain agreed to establish a joint naval commission in 1887 (Philibert 1981). In 1906, this was transformed into the French-British condominium of the New Hebrides (Philibert 1981). The dual government established a joint high court in Port Vila, which was created to ratify land titles as planters had previously stolen or bought land from natives (Asterisk [1923] 1986: 24p). As the hold of colonial authorities expanded on Espiritu Santo, the British magistrate began to involve himself in investigating and adjudicating disputes and jailing perceived troublemakers (for an example case see Miller 1990: 492).

By the 1920s, European settlers, who numbered just over a thousand, had come to acquire land with remarkable ease (Philibert 1981). European settlers in Espiritu Santo and other islands claimed large tracts of land for plantations, backed by often dubious land deeds, which limited locals' expansion into virgin jungle (Harrison 1937: 283p). The courts only considered land claims as valid if they were registered according to their own legal standards (Philibert 1981). Accordingly, their rulings were biased in favour of European newcomers. Seeing as rights in land were traditionally transmitted within the extended family and could not be alienated freely or permanently (see Section 2.4.5, Inheritance), indigenous notions of ownership clashed considerably with the European ones of private property. In addition, the local population suffered demographic decline due to introduced diseases which they had no biological immunity to, causing their numbers to dwindle to merely 45,000 in 1935 (Harrison 1937: 261pp). In response to these conditions, the first anti-colonial movements emerged in the early 20th century, some of them with a cargo cult-like character (e.g. the so-called 'Vailala madness' on Santo, which sought to kill settlers to bring back the dead, who would then bring valuable goods; see Harrison 1937: 380p).

WW II brought about more transformations. Seeking to halt the Japanese advance in the Pacific, American forces arrived in 1942 and established a military base in Southeast Santo. Another American base was established on Efate (Philibert 1981). The army proceeded to build the infrastructure required to harbour ships, land planes, and transport supplies, often relying on local labour (Philibert 1981). Many of the piers, airfields, and roads constructed are still in use today. Additionally, ni-Vanuatu went to work on American military bases, which was relatively well paid compared to the wages offered by European planters, and many became exposed to American consumer goods (Philibert 1981). In the 1930s and 40s, further cargo cults emerged on Santo and Tanna (see Brunton 1981).

After WW II, the colonial governments began to increase spending on development, education, and health care (Philibert 1981). Key services in Vanuatu came to depend on foreign aid (Philibert 1981), a situation that continues to this day. During this time, multiple independence and secessionist movements emerged, initially crystallized around the Vanua'aku Party, led by Father Walter Lini, which acted as a catalyst for Anglophone ni-Vanuatu who sought independence from both colonial powers. Another movement, the Nagriamel, centred on Espiritu Santo (Allen 1981b). Founded in 1965 by Jimmy Stevens, its members demanded that the colonial government and plantation owners hand over land rights to natives, especially bush land that they had not yet put under cultivation (Allen 1981b). They established a settlement at Vanafo in inland Santo and petitioned the United Nations for support in the land rights problem (Allen 1981b). The movement also advocated for a return to customary lifeways: "There was a well-defined notion that ni-Vanuatu should strengthen themselves by a return to customary modes of behavior and cleanse themselves by avoiding all defiling and weakening European habits" (Allen 1981b: 130). Due to its focus on local autonomy over national independence, this movement attracted Francophone 'moderates' and eventually won the support of French settlers and the American Phoenix foundation, who encouraged its members in their anti-British stance and in their opposition to the Anglophone Vanua'aku Party. In 1980, when Vanuatu was granted independence, the Nagriamel staged a (failed) secessionist uprising against the new national government headed by the Vanua'aku faction, an event now known as the Coconut Rebellion.

Today, 99.2% of permanent residents are of ni-Vanuatu origin, with only a small minority of Europeans, Chinese, and Vietnamese (CIA World Factbook 2021). Vanuatu's population is still overwhelmingly rural, with 74.5% living in small villages (CIA World Factbook 2021) and exhibits many characteristics of developing countries. While 93.7% of urban residents have access to electricity, only 51.1% of the rural population do (CIA World Factbook 2021). In 2019, Vanuatu's GDP was valued at $945 million, with per capita GDP at $3,153 (CIA World Factbook 2021). At 303,009 inhabitants, the population is growing at a rate of 1.67% per year (CIA World Factbook 2021). Fertility remains somewhat high at 2.72 life births per woman (CIA World Factbook 2021). Democratically elected institutions comprise the national parliament headed by a prime minister and the president, who is chosen by an electoral college, but on the local level, informal leaders such as chiefs are paramount (for a description of the relationship

between the state and traditional leadership systems see Forsyth 2009). 87.5% of adults are now literate (CIA World Factbook 2021).

2.1.3 The Field Sites

My first field site was located on the island of Efate, where I worked in rural settlements on the Northern coastline, opposite the small offshore islands of Nguna, Pele, Kakula, and Emao. In 2018, I lived in a small guest house in the village of Paunangisu, along with a former supervisor and two Master's students who were working on their dissertation projects. In 2018, that former supervisor was in charge of approaching communities and obtaining permissions. In 2019, I conducted field work on my own and lived with a host family in Paunangisu, but also visited Siviri, Undine Bay, Samma, Emua, Launkarae, Marius, Napara, Manua, Suasu, Takara, Savaki, and Onesua. The placement with the host family was arranged by the owners of the guest house, who are their neighbours, and who initially approached my hosts enquiring whether they would sublet a room in their house, after which I moved in as a lodger. My meals were provided by my host family and their relatives and I paid rent on a bi-weekly basis. In 2019, the year all my quantitative data were collected, various families in Paunangisu were embroiled in a dispute over the chiefly title of that village; accordingly, there was no universally recognized chief when I arrived. I therefore obtained permission to conduct research from the principal of the nearest primary school (who also lived in Paunangisu), along with school staff and the chairman of the school board, who acts as a community representative at the school. Permission was granted verbally. I made the broader community aware of my presence by visiting key informants and friends I had made during the 2018 visit.

Efate is one of the most densely settled islands of the country. Its hilly interior is virtually uninhabited today, and the population is concentrated on the coastal strip. Port Vila, the national capital, is located on the Southwest coast of the island of Efate. At ca. 53,000 residents, Vila is the largest urban condominium in the country (CIA World Factbook 2021). Since the days of the condominium, Vila has acted as the commercial and political centre of Vanuatu. Accordingly, Efate has historically been visited the most by foreigners. Today, Vila provides access to several Western-style supermarkets, shops, and banking services, many of which are owned and operated by Asians. Villagers from North Efate regularly travel to town to do their shopping and sell produce at the farmer's market. Paunangisu is located just a 45 min drive away from town. As a result of the above factors, Efate, and especially the area close to Port Vila, is considered to retain the

least *kastom*, and to be the most Westernized, out of all regions in the archipelago (Philibert 1981). *Kastom* roughly translates to 'tradition' but is more expansive and is a loaded term that encompasses customary kinship systems, entitlements to land and chiefly titles, pre-Christian rituals and ceremonies, and ceremonial knowledge – in other words, the whole of received tradition. Linguists refer to the indigenous language of North Efate as Ngunese, while locals call it *Nakanamanga*.

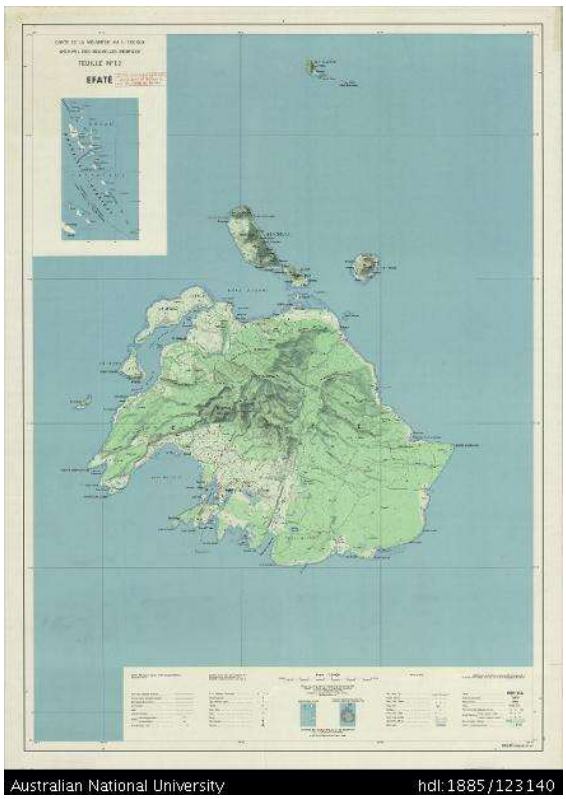


Fig. 2.2: Map of Efate. Source: Australian National University Open Research Library.

My second field site was a rural location on the Northeast coast of Espiritu Santo, South of Port Olry and facing Elephant Island. In 2018, I lived in a small boarding house on the grounds of Hog Harbour primary school, again sharing with a former supervisor and two Master's students. In 2018, the former supervisor was in charge of permissions and approaching communities. In 2019, I lived with a teacher in Hog Harbour, who occupied a small property on school grounds provided to her free of charge, but I also visited Lokalee, Lonnoc, and Towoc close to Champagne Beach. The placement with the teacher was arranged after approaching the principal, enquiring about renting a room either on school grounds or in the main village, after which I moved in as a lodger. I shared meals with the schoolteacher and her house girl (a younger female relative), sharing some household expenses and compensating them at the end of my stay. Unlike Paunangisu,

Hog Harbour had a recognized chief at the time of my stay in 2019. I therefore obtained permission to conduct research from the chief's council and the principal of Hog Harbour primary school, along with school staff and the chairman of the school board. Permission was granted verbally. I made the broader community aware of my presence by visiting key informants and friends I had made during the 2018 visit. Additionally, the pastor of the Presbyterian church of Hog Harbour announced my presence during a Sunday service, where I had a chance to greet the community in a more formal capacity.

Santo is less densely populated than Efate. The East Santo coastline is dominated by coconut plantations for copra cutting, some of which are also used for cattle grazing. Luganville, also known as Canal, is the only urban settlement on Santo. It is the second largest town in Vanuatu (CIA World Factbook 2021). It provides access to multiple secondary schools and an agricultural college as well as banking services, supermarkets, agricultural supply shops, and a hospital. Many businesses are operated by Asians. The Hog Harbour area straddles the East Santo highway and villagers frequent the farmer's market to sell produce. Locals call their language *Wanohe*.

In both locations, men and women wear European dress, such as shorts, T-shirts, and flip-flops. Women also wear 'island dress' or Mother Hubbard dresses, modest gowns introduced by missionaries. In addition to their indigenous languages, all residents speak Bislama, and many also speak some English or French.

Fig. 2.3: Map of Espiritu Santo. Source: IOCS.

2.1.4 Methods

I conducted in-depth interviews on the kinship system (including terminologies and aspects of social organization) with elders as well as current and retired schoolteachers (four key informants on Efate and five on Santo; with six people interviewed multiple times). I also conducted in-depth interviews on the history of the local education system with retired teachers (two key informants on Efate and one on Santo). These semi-structured interviews lasted ca. 30-45 min; no research assistants were present, but the former supervisor and/or the Master's students were present during interviews conducted in 2018. In all cases, I took notes documenting participants' comments during these conversations, which I included in my field diary. These key informants were from both sexes; four interviewees for kinship and one for education were female. Interviewees were informed that this information would be used to paint a picture of the cultural background of the field sites and agreed accordingly. I also conducted in-depth genealogical interviews with n = 38 residents (28 in Paunangisu, Efate, and 10 in Hog Harbour, Santo); again, each interview lasted ca. 30-45 min. I conducted these interviews on my own, supported by one female research assistant on Santo and one on Efate; both were local residents who were fluent in Bislama, English, and the local language. Responses were written down on paper forms (listing relatives and the genealogical connections between them) and/or recorded by drawing family trees together. Interviewees were informed that this information would be used to find out more about the history of the families at their village and how they are connected to each other and agreed accordingly.

Participant observations occurred serendipitously throughout my stay, by spending time with hosts, visiting friends, and attending community events such as weddings, church services, and gatherings organized on behalf of chiefs. During my stay in 2018, most daily conversation still occurred in English or in a mix of English and Bislama; I transitioned to using Bislama in all daily conversation during my second stay in 2019. While I interacted with people of both sexes, Vanuatu remains a strongly gendered society; accordingly, many activities I casually observed and participated in were female-centric, such as meal preparation and childrearing, with less exposure to male activities such as hunting and *kava* drinking. My social circle included six households on Santo and seven on Efate (including host families). I wrote down my recollections of events and conversations in a field diary, taking notes from memory at the end of the day or on the following day. While I was exposed to many aspects of

everyday life, I chose to focus on topics normally covered in 'holistic' ethnographies (subsistence strategies, social structure and kinship system, and 'religion' or supernatural beliefs) and themes relevant to cross-cultural research on child development (childrearing practices, moral values, impact of formal education, and ethnopsychology). I also (again, serendipitously) made observations on other issues such as gender-based violence; while topical and relevant to social tensions occurring in ni-Vanuatu society, I chose to exclude this information as space was limited and due to the sensitive nature of the material. For similar reasons, I also chose to forego a detailed discussion of the genealogical materials, limiting myself to a few key observations.

2.2 Rural Lifeways

2.2.1 Village Geography and Economy

In both locations, residents live in rural settlements on the coast. Informants have told me that these villages were established in the colonial period, due to the influence of missionaries (see also Guiart 1964). In the past, men slept in a central men's house, with women and children living in separate dwellings (for information on Efate see Guiart 1964). Today, families sleep together in small dwellings ranging from huts made of thatched roofs or corrugated iron to small brick bungalows. Dwellings are divided by narrow paths and dirt roads, which can support a small pick-up truck or van when conditions are dry. Many dwellings are arranged in clusters of related households sharing a yard. Hog Harbour village is further divided into three groups or sections, and different families predominate in each. There is a central *nakamal* or gathering place in the centre of the village located under a large banyan tree. In addition, the individual village sections also have their own *nakamal*, as does one of the dominant families in the village. Hog Harbour seamlessly transitions into the smaller neighbouring villages Lokalee and Lonnoc, which locals tell me have sprung up due to spill-over from Hog Harbour itself. Due to a leadership dispute over the inheritance of chiefly titles (see Section 2.3.1, Community Leadership and Social Control, Efate), Paunangisu village did not have a central *nakamal* during my stay. Families instead have their own gathering places, usually under a tree on their property. Paunangisu seamlessly transitions into the adjacent Marius and Napara areas, and other settlements in the area such as Siviri, Undine Bay, Samma, Emua, Launkarae, Suasu, Takara, Savaki, and Onesua are only a short truck ride away.

In both locations, families derive their main subsistence from growing crops in a

vegetable garden (*mekem garen*), most of which are located some distance away from the main settlement, on the opposite side of the country road and facing the interior of the island. Traditionally, tropical horticulture relies on slash-and-burn cultivation, in which farmers periodically burn jungle vegetation, leaving the ash as fertilizer, then cultivate the cleared plots for a few years before leaving it fallow for some time to regenerate (described in detail for South Pentecost in Jolly 1981). In addition to coconuts and tropical fruits such as banana, pineapple, grapefruit, mango, breadfruit, avocado, and papaya, ni-Vanuatu farmers primarily cultivate island cabbage (a local vegetable that resembles cabbage and spinach), breadfruit, and root vegetables such as taro, yam, manioc, and sweet potatoes (*kumala*), which differ in their growing periods, labour intensity, and planting techniques. Taro is planted in holes dug out with a digging stick (Jolly 1981). The hole is partially refilled with soil (Jolly 1981). Depending on the variety, taro matures within 4 to 24 months (Jolly 1981). Come harvest time, farmers loosen the soil with a stick, then pull out the tubers by their leaves (Jolly 1981). Taro can be planted and harvested year-round (Jolly 1981). Yam is more labourious and strictly seasonal. Yams are also planted in holes, but this is done with a longer and harder digging stick (Jolly 1981). The farmers shift the soil over the planted tubers in a small mound (Jolly 1981). Some weeks after planting, the farmers push a cane into the ground above each tuber, which the yam stalks climb during maturation (Jolly 1981). Planting begins in November or December, stalking starts in January or February and is performed until April, and the tubers are ripe for harvesting between May and August (Jolly 1981). Unlike taro, yam can be stored (Jolly 1981). Farmers plant manioc any time of the year, and harvest after three months. Gardens need weeding on a regular basis. People sometimes use the same gardening spots year after year but maintain soil fertility with inter-cropping.

Families supplement gardening with fishing, hunting, and marine gathering. In both field sites, some men still construct traditional dugout canoes to venture out on deep sea fishing trips, although fiberglass boats have become more common. Traditionally, these activities were performed with wooden spears, bows and arrows, and poison (Jolly 1981). Today, hunters and fishermen combine customary techniques with imported tools such as spear guns, baited hooks, fishing nets, and outboard engines (Jolly 1981). Fishermen catch octopus, shark, and smaller reef fish, but also turtles and stingrays. The men hunt turtles at nighttime when they approach the shallow waters near the shore. The men then spear the turtles. Reef sharks are caught with a rope, fishing line, and bait. Women venture out on the reefs at low tide to gather shellfish and clams. On the reef,

fishers and marine gatherers must avoid ecological dangers such as stone fish, which hide in the sand and sting with poison when people step on them. Other hazards include poisonous snakes such as 'black-and-white' or eels, which hide under rocks. In the past, men hunted wild pigs, flying foxes, birds, and snakes with bows and arrows and spears (Jolly 1981). Men still occasionally go and hunt wild hogs for meat, although they usually use dogs and rifles.

Some families also practice animal husbandry by keeping cattle, pigs or chickens. Most chickens roam freely and forage for food on their own, although they are sometimes fed food waste. Many families also tolerate cats around the house to kill rats and mice. Dogs are mainly kept for protection. In addition, some continue to breed pigs for ceremonial purposes. These pigs are exchanged, slaughtered, and consumed at festivities such as weddings. Like in inland Maleukula, smaller pigs and females may forage independently, but boars are often penned in and fed leftovers and unripe plants on a daily basis (Funabiki 1981). Boars with elaborate tusks are highly valued and often require handfeeding (Larcom 2000: 140). Only few keep larger animals such as cattle, which usually roam on coconut plantations.

Women are generally responsible for washing, cleaning, cooking, and many gardening duties, along with weaving mats. Men also garden and contribute to household chores, although to a lesser extent. However, men perform the heaviest gardening duties such as clearing bush. In addition to these subsistence activities, many families now must produce some cash income, mainly to pay tuition fees for their children (see Section 2.6, Formal Education). In both communities, families send surplus crops to town to sell at the farmer's market. Additionally, some families earn cash from producing food such as bread or doughnuts which they sell to other residents in the village. Some households also raise short-term income by hosting fundraisers where they sell warm meals for cash. Some people obtain a more regular income by participating in wage labour or small enterprise. For example, some residents drive vans or VW buses between the rural areas and towns. These operate like shuttle buses and charge modest fares from travelers. Others sell top-up cards for cell phones. Tourism also plays a role, especially in Hog Harbour. Hog Harbour is located a 40-minute walk away from Champagne Beach, which is frequented by a small number of tourists on a regular basis, although they very rarely enter the main village. In the past, cruise ships occasionally visited the area, and locals took advantage of this by selling home-made handicrafts such as woven baskets. However, this has become rare due to a land ownership dispute about the beach. One

family operates a small guest house in Paunangisu, and so do two families in Lonnoc and Towoc. Cash-cropping is also practiced. For example, some families own small coconut plantations to produce copra, and families assist each other with the relevant tasks. Finally, some residents have found work away from the village, for example by working day jobs in town. Seasonal labour on plantations in Australia and New Zealand is also common (for quantitative data on families' participation in wage labour see Chapter 5). Despite these activities, rural ni-Vanuatu continue to rely on subsistence production as protection against proletarianization, demonstrating their conscious and selective adoption of foreign goods and modes of production (Philibert 1981).

Fig. 2.4: Banana grove, Paunangisu, North Efate.

Fig. 2.5: Traditional dugout canoe with outrigger, Paunangisu, North Efate.

Fig. 2.6: Fibreglass boat, Paunangisu, North Efate.

Fig. 2.7: Family home, Paunangisu, North Efate.

2.2.2 Nutrition and Food Preparation

Most families prepare meals in 'island kitchens', small huts made from wood or corrugated iron, often covered with a thatched roof. Underneath, a gap is left to allow the smoke to escape. Generally, women prepare meals over an open fire or in an earth oven made of hot stones. Kitchen huts feature an assemblage of Western, Chinese, and local products, tools, and techniques. The main sources of protein are chicken and fish. Fish consumed by locals include *naika* (flying fish), poulet fish, *piko, bonito* (tuna), sardines, and octopus. People also consume reef fish (they have a built-up tolerance against ciguatera poisoning), shellfish, and clams, and more rarely stingray, turtles, beef, and pork. Imported and store-bought foods include canned tuna and corned beef (*tin*) along with biscuits, white rice, ramen noodles, and Nestlé powdered drinks.

Simple meals often include white rice with some *tin*, island cabbage, eggs, or vegetables. Root vegetables are the most important local staple. They are served roasted (*punia*) or wrapped in island cabbage leaves (*simboro*). One important dish is *laplap*, a kind of pudding made from coconut milk and grated root vegetables or banana. Making *laplap* is a complex process that requires familiarity with many different tools, products,

and techniques. First, women cut firewood and banana leaves. To prepare the banana leaves, the stems are cut lengthwise with a knife. Then, they peel and shred the root vegetables; open and drain coconuts and scrape out the meat; squeeze out the coconut milk and mix it with the root vegetable pudding; soften the banana leaves over an open fire and peel off the stalks; and heat the stones for the earth oven. After, they spread out the pudding on the banana leaves, then wrap them up in a parcel and place them on the earth oven, which is then covered to trap the heat. Some kinds of *laplap* require additional steps, such as banana *laplap* with island cabbage. Women fold the cabbage leaves and insert them into the pudding, then pour some hot coconut milk over them before covering the mixture with banana leaves as usual. Some kinds of *laplap* are known as *tuluk* when meat is placed inside, such as beef or pork. For banana *laplap* with pork, the mother scrapes a plantain with a shell or spoon. The banana mush is then mixed with coconut milk and spread over banana leaves. Then island cabbage, onions, raw pork, and coconut milk are placed on top before the parcel is folded over with banana leaves. There is also another kind of manioc *laplap*, which is made not from grated manioc, but from manioc cut with a knife, resulting in a different texture after baking. Throughout the process, great manual skill and coordination is required as some risk of injury is present. To open the coconuts, women hold them up in one hand while delivering forceful machete blows to the shell, which hit just a few inches from their fingers. They move the glowing hot stones with wooden tongues and sticks and use a simple broom to spread the hot ashes, all the while working barefoot or in flip-flops and without covering their hands for protection. The whole process involves both 'traditional' tools such as wooden tongues and imported ones such as machetes and potato peelers.

People also eat breadfruit, either roasted or with coconut milk. Steamed fish and roast plantain, wrapped in a banana leaf, serve as simple snacks. Many households have also adopted baking and drinking tea. For example, home-made banana bread is made by stirring sugar and cooking oil in a plastic bowl using a spoon. Then eggs and mushed bananas are added with self-raising flour and stirred by hand until the batter reaches the right texture. The mixture is then wrapped in banana leaves and placed in a pot, then baked over an open fire. Home-made sweets include coconut lollies, which are made with coconut milk or coconut water, which is heated in a pot over the open fire, then sugar is added and the mixture is stirred until it caramelizes. The mass is then removed from the pot and placed on banana leaves, then separated into little lumps and rolled by hand to form small balls. For tea, people submerge orange or lemon leaves in hot water and add

sugar. Some also produce ‘home brew’ or moonshine, which is made from yeast, water, sugar, and/or coconut and left to ferment. Store-bought alcohol is reserved for special occasions.

Fig. 2.8: Shed and kitchen, Paunangisu, North Efate.

Fig. 2.9: Preparing *laplap*, Paunangisu, North Efate.

Fig. 2.10: Roasting bananas, Hog Harbour, Espiritu Santo.

Fig. 2.11: Cooking with an earth oven, Hog Harbour, Espiritu Santo.

Fig. 2.12: Boiling tea, Paunangisu, North Efate.

2.2.3 Facilities

Villagers do not have access to running water, sewage treatment or waste disposal facilities. People rely on rain drums for drinking water. In Paunangisu, some households are connected to the electrical grid, but most are not. The Hog Harbour area is not connected to the electrical grid. Limited electricity is instead available through small solar batteries, and in the case of Hog Harbour, the primary school has access to a Diesel generator. Most households use handheld solar torches for some hours after sundown. Food waste is either fed to animals or discarded outside dwellings where roaming animals can find it. Other kinds of waste, such as plastic bottles and bags, are discarded on site or in a nearby landfill. At Hog Harbour, many people bathe and wash at the beach, which is divided into separate bathing areas for men and women. Otherwise, simple outhouses made from wood and plastic sheets are used. In both locations, a few small trade stores sell household items such as threads, needles, laundry soap, phone top-up cards, canned and packaged foods such as ramen noodles and biscuits, and school materials such as pens and stationery. In both locations, men gather after dark to consume *kava*, an intoxicating drink made from the roots of a local pepper plant (*Piper methysticum*). This drug is consumed at a local *nakamal*, a meeting and *kava* drinking place, usually a small bamboo shack. While elders have told me that in the past, *kava* was only used for ceremonial purposes, it is now bought and sold as a commodity.

Hog Harbour and Paunangisu operate small medical dispensaries, which serve as the main point of access to Western medicine in those areas, and many women give birth there, only travelling to the hospitals in Luganville and Port Vila in case of serious complications. Rural clinics also offer vaccinations and occasional dental check-ups, although access to dental care is rudimentary and erratic. A medical volunteer who was visiting Hog Harbour at the time shared that the local clinics often have badly stocked supplies, at least when measured against standards in developed countries. Accordingly, many health conditions remain untreated or poorly treated, including some cases of arthritis, cervical cancer, and uterine prolapse. I also observed many children with large scars or open sores on their legs and arms. Due to increasing consumption of processed foods and refined sugars, some inhabitants now suffer weight gain and diabetes, especially elderly people.

Fig. 2.13: Rain drum (right), Hog Harbour village, Espiritu Santo.

2.3 Community Leadership and Social Control

Social control is enacted through a variety of mechanisms, including informal leadership by chiefs and village councils, reconciliation ceremonies between conflicting parties, and social pressure exercised by churches and extended families. Elders, including grandparents and aunts and uncles, as well as grandparents' siblings and their relatives, rebuke young people who are thought to fail on their family obligations or offend notions of appropriate conduct. Conflicts can be resolved through gift-giving, where the guilty party transfers gifts to the aggrieved individual. In Paunangisu, a large pig left its pen and was walking around the banana grove next to it. Maybe fearful that the pig would disturb their gardens, a group of men proceeded to kill it. This upset the owner as the pig had not spoilt anything or attacked anybody. The men tried to reconcile the owner by gifting him a mat (in this case the owner refused the gift). Anti-social behaviour such as drunkenness, personal insults, and brawling is often dealt with through physical confrontation, and these kinds of behaviours are also subject to public shaming during church services. Vanuatu also has a police force and a formal justice system of government courts, although these are only a marginal presence in rural areas. A resident of Paunangisu told me that police were not always effective at dealing with violent incidents in rural areas, and that in turn people did not always trust the police enough to approach them. The same informant stated that most villagers are unfamiliar with the formal legal system, even though it can be accessed for appeals if chiefly councils, which are 'only about story' (i.e., oral tradition and rhetorical presentation), do not deliver the desired verdict.

After serious incidents such as murder, community leaders may call on all three

sources of social control (conflict resolution through chiefs and extended families, Christian principles, and the state) to maintain order. This was evident after a violent altercation that occurred in Port Vila during my stay in Efate, where a group of men attacked a person from Tanna island, who later died of his injuries. One of the paramount chiefs of the province held a meeting with a council of Tannese chiefs to coordinate a march for mourning the victim and protesting against violence, during which vigilantism and retaliation were condemned. In an announcement published in the Vanuatu Daily Post, he declared that Vanuatu is "a Christian country built upon the foundation of 81nkle81ian [sic] principles" (Massing 2019: 2) and expressed hope that the march would deter other chiefs from vigilantism (Massing 2019). He added that "[w]e must refer to our traditions and customs, there's always a nonaggressive alternative we can look to" (Massing 2019: 2). He also thanked the chiefs from the area where the attack took place "for keeping the communities together and preventing any attack, following the attack and death of late Ramawi" (Massing 2019: 2), and stressed the chiefs' ability to "maintain peace and stability within its [the country's] communities" (Massing 2019: 2). He also emphasized that "abiding law and order is mandatory" (Massing 2019: 2). Accordingly, he invoked the modern state and law enforcement, Christian values, and traditional systems of leadership as acting in tandem to guarantee harmonious community relations. Ethnographers working in other locations such as Ambrym have already remarked that the relationship between church and *kastom* has shifted from initial hostility in the colonial period to complementarity (Tonkinson 1981).

In reality, these three pillars of social control face contradictions and conflicting values. A resident of Paunangisu shared that rural Vanuatu was a society built on consensus, and that respect for the authority of elders and chiefs and communal action by families were cornerstones of village society. He also shared that these values clashed with the Western legal tradition centred on human rights, and that the informal authority of chiefs clashed with state power, and that these tensions were still being negotiated. Leaders are also flexible, invoking Christian values in one case but not another, and the same applies to *kastom*. At the same time, the concept of what constitutes *kastom* is itself fluid and open to interpretation.

2.3.1 Hereditary Leadership in Efate

Traditionally, the paramount chief of a village (*nawota maraki*) consults with a group of subordinate chiefs in a chief's council, who are served by a speaker who reports

complaints and disputes to them (for ethnohistorical accounts of the powers and duties of chiefs see Macdonald 1893; Espirat et al. 1973; Facey 1981; also note that an earlier ethnographer gives the term *nawotalam* and writes that these title holders traditionally received tribute in the form of pigs, see Guiart 1964). The chief then calls a council meeting, which is often attended by the whole village, to discuss the matter. During my stay in North Efate, rights to the chiefly title over Paunangisu village were being disputed before a tribunal in Port Vila. The tribunal eventually determined that one of the contending lineages was in the right, which came as a surprise to some of the families in the village (the winning family held that they had held the relevant title in the past, and that this title had been 'stolen' from them some decades ago and had asked for the title to be restored to them, although their competitors disputed this version). After the decision, the newly appointed chief selected a village council, of which many were men with claims to subordinate titles, although some female elders were also selected. Council members were selected from multiple large family groups in the village. The appointments were announced during a feast which the chief's relatives had prepared. Large feasts such as this one require contributions from multiple relatives of the feast-giver. In this case, the female relatives and some males had been working together throughout the previous night to prepare *laplap* and meat, along with other dishes.

At the start of proceedings, prominent attendees were welcomed with a flower necklace (*salu-salu*), and the recipients were seated at the front of the crowd. A small crowd gathered by the seashore, and the remaining participants were seated some distance away, on mats spread out near the beach. During the day, pastors affiliated with the various churches in Paunangisu were present to give sermons and say prayers. Multiple elders also gave speeches during the day. Prominent themes were the importance of unity for building healthy and strong communities and overcoming divisions. Some also drew on Biblical references, such as the spirit of council and the spirit of governance. The event concluded with a kava-drinking ceremony, which was said to 'seal the agreement' for reconciliation. After proceedings had closed, those who had helped with preparations were compensated with small bags of rice. However, many residents from other families did not attend the feast, which I took as a sign that the tensions had not been resolved yet.

2.3.2 Elective Leadership in Espiritu Santo

In contrast to Panaungisu, there is only one recognized chief in Hog Harbour village, in addition to an assistant chief and a group of helpers and assistants. Today, chiefs are

elected for one term of four years and then another man becomes chief. In this manner, the title rotates between the three sections of the village. The chief congregates with his advisers and assistants, usually a group of elderly men deemed 'wise' or knowledgeable, to discuss any matters relevant to village life or to hear any issues that residents may present him with. They can be found at the village's central *nakamal*, which consists of a large banyan tree and some makeshift benches.

An elder informed me that in the past, chiefly authority followed the paternal bloodline, which goes from father to son, or from a man to his daughter and then his grandson if he has no sons. When one of the eligible candidates was chosen to be chief, they had to perform a pig-killing ceremony, preferably with circle tuskers (*navave*), with up to 100 animals presented. Not all animals were killed immediately as the candidate would kill some but merely touch others with a staff. Different families contributed pigs, and the candidate was then obligated to repay them in the future. Pig-killings were also performed at peace-making ceremonies. The traditional rank-taking system involved seven steps, also with pig-killings, although I do not know the details involved in each. The system described by this elder appears to be part of the graded society complex in Northern Vanuatu, which is made up of voluntary male associations which are defined by a hierarchy of ceremonial ranks (Blackwood 1981). Men's societies were known as *maki*, *nimangki*, and *mwele* or *sukwe* and *hukwe* (Deacon & Wedgwood 1934: 270). These associations "consist[..] of a number of ranked grades entry into which is gained by the performance of ritual based on the sacrifice of pigs, the transfer of payments for insignia and services, and the performance of elaborate dances" (Allen 1981a: 24). Grades or ranks owned ceremonial titles, but also distinctive crotons, ornaments (such as penis sheaths, feathers, garters, headbands, and armbands), body paintings, masks, and names and effigies associated with ancestor spirits (Deacon & Wedgwood 1934: 280-286).

After the arrival of missionaries in the Hog Harbour area, the missionaries began to appoint chiefs according to their own criteria, starting in the early 20th century, and introduced elections (see Miller 1990: 457 for corroboration in accounts written by missionaries). I have been informed that Hog Harbour's electoral system is atypical for this area and not practiced in nearby settlements, which generally follow the chiefly bloodline. My impression is that, for older people in particular, the bloodline still plays a legitimating role, and some have claimed that people from non-chiefly lineages 'don't know how to look after the place'.

2.4 Kinship

2.4.1 Genealogies

In both locations, villagers live among extended kin. The population is split into a number of major extended families, often patronymously identified with a male ancestor a few generations back. Due to frequent intermarriage, these families have become linked and most residents have genealogical connections to many other members of the community. These connections are recognized. At Hog Harbour, an informant told me: 'you will see that many families are related to each other', and in Paunangisu I was told that 'we are all connected'. In some cases, two extended kin groups have intermarried multiple times. As a result, it is possible to construct multiple genealogical connections between two individuals. For example, in Paunangisu, N. is the daughter of B. and A., who reside in the Mele-Kiki area. A. is the sister of Je., who lives in the Saurone area with his wife Ja. and their four children. Ja. is in turn related to N.'s father B. As a result, N. can trace a recent genealogical connection to Je. and Ja.'s children through both of her parents. In another example, D. has a grandmother L., who is the sister of N. and P., who are all part of the Kaloris branch of the Fakao family. However, D.'s grandfather is a relative of M., and both are descended from R.'s family, which is another major family group in the village. In turn, R. is the mother of W., whose father belongs to the John Bunyan branch of the Fakao family, and who is a cousin of N., P., and L. Only few households are not connected to any of the major kinship networks; this is the case for teachers, nurses, and pastors, who are regularly posted to islands other than their own.

Due to sometimes large age gaps between siblings, siblings may start their reproductive careers some time apart. As a result, large age gaps between cousins are not unusual, and some people are closer in age to their aunts and uncles than to their own youngest sibling. For example, in Paunangisu J, is the eldest son of A., who is the firstborn daughter in her sib. Ak. is A.'s youngest sister, but Ak. is only a year older than J., even though she is his aunt. Conversely, J.'s youngest sister N. is over a decade younger than him. Maybe as a result of these circumstances, the term 'cousin' can be used in a somewhat loose manner. For example, B. would occasionally refer to Be. as his cousin because she is a relative of roughly the same age. However, in genealogical terms, Be. is the daughter P., who is B.'s grandmother's brother, and thus structurally a generation above B.. This shows that structural distance through genealogy does not always reflect the true generational distance between two individuals.

2.4.2 Kin Groups and Terminology

2.4.2.1 Matrilineal Clans and Bifurcate Merging in Efate

In North Efate, the kinship system recognizes matrilineal clans (*nakainanga*, elsewhere known as *naflak*), which are not territorial but structure marriage through exogamy (for discussions of the history of the matrilineal clan system see Facey 1981; Luders 2001; for colonial-era accounts of the kinship system see Macdonald 1893; Somerville 1894; MacDonald 1904). Some locals have told me that clan membership must be transmitted through the mother because women bear children, whereas with a man the line is 'finished'. Interlocutors told me that the largest clans in Paunangisu are yam, taro (*natale*), fish (*kanasi*), octopus (*wita*), coconut (*naniu*), and island cabbage (*noasi*). While most clan terms refer to edibles, some do not, including rat (*kukusuwe*), banyan tree (*nabanga*), and one called *makaru*, which is a plant that can cause skin rashes. I have been told that there are two yam clans, small yam (*nawi kiki*) and big yam (*nawi warua*), but respondents were unsure whether those could intermarry. *M̃alu* is another yam clan, although this refers to a different type with a hairy surface and a round shape. The clans and clan terms I collected overlap to an extent with the ones collected by Guiart (1964) in the late 1950s. For Paunangisu, he lists: yam (*solea, kalamea, kaykay, tuturu*); wild yam (*malu*); coconut (*naniu*); arrowroot (*makaru*); breadfruit (*napetaw*); taro (*dalo*); octopus (*wita*); clamshell (*karaw*); stone (*vatu*); banyan tree (*nambanga*); shark (*pakoa*); *kanaa* (mullet); *fon* (turtle); *faverus* (whale); bush vine (*napu*); and rat (*kusue*).

The *nakainanga* system is legitimized through a founding narrative, which informants have told me as follows: in the time before, there was a lot of fighting and war on Efate island. Then the paramount chief Roi Mata invited the warring parties to a feast. All the visitors brought foods and other things, then Roi Mata made the people who brought bananas into the banana clan, the people who brought coconut into the coconut clan, and so forth, so people from different places would cooperate. This brought about peace (for a discussion of the relevant archaeological and ethnohistorical evidence see Garanger 1972; Luders 2001). In line with this account, I was told that the *nakainanga* facilitates peace-making efforts by extending everyone's family beyond their own village and thus establishing connections across localities, which has historically enabled people to build relationships when travelling. The *nakainanga* system is a general cultural feature of Efate, its offshore islands, and the Shepherd's group, which all share similar traditions. I was told that incest or clan endogamy 'breaks' the family and brings shame on it, and

that perpetrators were killed in the past.

The kinship system also recognizes the patriline or 'bloodline', which is called *namatarau* and refers to 'people who belong to the same bloodline' (for a historical discussion of the bloodline concept see Luders 2001). This bloodline 'follows the father and his sisters, or at least it should'. It was described as follows: Pi. has a son Pe. Pe. and his brother and sister all belong to Pi's bloodline. Pi's wife C., the mother of his children, was not originally from Efate, and was an outsider from a different ethnolinguistic group. Thus, Pi. explained that 'in true *kastom*, she is not a member of my *namatarau*, she married here but she is not from my bloodline, but she was accepted'. These comments suggest that in principle, the paternal bloodline may have been the preferred lineage to marry into, although I have not been able to confirm this definitively. As the *nakainanga* is matrilineal, members of the paternal bloodline belong to a different *nakainanga* from Ego, and thus the father's sister's children are suitable for marriage. A female elder told me that 'my children can marry my brother's children'.

Table 2.1: Kin Terms in Ngunese (Nakanamanga)

Kin Category	**Ngunese (Nakanamanga)**
Father	Mama
Mother	Tete
Brother	Tai
Sister	Ngore
Father's Brother	Mama *[plus their given name]*
Father's Sister	Mimi *[can be followed by their given name]*
Father's Brother's Child	Tai (M) / Ngore (F) *[plus their given name]*
Father's Sister's Child	Tia
Father's Father	Tia
Father's Mother	Tua
Mother's Brother	Wawa *[can be followed by given name]*
Mother's Sister	Tete *[plus their given name]*
Mother's Brother's Child	Tia
Mother's Sister's Child	Tai (M) / Ngore (F) *[plus their given name]*
Mother's Father	Pua
Mother's Mother	Tata

The terminological system uses bifurcate merging typical of Iroquois kin terminologies. The terms for mother's brother and father's sister (*Wawa/Mimi*) are considered to be equivalent to the English uncle and aunt, whereas mother's sister and father's brother are addressed with the same terms as mother and father (*Tete/Mama*), followed by their given names, which is said to 'tie everybody together in the extended

family'. By the same logic, parallel cousins (who Ego is prohibited from marrying) are called brother and sister, but cross-cousins are addressed by a different term. The same logic also applies to the spouses of the parents' siblings. For example, the spouses of the mother's sister and father's brother are addressed as mother/father, followed by their given names. For example, S. calls B. 'daddy B.' because B.'s wife A. and S.'s mother are sisters. But as B. is merely an in-law, S.'s mother calls him *tawi* (a Bislama term for in-laws, in this case brother-in-law). Accordingly, some relatives are classificatory mothers/fathers even though there is no blood relation to Ego. Furthermore, this system distinguishes not only between marriageable and prohibited lineages that derive from the parents' siblings, but also between maternal and paternal grandparents, and again between the fathers and mothers of both of Ego's parents (*Tua/Tia* and *Pua/Tata*). People can also address elderly people with the generic term *matua* (elder), e.g., *Matua Janet*. Travelling further up the family tree, Ego's great-grandparents retain their distinctive kin terms, but are differentiated from grandparents by the addition of *matua*: the paternal great-grandparents are called *Tia matua* and *Tua matua*, and the maternal great-grandparents are *Pua matua* and *Tata matua*. All previous ancestors receive the generic term *Tai matua*. Indigenous kin terms are used in everyday conversation and children are corrected when they make mistakes. I sometimes observed children addressing some relatives with Bislama kin terms and then addressing others with indigenous kin terms.

The kin terminology also contains some puzzling features. For example, Ngunese uses the same term for the paternal grandfather and for cross-cousins (*Tia*), especially the patrilateral cross-cousins (the father's sister's children). The father's sister's relatives may in turn address Ego as *Kiki* (child): 'my father's sister's children may call me *Kiki* (child), for example *Kiki* Pita, *Kiki* Leiwia'. The informant further elaborated: 'My auntie's children call me *Kiki* as if I were their son. All my father's cousin sisters call me *Kiki*, and I call them *Tia.* I call them *Tia* followed by their given name, and they call me *Kiki* followed by my given name. My daughter and her children also call them *Tia,* and my wife also calls them *Tia*'. When asked about this, respondents speculated that it 'reminds me that they belong to my father's bloodline, because all come out from the father's father' and that 'the child of the father's sister is called *Tia* because they share land with the father'. This suggests that the terms *Tia* and *Kiki* are conceptually linked through the *namatarau*. The conflation of the father's sister's children with older generations on the father's side of the family, combined with addressing Ego (who, from their perspective, is the mother's brother's child) as child, resembles some features of

Crow kin terminologies. The latter conflate father's sister's children with father's sister and father, whereas mother's brother's children are terminologically conflated with one's own children (Coult 1965).

My data are based on conversations with interlocutors in Paunangisu. I acknowledge that this information conflicts with ethnographic evidence collected in the late 1950s, although at this stage I am unsure of the reason. For example, the kin terms I collected largely overlap with those collected by Guiart (1964) in Emao and Nguna, where the same language is spoken, but he gives a different term for mother's brother (*loloa* in Emao and *aloa* in Nguna). As the language history of Efate is very complex (Hermann & Walworth 2021), I have not been able to resolve this disagreement. Furthermore, Guiart writes that *namatarao* is an alternative name for *nakainanga* used on Nguna and Pele, that the term *nakainanga* is primarily used in Siviri, Moso, and Lelepa, and that Paunangisu and Emua use the term *naflak* instead (Guiart 1964). Guiart (1964) refers to patrilineal principles with the term *namavisi*, although unlike clans, these linkages are limited to a man and his father. He further writes that people used a set of *namavisi* terms to identify the matrilineal clans of their fathers (to avoid mentioning the clan terms directly, which were taboo in the past). Guiart also wrote that while people are forbidden from marrying a person from their own matrilineal clan, a man can further only marry a woman if her clan is different from those of his father and father's father (Espirat et al. 1973: 275). Based on statements by the descendants of the Nguna missionary Peter Milne, Guiart (1964) also argued that people are forbidden from marrying their cross-cousins, and that this includes their *namavisi* relatives (which includes the father's sister's children). Guiart, too, noticed the similarities between Efate and Crow-Omaha-type systems, and wrote that a man cannot marry woman whom he addresses with a 'parental' term (Espirat et al. 1973: 275). Presumably, this would entail that a man cannot marry a woman whom he addresses with a 'grandparental' term and who addresses him with a 'child' term, either. This is logical, but directly contradicts statements from my interlocutors. Furthermore, Guiart writes that Dick Tinabua (a paternal ancestor of my interlocutors) attributed the creation of the matrilineal clan system to Roi Muri (another figure known in oral tradition), not Roi Mata (Guiart 1964). However, the basic narrative about the origins of the clan system has remained the same, and also the idea that with territorially dispersed matrilineal clans, people of one clan can find refuge, safe passage, and hospitality with clan mates in other villages (Espirat et al. 1973: 275; Guiart 1964).

Furthermore, Guiart (1964) agrees that matrilineal clans are divorced from territorial organization.

2.4.2.2 Matrilineal Moieties in Espiritu Santo

In Hog Harbour, named lines or lineages are present but do not function as clans or corporate kin groups. Instead, they resemble moieties as there are only two lines present in the village. These lines do not have 'totemic' clan names, but membership is transmitted through the mother. I have been informed that in other places on Santo, these lines have different names, but are still always limited to two in any given settlement. Colonial observers also hinted at the existence of a "dual (matrilineal) culture" (Harrison 1937: 382) on the Sakau peninsula in North Santo. Exogamous matrilineal moieties are also present on nearby Aoba island (see Rodman 1981). In Wanohe, the two lineages are called 'red line' (*Nalyö kar*) and 'white line' (*Nalyö wooc*). Exogamy rules also follow the lineage of the mother, i.e. people cannot marry partners from their mother's line, which is also their own. I have been informed that breaches of the line exogamy rule only happen rarely (I am aware of two incidents within living memory) and offenders are punished with fines 'to mend the broken line', because 'property goes to the other line in marriage'. Specifically, the man has to pay the fine to the woman's uncle or mother's brother (*Nevtec*/*Veli*). In the past, people were fined in pigs, although now money is more common.

Informants have explained to me that as a result of line exogamy, a man cannot marry his father's brother's daughter 'because the mothers are of the same line, but 'I can marry my mother's brother's daughter'. In other words, people can marry their cross-cousins (mother's brother's and father's sister's children) on both sides of the family, but not parallel cousins (mother's sister's and father's brother's children). Consult the diagram below:

FF=FM MM=MF

FZ=FZH ---------- FB=FBW ----------F=M --------- MB=MBW ---------MZ=MZH

FZD FBD Ego MBD MZD

Ego is a man who belongs to the red line. Individuals belonging to the white line were coded black. Due to matrilineal inheritance of line membership, Ego, Ego's mother,

mother's brother, and mother's sister share the same line, which goes back to Ego's maternal grandmother. As there are only two lines, and residents must respect line exogamy, it follows that mother's brother's wife and mother's sister's husband belong to the white line. It follows that the matrilateral cross-cousin (mother's brother's daughter) belongs to the line of mother's brother's wife (in this case, the white line). This cousin is therefore, in principle, allowed to marry Ego. Conversely, the matrilateral parallel cousin (mother's sister's daughter) follows the line of mother's sister and thus belongs to the same group as Ego (in this case, the red line), which makes her unsuitable for marriage. An informant put it like this: 'You cannot marry the children of your mother's sister because you are the same, but you can marry the children of your mother's brother. Your children [referring to me being female] cannot marry the children of your sister because you are the same, but they can marry the children of your brother'. Expressed in another way: 'if I am a woman and I have a brother, then our children can marry each other. But if we are two sisters, our children cannot marry each other because we are all the same'.

The same principle holds true on the father's side of the family. As Ego and his mother are red, Ego's father, father's brother, and father's sister all belong to the white line, which they have taken from father's mother. Given the practice of line exogamy, father's brother's wife and father's sister's husband both belong to the red line. It follows that the patrilateral cross-cousin (father's sister's daughter) is white, taking after the father's sister in accordance with the matrilineal principle. Accordingly, she belongs to the opposite line and may marry Ego: 'Me with my father's sister's children, we are two different lines.' Conversely, the patrilateral parallel cousin (father's brother's daughter) belongs to the red line, taking after father's brother's wife, and is thus unsuitable for marriage.

The functional differentiation between marriageable and tabooed lineages in the extended family is reflected in the terminology, where parallel cousins are conflated with siblings but cross-cousins are differentiated from the former two. A resident put it like this: 'the ones you call *Thvüc* (cross-cousin) you can marry, the ones you call *Tatec* and *Witiec* (brother and sister) you cannot marry'. Following the same logic, a woman can address her sister's children as her own, but not her brother's children, and this is reversed for a man: 'If I am a man, then I can call my brother's child *Kaat hëc* ('my son') or *Kö hëc* ('my daughter'). But if I am a man, I call my sister's child only by their given name, there is no language word for them.' By the same token, Ego addresses the same-sex siblings of their parents (mother's sister and father's brother) as mother and father, but

the opposite-sex siblings (mother's brother and father's sister) are differentiated through a separate kin term (mother's brother) or through no kin term at all (father's sister).

Unlike North Efate, the system in East Santo does not differentiate between maternal and paternal grandparents (*vuvu*). Reciprocally, grandchildren are referred to by the same term as grandparents (*vuvu*). Children also call their grandfather's brother grandfather, and in return, elders address the grandchildren of their brothers as they do their own grandchildren. The same goes for the grandmother's sister. Moving upwards on the family tree past the grand-parents' generation, kin terms are again assimilated to the generic terms for parents. The great-grandmother is simply called mother, and the same goes for the great-grandfather. Elders are sometimes generically referred to as *Vaat Wakër* ('old woman') or *Vaat Wari* ('old man'). When questioned about their own reasoning for the terminological assimilation of various kinds of relatives, informants state that it 'makes the relatives closer' and 'keeps the family together', both of which are part of *kastom*

Table 2.2: Kin Terms in Wanohe

Kin Category	**Wanohe (Regular/Vocative)**
Father	Teta /Ta
Mother	Ma
Brother	Tatec
Sister	Witiec
Father's Brother	Ta
Father's Sister	*[child name]'s mother*
Father's Brother's Child	Tatec (M), Witiec (F)
Father's Sister's Child	Thvüc / Vuvu
Father's Father	Vuvu Wari
Father's Mother	Vuvu Wakër
Mother's Brother	Nevtec / Veli
Mother's Sister	Ma
Mother's Brother's Child	Thvüc / Vuvu
Mother's Sister's Child	Tatec (M), Witiec (F)
Mother's Father	Vuvu Wari
Mother's Mother	Vuvu Wakër
Grandchild	Vuvu

Some kin terms have a vocative, i.e., they change when addressing the relevant relative directly. Endings can change depending on whether a possessive is added. When I was interviewing two informants about the terminology, they often discussed which term was

the most appropriate and what spelling to use. To some extent, the above table was thus constructed to conform to the latest draft of a Wanohe dictionary that some local schoolteachers were working on at the time I was in the field. However, when I enquired whether the kin terms had ever been different when they were younger, they confirmed that they had been used the same way. Consulting an earlier draft of the dictionary, I also documented some additional variants, for example for brother (*Manec*). Intriguingly, this dictionary version allows for terminological overlap between in-laws and marriageable extended kin. For example, the term *Veliec* ('my uncle' or 'my mother's brother') is listed under uncle, but also under father-in-law. Following the same pattern, *Vyan* (*Viec* with possessive 'my') is noted as an alternative term for brother- and sister-in-law and 'cousin'. This term is also noted as an alternative variant for 'grandchild'. I was also provided with another term for cousin (*Isa*) that does not overlap with any of the other terms. The dictionary also lists a term for nephew or niece (*Seklan*). I was later provided with another term for grandparent (*Thvön*).

Intriguingly, when I questioned local teachers about the terminological overlap between grandchild, cousin, and in-law, they were surprised. Furthermore, rather than knowing the vernacular terminology by heart, they had to look up some terms for extended kin in the dictionary for me. This indicates that some Wanohe terms are not used much and may have lost relevance in daily conversation. This observation also fits well with that I have been told by other informants, who report that some families now use Bislama kin terms when conversing with their relatives. They have told me that nowadays, siblings often just address each other by name, while cousins address each other by name or alternatively as cousin brother or cousin sister. This is also backed up by my own observations as I frequently heard children use Bislama kin terms when conversing with their relatives.

2.4.2.3 Bislama Kin Terms

In addition to the indigenous kin classifications, people thus also increasingly use a largely parallel terminology in Bislama. While Bislama has assimilated many kin terms from English, the use of these terms can still reflect the conceptual structure of the 'native' kinship system by using bifurcate merging. In Bislama, the mother is called *mama* or *mommy* and the father *papa* or *daddy*. Children also call their father's brother father. This usually takes the form of *papa* or *daddy* followed by his given name (*papa Warilei* or *daddy Kalfau*), and the same goes for the mother's sister. This may be accompanied by

modifiers such as *smol mama* and *smol papa* or *bigfala papa* and *bigfala mama* if the aunt or uncle is older than the speaker's parents. Conversely, the Bislama terms for uncle (*ankel*) a93nklent (*anti*) are more appropriate for mother's brother and father's sister. Consistent with these norms, cousins call each other brother and sister, sometimes with the modifiers cousin brother (*kasen brata*) or cousin sister (*kasen sista*). Nephews and nieces are addressed as sons and daughters. In-laws are called *tawi/tawian*. Grandparents are uniformly called *bubu* or *vuvu*. In their turn, grand-parents also call their grand-child *bubu* or *vuvu*, or they may just refer to them by name. Sometimes, the Bislama term for uncle (*ankel*) is also used to talk about nephews. Additionally, while there is considerable terminological overlap between different classes of relatives, people also, on another level, differentiate between 'straight' or biological relatives and others, such as distant and adoptive kin. For example, a man may refer to his father's brother or his adoptive father as 'father', but then explain that his 'straight father' (*stret daddy*) is his real, or biological, father. While some colonial sources have claimed that biological paternity is not a concept in ni-Vanuatu mentality (see Asterisk [1923] 1986: 169), this is not true in my experience. Unlike Ngunese, Bislama does not distinguish between maternal and paternal grandparents, or conflate father's father with father's sister and her descendants.

2.4.3 Marriage

In both locations, marriages are contracted through bride price, which the groom's family transfers to the bride's family. In Bislama, the expression for paying the bride price is *pem woman* (or 'buying the woman'). At Hog Harbour, I have been informed that traditionally, the mother's brother was responsible for organizing marriages. Specifically, I was told that a boy may identify a girl for marriage and then approach his uncles, who proceed to inform his parents. The uncles then contact the girl's family and, if successful, come to an agreement with them. They then organize pigs and other gifts to fund the wedding feast where the girl's parents will be 'giving away the daughter' in exchange for bride price, which compensates them for the loss of their daughter to the husband's family. Nowadays, the boy's family may also gift money, often in multiples of 10.000 VT, a princely sum given the meagre cash income of many rural families. As a result, an informant in Paunangisu has told me that the groom usually receives help from his extended family, and it is therefore important for him to maintain good relations with them. This echoes observations from ethnographers, who write that elders have traditionally exercised control over marriages because they controlled access to pigs,

which young men need to pay the bride price (Larcom 2000: 148). Attitudes to bride price vary depending on sectarian affiliation. While the Presbyterian church accepts bride price arrangements, NTM (Neill Thomas Ministry, a splinter group) rejects obligatory bride price and only recognizes voluntary gifts between families.

Arranged marriages between cross-cousins occur occasionally. For example, in Paunangisu, Pi.'s and C.'s daughter Be. married C.'s brother's son. The reason given was that C., who was originally from another island, 'had married here, and her family decided that her children must come back and take her place, so it was arranged for them to marry, so her daughter will not feel like a stranger when she goes back there'. I was told that 'Be. can then work the land and touch any fruit in C.'s home area and no one can say anything against her'. I am also aware of a case in Hog Harbour, although in both locations the couples in question are now middle-aged. An ethnographer who studied a neighbourhood in Port Vila has noted that nowadays, young people in urban areas exercise much autonomy in their partner and reproductive choices (Servy 2000). I have been told that the same is true in both of my rural field sites, and that most young people find their own partners instead of relying on relatives to arrange their marriages for them. I have been told that 'today we marry whom we love the most', but love marriage does not free them from bride price payments and other gift-giving obligations.

The same ethnographer has noted that traditionally, bride price also granted the groom's family access to the wife's labour and fertility, although this concept is becoming less important nowadays (Servy 2000). In fact, many young urbanites now begin their reproductive careers and their conjugal life before marrying and paying bride price (Servy 2000). Some young men pay bride price only after they have already lived with their partner, sometimes for years (Servy 2000). I have found the same trend in both of my rural field sites. Despite bride price obligations, pre-marital relationships are common, including cohabitation and having children before marriage, although this is recognized as going against Christian principles. For example, during an interview an elder jokingly referred to the relationship between her son and his live-in girlfriend as 'bush marriage' because the couple already had children but were not married. This term is also used to refer to 'heathen' marriages concluded before conversion to Christianity. During a wedding, the pastor remarked that the ceremony would make things right before God because the couple already had a child, even though Christianity says that people should be fruitful and multiply only after marriage. In general, the extended family takes an active interest in people's romantic relationships even before marriage and may call

family meetings to determine whether a relationship is still active. At Hog Harbour, I was told that when a couple make their relationship official, they will inform their families. Their fathers and uncles then arrange a *kastom* for them, which allows them to spend the night in each other's homes until marriage. Extended families are also involved in maintaining (and ending) pre-marital relationships. In Paunangisu, a man and his partner had been arguing, then the woman's brother fought him and was injured in the process. The man then temporarily left the estate. I was told that to come back, they might have to perform a family meeting to reconcile. The man would gift mats, *kava* or sugarcane to the wife's uncles (her mother's brothers) because they hold a chiefly title.

Bride price is not the only material investment in marriage. During the preparations leading up to a wedding, the bride's family also makes contributions, most importantly in the form of a trunk filled with gifts from her relatives. I took part in a trunk-filling ceremony in Laathi village near Hog Harbour. During this ceremony, the relatives of the bride came together and had a feast. Afterwards, the relatives presented gifts, which were mostly things the bride would need in her future home such as tea towels, bedsheets, clothes, blankets, dishes, cutlery, pots and pans, and plastic bowls. The guests then filled up a large wooden trunk with these items while a relative kept a tally of who gifted what. Most roles involved in the event, such as presenting gifts, keeping tally, and giving speeches, were taken by women. In many events such as these, hosts and visitors combined elements emphasizing the extended family with appeals to Christian values (e.g., by saying a prayer together) and traditional elements (e.g., communal feasting and speeches by community leaders).

During my stay in Paunangisu, I had the chance to attend a wedding. Some days before the wedding, a feast house was built, where the guests and relatives, some of whom had travelled from other locations, feasted for several days. The feast house was a traditional hut with a table and benches, and female relatives kept cooking rice, *laplap*, beef, and vegetables. Next to the feast house, a tall scaffolding was erected, where root vegetables and other foodstuffs were stored. At nighttime, the guests consumed copious amounts of wine and homebrew. The day before the ceremony, the groom's relatives slaughtered a cow. On the day of, the groom's family made gifts to the bride's parents, which included mats, kava, sugar cane, yams, and a pig, in addition to ca. 40.000 VT. This was done at the bride's family's home. Afterwards, the wedding party gathered at the beach for a Christian wedding service held by a pastor. Bride and groom donned Western wedding attire and performed a ceremony with a sermon and vows. The pastor

touched on topics familiar to a Christian audience, such as the groom's and bride's duties in marriage, norms and expectations regarding conduct in a Christian household, and the couple's duties to God. This was followed by a *kastom* ceremony at the groom's house. The bride's relatives formed a dancing parade accompanied by a string band and paraded to the groom's house. The bride's party was carrying her trunk, filled with household items they had gifted to support her in her new home. Bride and groom donned calico, the bride was wearing an island dress. First, the bride passed over to the groom's family. The bride then greeted and shook hands with all the groom's relatives individually and handed each of them a mat, assisted by her father. As an informant put it, both families thus 'showed their strength' by presenting gifts. The bride's father also gave a speech to the assembled guests in which he touched on the coming together of the two families. At the conclusion of the ceremony, the guests and those who had contributed to the wedding received gifts such as root vegetables, bags of rice, and meat. All the gifts were lined up in a row and marked out by recipient, then all recipient families were called out and collected their gifts. This concluded the festivities and the relatives then departed to their homes. While festivities can continue for up to five days, weddings can also be more modest affairs with just one day's celebration in which the families feast in a small tent and other guests are fed separately, carrying their own plates and eating in their own residential clusters, picnic-style, with a simple ceremony held at church.

While many young people choose their own partners, marriages still establish permanent ties between the families of groom and bride. Ethnographers of Vanuatu have noted that traditionally, "marriages were between groups rather than individuals" (Larcom 2000: 148). But even today, bride price payments establish 'roads' (*rod*) or relationships between the families involved in the marriage (Servy 2000), allowing families to "build or strengthen social relations within clans and between families" (Servy 2000: 305). Accordingly, "bridewealth payments are [..] mainly used to create protective and supportive relationships between social groups" (Servy 2020: 305). Exchanging pigs, mats, and other forms of modern and traditional wealth during ceremonies cements relations of mutual dependence between the generations and between allied kin groups:

> Ceremonial expenditure ensure a fund of social capital that can be drawn upon in times of need. Contributions of mats and pigs from a large segment of local residents effect and affirm changes in status through ceremonial exchanges. No individual can afford to alienate kinsmen, affines, or neighbours if he wishes to rise in rank or to maintain a buffer against future hardship (Rodman 1981: 101).

These ties are not limited to one locality. Instead, marriages frequently cross community boundaries and thus extend people's kin networks to other villages. For example, L. and her sister are from Emua village. L. married K, who is from the Esly branch of the Fakao family. L.'s sister married a man from the Kaloris branch of the Fakao family, and now both reside in Paunangisu. However, they maintain strong ties with relatives who continue to reside in their natal village. These connections can also cross islands. Some families in Paunangisu can trace ancestry to other islands in the archipelago such as Tanna and the Shepherd's group, especially Tongoa. Some of these ancestors landed on Efate after being displaced due to blackbirding, then were accepted by a chief, provided with land, and permitted to settle there, eventually marrying local women (for corroborating evidence see Miller 1987: 206). Others are descended from chiefly families with ties to Nguna island. These families continue to maintain ties with these islands and intermarry with people from there. Finally, the Cyrel branch of the Fakao family has marriage ties to Hog Harbour village as one of theirs migrated there for marriage. Furthermore, some of the families in North Efate are of mixed Asian and Melanesian descent and carry Asian family names such as Phung. These connections may date back to the colonial period when some settlers recruited Asian labourers to work on plantations. Others have a mix of Melanesian, Polynesian, and white heritage, also dating back to the colonial period.

Fig. 2.14 and 2.15: Guests observing the exchange of mats, Paunangisu, Efate.

Fig. 2.16: Children playing between the scaffold and feast house, Paunangisu, Efate.

2.4.4 Residence

In both locations, I have been told (by male informants) that the bride usually moves to live with the family of her husband, who then establishes a dwelling for his wife and children on his natal home's yard. I have been informed that when women immigrate from other islands with different kinship systems, they are adopted into a line that the husband is permitted to marry. These statements are echoed by earlier ethnographers, who write that on Efate, localities or *farea* were patrilocal and patrilineal units (Espirat et al.

1973: 338), resembling the territorial situation in many other locations of the archipelago (Espirat et al. 1973: 274).

While this suggests a patrilocal preference in post-marital residence, real residence patterns deviate from this most of the time. For example, I have encountered multiple cases in which local women married men from elsewhere in Vanuatu, who then came to live with their wife's family at Hog Harbour or Paunangisu. My demographic data also show that in practice, matrilocal residence is more common than patrilocal residence (methods presented in Chapter 5, along with a discussion of potential sampling biases). Specifically, I found that about half of households were extended family households and just over a third were nuclear family homes (see Table 2.3). Among children living with extended family, most lived with maternal relatives (see Table 2.3). Only few lived with paternal relatives, a mix of both, or their older siblings' family. Most of these children lived with their aunts and uncles, cousins, and/or grandparents (see Table 2.3). Living with more distant kin was less common. Other kinds of arrangements (such as households that included unrelated individuals and stepparent or patchwork families with purely affinal connections between the residents) were rare. In a few cases, the degree of relatedness between the residents was unclear. This was the case for one household on Efate and one on Santo. On Efate, the child lived with the adoptive parents of their biological mother, but the precise genealogical connection between the child and head of household could not be clarified. On Santo, a nuclear family had adopted a child whose biological mother had herself been adopted by the child's adoptive mother's aunt some decades prior, but the connection that motivated that first adoption could not be identified.

Table 2.3: Residence Arrangements at the Field Sites (Children's Point of View, n = 282).			
Household Type and Relatedness			
Extended Family	51.6%		
Nuclear	36.2%		
Single-Parent	2.3%		
Extended/Nuclear w/ unrelated	6.1%		
Stepparent/Patchwork/Affinal	2.8%		
Unclear	0.9%		
Extended Kin: Line		Extended Kin: Type	
Maternal	57.1%	Aunts and Uncles	46.9%
Paternal	36.8%	Cousins	38.9%
Both Maternal and Paternal	1.8%	Grandparents	58.6%
Older Sibling	4.3%	Great-grandparents	5.6%
		Grandparent's sibling or their descendants	16.0%
		Great-grandparent's sibling	0.6%
		Cousin's children	2.5%
		Older sibling's children	6.2%

2.4.5 Inheritance

Unlike reefs and fishing grounds, which are owned and accessed by everyone in the village, genealogies regulate access to gardening land. A prominent concept in ni-Vanuatu's relationship with their land is that of *manples* (lit. 'man place') or 'peace ground'. *Manples* - the place where one is from, where one's ancestors used to live, and where one's relatives reside- plays an important role in people's notions of belonging and identity, but also in people's access to land, food, and support. Writing on Mewun, Larcom has noted that "without a *ples* people are also *ded* [sic]" (Larcom 2000: 99). She further writes that "[p]eople driven out of their *ples* by gossip or humiliation have attempted or actually committed suicide or, if male, they have run amok or crazy in the bush, outside the social order" (Larcom 2000: 99). She concludes that living without *ples* amounts to a loss of resources and social support, but also to a loss of identity (Larcom 2000: 99). A resident from Hog Harbour explained to me that 'peace ground' refers to the ancestral land of the rightful landowners, 'where your father and grandfather is from, that is where your land is'.

This statement may suggest a bias in favour of patrilineal inheritance of land and *ples* membership. However, in principle, people can inherit land from both their father and mother. The same informant explained it thus: 'my father is from Vanafo, my mother is from Port Olry, so my family has ground in two places. The land from my father is ours and belongs to the descendants. I have never worked our land in Port Olry, but the land

is there, our relatives live there, and they still talk about it. So, if I want to go and claim that land, I can go there. Maybe I will do this in the future, or my children will'. While land is normally inherited from father to son, daughters too may inherit some, especially when they do not have brothers. In fact, the father is at liberty to decide how to distribute his land among his children, and the children's uncles may also provide land to them.

As to North Efate, it was traditionally common to 'share land within families to support each other'. Elders told me that the patriline or *namatarau* 'exists to live peacefully together', and that the reason for marrying cross-cousins, especially patrilateral ones, was to 'preserve family land and to circle family land inside the family tribes, and not to foreigners'. I was also told that people who have left the village can return and settle on their father's ancestral lands. In addition to land, descendants may inherit communal usufruct rights in fruit trees. There is a small group of lemon trees in Paunangisu which were planted by Fred Manuwia, who decreed that the fruits of those trees were meant for his descendants. Somewhat confusingly, Guiart (1964) claims that on Efate, titles related to land ownership were inherited matrilineally but preferentially transmitted within virilocal groups, but also that men typically received land from their fathers. This confusing statement may come down to the fact that according to Guiart, some plots of land were attached to chiefly titles (which he believed to be traditionally matrilineal; see below); these chiefly lands fulfilled ceremonial purposes and were cultivated by the community to prepare for feasts (Espirat et al. 1973: 338). In contrast, ordinary entitlements to land (cultivated for the personal subsistence of individual families) were transmitted from father to son (Espirat et al. 1973: 338). Accordingly, Guiart's material is partially consistent with my own. Guiart also mentions another type of land holding called *pwaumaso,* which a woman received from her mother as a dowry of sorts when she got married (Espirat et al. 1973: 338). These plots of land were then held by her and her husband until their own daughters married (Espirat et al. 1973: 274). These holdings often consisted of multiple plots and could be widely dispersed (Espirat et al. 1973: 338). As a result, families sometimes tried to restrict the post-marital dispersal of women, especially across islands, resulting in a preference for marrying close to home (Espirat et al. 1973: 338). I am unsure whether this dowry system is still practiced, although this is arguably an intriguing subject for further inquiry. In particular, future research should explore to what extent this can explain the de facto preference for matrilocal residence.

In Efate, people whose ancestors were migrants who arrived after blackbirding

journeys derive their land rights as follows: a local chief gave a piece of land to the migrant, who then transmitted it to their children, then their descendants held it and transmitted it within the family. The idea of 'gifting' plots of land to strangers or other landless people is also present in Guiart's material. According to Guiart, people could receive a plot of land as a gift in exchange for providing cooked food during the funeral ceremonies of a deceased man, a practice which was common in the North and Centre of the archipelago (Espirat et al. 1973: 274).

I have received ambiguous information about the inheritance of chiefly titles. For example, in Paunangisu elders disagreed on the appropriate tracing of chiefly titles. One resident informed me that 'I could be a chief because I am from the yam clan'. But another resident shared: 'I overheard (the first man's) wife say that the first contender [for the disputed chiefly title] cannot carry a chiefly title because he is not from the yam clan, but this does not matter because chiefly titles follow the bloodline, not the clan. Whether he is a yam or not has nothing to do with it. If he is not from the bloodline, he cannot carry the title'. The same informant then told me: 'if I'm in the yam clan but not in a chiefly bloodline, then I cannot be chief'. According to this informant, the old chief chooses the next one from within his own bloodline, usually one of his own sons, albeit without primogeniture. The best candidate was selected according to his 'respect, *kastom* knowledge, wisdom, and character'. If a chief has no sons, he passes the title to a sister's son or to a daughter, and the daughter then carries the title for her son (the daughter cannot be a chief because women are by *kastom* 'below the authority of the man').

Their disagreement is intriguing in the light of debates about the historical significance of the matrilineal (*nakainanga*) and patrilineal (*namatarau*) elements of North Efate society. Facey (1981) has argued that the present-day system of patrilineal succession for chiefs, which is also practiced on nearby Nguna island, only traces back to the early 20th century, when the missionary Rev. Milne began to ordain Christian chiefs, displacing traditional installment rites based on ancestor beliefs (for an account of the history of the missions see Miller 1987; Miller 1990). Facey (1981) reasoned that locals had previously practiced matrilineal-avuncular succession within the *nakainanga* (mother's brother to sister's son), but missionaries encouraged converts to abandon this in order to expunge the notion of chiefly sacredness, which was tied to the continuity of clan blood. Guiart has likewise claimed that chiefly titles were initially transmitted matrilineally (Espirat et al. 1973: 338), preferentially to the maternal nephew of a recently deceased chief (Espirat et al. 1973: 274). Milne tried to replace this with patrilineal

inheritance, de-emphasizing the transmission of chiefly titles in the maternal line and obfuscating the importance of maternal uncles in the pre-contact system (1964). This disturbed local structures, although his attempt was not entirely successful (Espirat et al. 1973: 338).

This account has been contradicted by Luders (2001), who has argued that the interplay between matrilineal and patrilineal conventions, and thus between *nakainanga* and *namatarau,* predates colonialism. Accordingly, he has speculated that Ngunese chiefs did in fact manipulate the missionaries into reinstating a patrilineal convention that had been abandoned in the past (Luders 2001). This is further complicated by the assertions of yet other informants, who felt that there was some 'confusion' in the records of the missionaries. I was also told that titles can be 'lent' to other lineages but am unsure of the details. As a result, I cannot determine which account (if any) is correct. However, contradictions may be a feature, rather than a bug, of this system. As I have shown, interlocutors of different generations, speaking to different ethnographers, can conflict with each other, and statements from interlocutors can in turn conflict with demographic data collected during the same field trip. This may reflect confusion, or this may reflect that the interplay of matrifocal and patrifocal elements affords some flexibility to the system, which people manipulate to serve changing needs. Guiart acknowledged that the structure was very fluid during his time in the field (Espirat et al. 1973: 338). Something like this may have occurred in the dispersion of different kinds of yam in the clan system of Efate. For example, Guiart (1964) has reasoned that these were created to circumvent marriage taboos to cope with depopulation suffered in the colonial period.

2.5 Childrearing

2.5.1 Caregiving and Play

Most children attend primary school and many have some, if limited, access to Western media and toys. For example, children may occasionally watch movies on their parents' phones. I have also witnessed young children playing card games and hugging dolls and stuffed animals. Some children also have access to story and activity books, although this appears to be rare.

Women perform most infant care and unweaned children are indulged and held often. Mothers use disposable nappies or handwashed cloths. Some mothers take their infants to the vegetable garden, where they are put up in a hammock to sleep. However,

most mothers with nursing infants remain in their homes most of the time. Once weaned and walking independently, and in the case of school-age children, once out of school in the afternoon or on the weekends, children often roam the village and surrounding areas in unsupervised mixed-age play groups. This also evident in early ethnographies of Malekula, where observers note that until weaning age, which occurred when children were around two or three years old, infants spent most of their time in close contact with the mother (Deacon & Wedgwood 1934: 36). Afterwards, children were more independent from adults and spent much of their time in a "children's republic" (Deacon & Wedgwood 1934: 36). In this children's republic, boys and girls often go fishing. Children use fishing lines, carrying plastic bottles with small crabs as bait. Hook and line are wrapped around the bottle, then thrown out by hand. The children stand on the beach or climb on a tree at the seashore. Sometimes children wade through the water close to the shore, hitting the water surface with sticks to stun small fish, then pick them up. Boys also congregate in the afternoons to play football. In these playgroups, children often engage in rough and tumble play with little interference from adults. I witnessed children of kindergarten and primary school age playing with machetes or aggressively swinging sticks. Adults responded very differently to these behaviours, with some ignoring rough play and others intervening or telling them off. Children's play also involves mutual grooming, for example by brushing each other's hair or looking for lice.

I have often observed children wandering in and out of each other's compounds, and thus in and out of each other's guardians' respective spheres of responsibility. Some people shared that parents must watch toddlers at all times because they are prone to get into accidents, but even toddlers often walk around freely and solicit care from other family members and neighbours, through touch or calling out. Children frequently play with and care for infants and toddlers, such as their younger siblings and cousins, and are eager to engage infants and toddlers by using baby talk or exaggerated facial expressions. At Hog Harbour, some residents shared that many parents do not spend much time with their children because they are busy with gardening work. Unlike Hog Harbour, Paunangisu also has three supervised playgroups for preschoolers, where an adult is watching over a small group of children. These were initiated by a British-born resident (who had moved to Vanuatu in the 1970s and married into a local family) and usually involve structured play, including singing, drawing, and playing with toys. Two of these playgroups are attached to local churches.

2.5.2 Involvement in Chores

Children are familiar with household items and how to use them and perform manual tasks on a regular basis. Participation in 'adult' activities and self-guided familiarization with tools during physical play form part of children's everyday lived experience. I have been informed that families tend to go to the vegetable gardens on Saturdays, often taking their children with them 'to teach them our ways'. And I have indeed observed families with even very young children returning from the gardens, with children of all ages, from toddlers to adolescents, carrying produce and tools. However, other informants have stated to me that when children accompany their parents to the garden, 'they just play around' and don't perform 'serious' work. I have witnessed children contribute to household activities on numerous occasions, usually in the manner of guided participation. For example, I have witnessed primary school-aged children contribute to food preparation by cutting meat and running errands for their parents. For example, caregivers may send them to fetch a knife or plate, or they may send them to the beach to scrape pots clean. On one occasion, the schoolboys were instructed by the headmaster to fetch a chicken for dinner. The boys immediately chased down a cockerel and caught it, then delivered it to the lunch lady. I also witnessed mothers doing their laundry and washing dishes at the beach with their children present, and children, especially young girls, were helping their mothers wash clothes. I have also witnessed children contributing to regular chores such as cleaning the floor with a broom or tending the fire.

Children are evidently familiar with 'adult' tools and how to handle them. I frequently observed young children, even toddlers, casually swinging machetes, and I have observed older boys chopping wood by themselves without interference or help from adults. On other occasions, I have seen primary school-aged children use machetes and other knives to open fruit by themselves, including coconuts. This involves taking the coconut in one hand and hitting it repeatedly with a knife, and then splitting the shell horizontally. Children of that age also know how to prepare a coconut for drinking. This involves scraping off the fibers on top of the shell, then piercing it with a knife. Children also readily imitate common household tasks during play, picking up the relevant tools where they find them, for example by grabbing a washing board and scraping it with a brush.

While children readily copy the behaviour of those around them, the caregivers decide whether a situation calls for an extended teaching moment or not, and these

judgments account for the child's age and skill level. This was evident during some incidents at Hog Harbour. I witnessed a young mother opening a *naveli* nut with a knife. Her adoptive daughter, of primary school age, began to imitate her spontaneously. She took a knife, drove it into the nut, then repeatedly hit the knife, with the nut still attached, against the root of a tree. The child was clearly aware of the steps necessary to perform this task and had some notion of how to carry them out but did not manage to open the nut by herself. On a different occasion, the same girl was present when her adoptive mother prepared banana bread. When her mother turned away for a moment, the girl picked up the spoon she had just used and began to stir the batter. Later, she attempted to light some firewood with her cousins to cook a meal. On all three occasions, she was calmly told off by her adoptive mother, who resumed her normal household activities. This type of teaching was also evident during nutcracking. This involves *nanggae* nuts, which have a hard, round shell with a smooth surface and a soft, almond-shaped nut inside. The nut is placed on an anvil and held with one hand. Then the person takes a rock or a hammer and hits the nut with the other hand. Sometimes toddlers and kindergarten-aged children watch adults nutcracking and stand by closely and even touch them. But they were reminded not to get their hands too close to the anvil or they would get hurt. Sometimes, I also observed primary school-aged children cracking nuts by themselves. More complicated tasks such as *laplap* are reserved for older children and adolescents. When questioned directly, female informants have stated that they learnt how to prepare *laplap* and other meals from their grandmothers in their early teens. Confirming this, I have observed young teenagers scraping plantain for *laplap*. Small children were wandering in and out of the cooking hut, sometimes stopping to watch, but never asked to help.

2.5.3 Extended Kin, Ritual, and Exchange

Children's social networks transcend the nuclear family through their parents' relatives. As stated above, most children either live with or in close proximity of their extended kin, who share child-rearing duties. Female relatives also spend time with each other while their children are present, holding each other's infants and nursing in front of each other. Villagers said that the whole extended family is responsible for looking after children, and that there is a sense of holding children in common and sharing responsibility for them. At Hog Harbour some residents stated that 'we should treat each other's children like our own'. In Paunangisu, I was told that the father's brothers look after each other's

children together and teach them social norms. In turn, they regard their nieces and nephews as 'their' children. In day-to-day life, this communal alloparenting is informal and ad hoc.

But on another level, alloparents' responsibilities towards particular children are formalized in life cycle rituals, exchange cycles, and long-term reciprocal obligations between specific classes of relatives. In North Efate, I was told of *kastom* payments and rituals performed on the occasion of childbirth and breastfeeding. The father/husband pays the mother's brother/wife's brother or her uncles to compensate for her work in breastfeeding and childrearing. Furthermore, during the first month, babies are kept inside the home and never taken outside. After one month has passed, the baby is taken to church, where the pastor prays over it, which is followed by a family gathering and celebration. After that, the baby can be taken outside the house. I have been told that mothers are judged harshly if they do not follow this custom, although it was not clear what exactly happens when the rule is breached. This *kastom* may originate in seclusion rites and protective spells performed in earlier times (see Macdonald 1893 for evidence of pre-Christian seclusion rituals). I had a chance to participate in such a ceremony. During the prayer, the pastor called out the baby's name and said a blessing. The families of both parents attended the ceremony, which was performed during a regular Sunday service. Afterwards, a family feast was held with *laplap*, rice, chicken, fish, root vegetables, and fruits. Some relatives had come from Port Vila and other villages to attend. Some years later, boys are circumcised, and young men and male adolescents undergo an initiation of sorts which is called 'first shave'. During this ceremony, the mother's brother shaves the boy's beard for the first time. A woman told me that 'my sons are shaved by my brother'.

As a result, gifts circulate within the kinship network, first from the husband's family to the wife's family at marriage, then again for childbirth and breastfeeding, although it appears that the recipient shifts from the wife's parents to the wife's brother once children are born. This appears one-sided at first, to the exclusive benefit of the maternal line. However, the man in this scenario will also receive bridewealth and other payments through his daughters and sisters. In addition, the wife's brother must in turn transfer wealth to his own wife's relatives. Finally, as the young men have their faces shaved by their mother's brothers, so they will in turn shave their own sisters' sons, simultaneously closing their own cycle and continuing that of their nephews. Similar customs have been reported in various areas of Malekula, where the maternal uncle

played an important role in the life cycle rituals performed for a child, especially in the case of a boy, for which he received gifts from the child's father (see Deacon & Wedgwood 1934: 82, 242; Layard 1942: 177p).

2.5.4 Parental Absence and Adoption

Some ethnographers write that in Vanuatu, parenthood is 'accumulated' through a series of "life-sustaining contributions to the child" (Larcom 2000: 88). Larcom reports that adults who provide food and gifts to a child, or who provision its mother during pregnancy, earn a share in it and "can to some extent claim it as [their] own" (Larcom 2000: 94). In Vao, the family's offspring were commonly likened to the yam fruit, "since, like this staple article of food on which the life of the community primarily depends, it must be tended with great care and labour but amply repays the energy expended on it" (Layard 1942: 181). Similarly, "Mewun see strong group ties as products of nurturing and feeding processes" (Larcom 2000: 86). This sentiment is evident in the common practice of adoption, where the biological parents transfer a child to another household, who then assumes custodial duties for them. Adults, especially men, attempt to cast a wide net of personal ties linking them with other members of their *ples*, and this includes ties with children other than their own, which are established through adoption and foster relationships (Larcom 2000: 102). Big men are particularly successful at establishing these reciprocal relationships and therefore can rely on a large number of supporters (Larcom 2000: 102). Fosterage and adoption establish ties between families and communities, but adults also compete with each other for future *ples* members and supporters in this way (Larcom 2000: 85).

Early ethnographers state that adoption was very common even when both parents were alive. On the Small Banks islands, children could even be adopted against their parents' will if the adoptive parents paid off the midwife (for an example see Layard 1942: 187pp). This practice followed from the logic a kinship system in which the clan's children belonged to the corporate kin group as a whole, and in which adoption or foster arrangements were often used to restore a kind of balance between different lineages or moieties (Layard 1942: 187pp). In some localities, adoption was governed by a complex set of rules related to ascribed status in various kin categories. For example, on Vao, adoptions were usually restricted to the offspring of a classificatory brother within one's own patrilocality, and adoptions were initiated with a formal proposal (Layard 1942: 187pp). Adoptive children were typically nursed by their real mothers and remained with

them until weaning age unless the adoptive mother was lactating herself, in which case the transfer was initiated immediately (Layard 1942: 190). The real father was compensated for the transfer with a payment of valued tusks and pigs (Layard 1942: 190).

In many Pacific Island nations, children whose parents are dead, absent, or unable to care for them, continue to be cared for by extended kin, who act as a safety net in such situations (UNICEF 2017: 144, 153). At my field site, only 2 out of 3 children lived with both biological parents (67.4%), and 1 of 6 lived with one (15.6%) or neither biological parent (17.0%). When talking to informants, I was told that people usually adopt relatives, and that it is very exceptional to adopt unrelated individuals from beyond the extended family. This is in line with my demographic data, which showed that children living with neither biological parent overwhelmingly lived in extended family homes (see Table 2.4). Among those living with extended kin, most again lived with maternal relatives. Most children who lived with extended kin lived with aunts and uncles, first cousins, and/or grandparents (see Table 2.4). Some children lived with more distant relatives, but this was not common.

When I questioned informants about why some people choose to adopt children, I was told that sometimes orphaned children are adopted. At other times, women who desire children but do not have any of their own may approach the mother of a young child to ask for it. Then the biological parents decide whether to give it up or not. My demographic data indicate that the most common reasons for living with neither parent were: labour migration, separation of their biological parents, or a combination of both (see Table 2.4). I must note that child transfers are not necessarily accompanied by formal adoptions, and some children transfer household multiple times. Adoptions usually occur shortly after birth or in early childhood. Earlier ethnographers have written that on Efate, adoptions were sometimes practiced to circumvent marriage taboos (Guiart 1964), but I was informed that adoptions in adulthood are rare nowadays. Finally, it is possible that adoptions were underreported by participants. I have come across some cases where guardians admitted to not informing an adopted child about their adoption status, leading them to believe that their guardians were their biological parents. I was also informed that children usually learn about their true relationship regardless, by listening in on conversations between adults or by confronting their guardians directly, and that this had led to conflicts in some families.

As households were surveyed on the condition that a resident child had participated in the cognitive assessments (see methods and discussion in Chapter 5), it

should be noted that data on household transfers are biased towards kindergarten- and primary school-age children. Had assessments included adolescents, fostering for the purpose of attending school away from home (which was very rare in my sample, see Table 2.4) probably would have been more common. While children usually attend primary school in their home village or a neighbouring settlement, there are fewer secondary schools and many of the most reputable ones are located in Port Vila and Luganville, meaning that adolescents must board or move in with 'townie' relatives to take advantage of these opportunities. Accordingly, I suspect that living away from both biological parents may have different reasons for different age groups.

Parental absence is not always resolved through transferring household as some children remain with a single parent. Among children living with only one biological parent, the vast majority lived with their mothers (see Table 2.5). Most of these children lived in extended family households. Only few lived in single-parent homes or in extended family homes that also included unrelated residents. Those living with extended kin overwhelmingly lived with maternal relatives (see Table 2.5). Most of those children lived with their aunts and uncles, cousins, and/or grandparents. Only few shared a home with more distant relatives. The most common reason for living with just one parent was that their parents had separated (see Table 2.5). Less commonly, this was due to the death of a parent or labour migration, i.e., the other parent lived and worked in town or overseas. Split households where mother and father lived apart but were not formally separated were very rare. This echoes some ethnographic observations from Port Vila, where single motherhood is on the rise as well (Servy 2000), but also shows that single parents in rural areas rely on co-resident extended kin for support.

Table 2.4: Residence Arrangement, Reasons for Adoption (n = 48 out of 282).			
Household Type		Reasons	
Extended Family	81.3%	Labour Migration	27.1%
Extended/Nuclear w/Unrelated	10.4%	Separation of Parents	16.7%
Affinal	4.2%	Both Migration and Separation	27.1%
Unclear Relatedness	4.2%	Evacuation after Natural Disaster	2.1%
		Rejection by Parents	2.1%
		Abuse in the Natal Home	4.2%
		To Attend School	4.2%
		No Reason Provided	16.7%
Extended Kin: Line		Extended Kin: Type	
Maternal	83.7%	Aunts and Uncles	69.0%
Paternal	11.6%	Cousins	40.5%
Both Maternal and Paternal	2.3%	Grandparents	59.5%
Older sibling	2.4%	Great-grandparents	14.3%
		Grandparent's sibling or their descendants	14.3%
		Great-grandparent's sibling	-
		Cousin's children	4.8%
		Older sibling's children	2.4%

Table 2.5: Residence Arrangements, Reasons for Parent Absence (n = 45 out of 282).			
Parent Present			
Mother	90.9%		
Father	9.1%		
Household Type		Reasons	
Extended Family	61.4%	Labour Migration	13.6%
Single-Parent	11.4%	Separation of Parents	70.5%
Stepparent/Patchwork	11.4%	Death of a Parent	11.4%
Extended w/ unrelated	15.9%	Split Household	4.5%
Extended Kin: Line		Extended Kin: Type	
Maternal	82.4%	Aunts and Uncles	64.7%
Paternal	11.8%	Cousins	41.2%
Older sibling	5.9%	Grandparents	82.4%
		Great-grandparents	5.9%
		Grandparent's sibling or their descendants	11.8%
		Great-grandparent's sibling	2.9%
		Cousin's children	-
		Older sibling's children	5.9%

I have been told that members of the adopted family become mother, father etc to the adopted child, and at least in Hog Harbour, the latter is entitled to family property as a full member of the adoptive household. However, adoption is not viewed as unambiguously positive. At Hog Harbour, a teacher shared about disobedient behaviour she experienced from a child. She attributed this to the fact that this child is adopted and

does not live with her biological mother. The same teacher shared that adopted children, stepchildren, and children living with their grandparents often perform worse in school and have behavioural problems. Another teacher felt that many custodial grandparents keep children fed and clothed and send them to school, but their support generally ends there. Another teacher commented that due to their age, grandparents often only have limited education and are therefore unable to support their grandchildren with schoolwork. This echoes some comments that residents made in Paunangisu, who felt that it was 'not good when children do not live with their mothers'. In both locations, I am aware of adopted children who experience severe relationship conflict with their families. I was told that illegitimate children in particular are 'first in line for abuse'.

These anecdotal observations are in line with other evidence, which suggests that living away from one or both biological parents is associated with greater risk of abuse and neglect. According to Vanuatu Child Protection reports, adopted children and stepchildren are at a higher risk of sexual abuse, especially if they are female (VMJCS 2016: 13). Similar trends have been reported in other Pacific Island countries such as the Federated States of Micronesia, where children living with extended kin sometimes experience sexual abuse and "domestic servitude" (UNICEF 2017: 147). In addition, they may be treated differently than biological children and are at higher risk of neglect and exclusion from schooling (UNICEF 2017: 147).

2.5.5 Discipline

Corporal punishment is banned nationwide in schools (UNICEF 2017: 155). However, in practice, "[p]hysical violence against children as young as two years of age, by family and extended family members as well as teachers, police and village leaders is a common and accepted form of discipline" (VMJCS 2016: 12). Surveys indicate that between 78% and 84% of adults have used corporal punishment (VMJCS 2016: 12; UNICEF 2017: 136). At my field sites, support for physical discipline remains strong and is not limited to older generations. I have witnessed parents beating children as punishment for acting out, throwing tantrums, being mean to others, and stealing from their parents. I frequently observed caregivers beating children for being naughty or disobedient, with their hands but also sometimes with sticks.

At Hog Harbour, teachers expressed support for corporal punishment and cited Biblical references to support their views: 'if you love your child, don't spare the rod'. They also shared that the purpose of corporal punishment was not to harm the child, but

to ‘teach them right from wrong’ and to ‘teach respect’. The same sentiment was echoed by retired teachers in Paunangisu, who felt that students should feel grateful for being disciplined, and that discipline was necessary to grow into a respectful person. Some teachers also felt that nowadays, there was too much emphasis on children’s rights but not enough on their responsibilities and obligations, and that teachers were powerless to stop disobedient behaviour if they could not resort to corporal punishment. This is in line with findings from child protection surveys, which show that corporal punishment is “thought to promote obedient and respectful behavior” (VMJCS 2016: 12), that more Westernized approaches focused on children’s rights are often perceived to “undermine parental and adult authority” (VMJCS 2016: 15), and that Biblical beliefs are often used to support the practice (UNICEF 2017: 145). These views operate within a conception of caregiver-child relationships in which “[c]hildren are expected to respect and abide by the wishes of their elders, whose authority is always paramount” (VMJCS 2016: 12). However, I have also found that there is disagreement about the extent of corporal punishment that should be used against children. For example, another teacher at Hog Harbour felt that children should not be beaten or treated harshly.

2.6 Formal Education

2.6.1 History of Formal Education at the Field Sites

Conversion to Christianity has impacted socialization practices. Missionaries not only preached, but also established Sunday schools and day schools in both locations and recruited locals to serve as teachers (for a comprehensive account of the history of the missions see Miller 1987; Miller 1990). The same process has been reported for other locations such as Mewun (for an account see Larcom 2000: 199-207). Later, missionaries contributed to the establishment of schools providing primary and sometimes secondary education to local children, which some use as a steppingstone for tertiary education today (Larcom 2000: 199-207). The presence of female missionaries – usually the wives of the mission leaders - promoted the enrolment of girls (Larcom 2000: 199-207).

Elders from the Hog Harbour area have told me that the instruction provided by the first missionaries was very informal. The missionaries gathered with a group of converts, which people from all age groups were welcome to attend. Topics of instruction covered primary-level materials such as counting, reading, writing, and religion, along with some English. There was no fixed curriculum and attendance was entirely voluntary,

with the level and amount of instruction received dependent on the individual. Learners gathered for only two to three hours in the mornings as adults had to attend to their gardening duties in the afternoons. This arrangement gradually morphed into a more permanent village school. Locals who had themselves been taught by missionaries began to take over instruction in the 1940s. Attendance at the village school was free of charge, but teachers received presents from the students' families at the end of the year. A similar story emerges from North Efate. Elders told me that when missionaries first established village schools there, they mostly gave casual morning lessons, with students gathering outdoors or in a small shed. Using the vernacular language, they taught reading and spelling, along with religion and some Maths and English. Their wives also gave sewing classes to women. While regular classes were open to all ages, most attendees were adult males, at least initially. Missionaries also trained locals to deliver lessons, and these teachers primarily taught peers from their own ethnolinguistic group (again, corroborating evidence by missionaries can be found in Miller 1987; Miller 1990).

Elders informed me that instruction was gradually formalized, with a system of village schools covering a four-year curriculum of primary school materials. After a finishing exam, the best-performing students were sent on to study at a district school for two more years. After another exam, the best performers were then admitted to boarding schools delivering secondary education in English (or French in Francophone areas). One such institution, Malapoa College, was opened in Port Vila in 1966, finishing with the Cambridge exams, an A-level equivalent. Teacher training was also formalized with the establishment of a central teacher's college in Port Vila in 1962, which trained government teachers. In the 1960s, English gradually replaced Ngunese as the standard medium of instruction across North Efate, even on primary school level. Many primary schools were attached to churches, and these started to implement a standardized curriculum with the Oxford English Course.

In Hog Harbour, a significant step towards formalizing schooling was taken in the late 1950s or 1960s, when Prenter Primary School was established by the Rev. Hugh Prenter. Prenter functioned as a district school with a large catchment area for children from the whole area between Khole village and Big Bay. Informational material displayed at the primary school today features photos taken during that time period, depicting classroom training supervised by teachers and assisted by books and writing materials. Additionally, some adolescents were sent away to attend secondary schooling and teacher's college in established institutions such as TTI or Teachers Training Institution

on Tangoa island, off the South coast of Espiritu Santo (Nottage 1940: 14). Graduates returned to their communities to instruct children and young people in religious education and other school subjects, acting as village and Sunday school teachers, and often helped with the performance of church services (Nottage 1940: 29). In North Efate, Manua School was built in 1965, and in 1977 the village schools from Emua and Paunangisu villages combined at Manua. The Anglican and Presbyterian churches had already handed over control over Anglophone primary schools to the British administration in 1972. North Efate played a small role in the expansion of schooling at Hog Harbour. One elder from Panaungisu taught at Prenter in the late 1960s, where he also served as assistant principal while his wife taught at the village school. At the time, Hog Harbour was a boarding school. Students had to cut their own firewood, grow their own food, and prepare their own meals. They also cut copra to provide funding for the school.

I have been informed that before independence, the colonial government was responsible for looking after the local schools, provided a shared syllabus, and performed regular inspections. At that time, the language of instruction at Prenter was English. After independence, Vanuatu's new government took over the education system and eventually, in the current millennium, Bislama was introduced as a language of instruction at primary school level. This proved controversial, especially among teachers trained in the colonial system who continue to view Bislama as a 'made-up language' unfit for instruction due to its limited vocabulary. However, Hog Harbour's primary school has since adopted an approach to the indigenous language that differs from most other educational institutions in the country. Unlike Panaungisu, children in primary school and kindergarten learn reading and spelling in the local language, then Bislama and English are gradually introduced until instruction switches fully to English in Year 3. I have learnt of at least one prior attempt to establish a primary school teaching in the vernacular language, which occurred in South Santo in the late 1990s, but this project received no support from the government. Hog Harbour's experimentation with teaching Wanohe in the classroom only started a few years ago, and I have been informed that the project has since been thwarted by local opposition.

Today, both primary schools hold morning and afternoon classes, school uniforms are worn by all years, and both operate a small kindergarten where children aged 4 to 6 can attend. In both field sites, some voices strongly promote children's enrolment in school. In a sermon, the pastor of Hog Harbour declared that 'we need more people with an education so the country can develop' and encouraged young people to work and 'save

money so you can have a future'. However, in practice, the school campus is a world of its own, located on the opposite side of the road or some distance away from the main village. Some teachers hail from elsewhere in Vanuatu and thus do not speak the local language. This is due to the practice of 'posting out' teachers: after completing their training in Port Vila, teachers are posted to schools by the national government and may then transfer between schools. In this manner, teachers from one island or language group may be posted to other islands or language communities. 'Foreign' teachers live on campus with their families rather than in the main village. The teaching style remains 'Victorian', focused on frontal teaching, drilling, obedience, following commands, and repeating the teacher's instructions. When learning new material, the students are asked to repeat the teacher's words in unison rather than working on problems by themselves. This is in line with reports from local observers, who write that "[d]rilling and spoon-fed teaching are common" (Tari 2004: 102). Some describe the curriculum as narrow, academic, and examination-oriented (Tari 2004). Rather than reflecting that the largest source of income for the population is agriculture, the education system is more geared towards producing a small elite of urbanized white-collar professionals (Obed 2004). Pupils further confront a language barrier as English and French are used as medium of instruction, usually from Year 3 onwards, which results in some children struggling to follow lessons (Kalsuak 2004). While the education system has received increased investment from the national government and international aid organizations in recent decades (Tari 2004), Prenter and Manua, along with most other rural schools, continue to charge school fees. So do their respective kindergartens, and this again mirrors trends in other localities (James 2004).

There are systemic challenges in the formal education system of Vanuatu. The distribution of resources favours the few towns over rural areas (Worwor 2004), resulting in a lack of textbooks, school supplies, chairs, and tables (Worwor 2004), but also toilet facilities (Worwor 2004) and housing for teachers (Worwor 2004). Poor remuneration with few opportunities for pay raises and promotions are further thought to damage morale among teachers (Tari 2004). Some rural areas lack qualified teachers, which often results in primary schools employing substitute teachers with no formal qualifications (Worwor 2004) or with qualifications unrelated to education (Tari 2004). The same trends are reported for kindergarten teachers (James 2004), who are often trained through a series of workshops to rectify the situation (James 2004). Due to the lack of teachers, teacher-to-pupil ratio can be very high, especially in rural schools (Kalsuak 2004).

Furthermore, the country does not provide enough secondary school places for all primary school leavers, which is attributed to the combined effects of rapid population and slow economic growth, leaving the education system unable to expand in step with demographic changes (Kalsuak 2004). Some rural communities are remote and do not have secondary schools nearby (Kalsuak 2004). Accordingly, adolescents who wish to enroll in secondary school must attend boarding schools, which are not only away from home, but also costly. As a result, many inhabitants do not continue their education after year 6, the final year of primary school (Kalsuak 2004), with dropping out particularly common in rural areas (Kalsuak 2004). Observers remark on the poor reading proficiency found at all levels of education (Worwor 2004) and declining exam results in both primary and secondary schools (Tari 2004).

2.6.2 Schooling and Cultural Transmission

By introducing schools, missionaries not only introduced new cultural contents, but also new forms of cultural transmission such as classroom teaching within the context of formal education, with a heavy reliance on frontal teaching. Some anthropologists have claimed that Western institutions such as formal schooling transform cultural transmission in small-scale societies (Lancy 2015a). Specifically, it has been argued that adults start viewing themselves as 'teachers' who begin to mimic the intensive instructional methods of schoolteachers (direct active teaching) when engaging children in cultural transmission, even if they had previously relied purely on observation and independent learning through participation.

Others have argued that formal schooling disrupts customary worldviews and systems of knowledge transmission. Indeed, some have argued that the introduction of formal education in rural Vanuatu has contributed to an erosion of traditional ecological knowledge over the past few generations (McCarter & Gavin 2011). Multiple reasons for this have been proposed, including the exclusion of indigenous languages, the exclusion of local ecological knowledge in favour of Western-derived curricula, the heavy reliance on teachers who are not local to the community they work in, and the necessity to spend time away from home to attend schooling (McCarter & Gavin 2011). Furthermore, the ways in which traditional ecological knowledge are transmitted across generations differ considerably from the way in which information is learnt in a school environment. For example, plant knowledge can be strongly gendered and constrained by varying levels of secrecy and must be taught be specific knowledgeable elders to be valid (McCarter &

Gavin 2011). While some medicines may be taught to everyone, others are secret, and "much TEK [traditional ecological knowledge] was private and was held by particular family groups or individuals" (McCarter & Gavin 2011: 9). These individuals "have earned the right to use them from the previous holder of that knowledge" (McCarter & Gavin 2011: 9). The transmission of these customary skills is embedded in everyday life, "bound by an ethic of respect and by social norms that existed outside the transmission of the knowledge itself" (McCarter & Gavin 2011: 9). In studies on traditional ecological knowledge, informants have stated that "in the time before, we didn't need to go to school to learn traditional knowledge - it was just life" (McCarter & Gavin 2011: 9) and that this type of knowledge is taught "by way of life" (ibid.).

In contrast, "[f]ormal school is based around a teacher-centred model in which one or two instructors dispense public knowledge to many learners, regardless of clan affiliation, gender, or age" (McCarter & Gavin 2011: 9). Accordingly, frontal teaching as it is practiced in schools has a parallel in the pastor's (and formerly, missionary's) preaching in church, as far as modes of cultural transmission go. Just like the teacher imparts knowledge on a group of passive learners, so does the pastor preach to a group of receptive believers. In both cases, anyone may attend regardless of their status in the traditional hierarchy. Some ethnographers have argued that the very public and communal dispensation of esoteric power by missionaries threatened and eventually destabilized the spiritual authority of elders, sorcerers, and chiefs because the latter relied on secrecy and ritual power to exert their influence over the community (for an account of this process on Malo island, which is located off the coast of South Santo, see Rubinstein 1981). And of course, both modes of learning were introduced by missionaries. It is thus not surprising that ni-Vanuatu often see church and school as entwined with each other, and as essential components of one 'road' (*rod*) or way of life, and that these institutions together constitute a distinct mode of viewing the world and attaining status. In fact, the word *skul* can be used as a synonym for the church. This observation is also echoed by other ethnographers (see Lindstrom 1990: 137).

Furthermore, McCarter & Gavin's (2011) informants have noted that "the [education] system as it is puts the kids in an artificial world that does not belong to them" (McCarter & Gavin 2011: 6). Accordingly, "formal school is perceived as a discrete entity that exists outside the framework of the village" (McCarter & Gavin 2011: 9). In this setting, "knowledge […] is theoretical, conceived and stored in paper and books" (McCarter & Gavin 2011: 9) rather than embodied in the rhythm of everyday life. In

contrast, the “transmission of TEK is inherently contextual, complex, and difficult to generalise into the school environment” (McCarter & Gavin 2011: 6). Accordingly, we have reason to believe that formal education not only changes what kinds of skills children learn (Maths and English as opposed to plant medicines), but also how skills are learnt, and ultimately, how the concept of knowledge itself is understood. At the same time, this material shows that there is a division of sorts between everyday life as it is practiced in the village and the routine of formal education as it is practiced in school. This casts doubt on Lancy’s (2015a) claim that norms and routines practiced in the school setting will inevitably seep into children’s home lives.

This is also supported by my own observations. During my stay in the field, I noticed that the relationship between the school and the rural population can be fraught and ambiguous. Among adults, exposure to formal education varies widely, from limited experience in primary school to tertiary-level education (see Chapter 5 for details). Furthermore, there is considerable variation in the resources that caregivers are able and willing to invest in children’s education. While some families put a strong emphasis on school attendance, others do not have enough cash to send all their children to school. In both locations, some children do not attend school, and I know of a mother in Paunangisu who tried to keep her eldest daughter out of school to help in the household and with raising her younger siblings (the child only enrolled after other residents intervened and covered the costs). This observation is echoed in published accounts written by teachers, who note that parents sometimes struggle to raise the funds for school fees, especially if they entirely depend on produce sales from small landholdings for their income (Worwor 2004). The funds raised from market sales can be unstable due to extrinsic factors such as weather conditions and fluctuations in demand (Kalsuak 2004). Furthermore, I have often heard teachers complain of caregivers who tolerate chronic truancy. Again, this is echoed in written accounts of teachers, who blame high rates of truancy on caregivers’ failure to enforce attendance (Kalsuak 2004). Primary schoolers are sometimes made to stay home for days to look after their younger siblings (Kalsuak 2004). Similar trends were evident in a home reading programme where children regularly take home assigned readings to read with their caregivers. In both locations, teachers have informed me that they had experienced issues with children not returning their assigned readings and caregivers not supervising their reading assignments. In both locations, teachers also complain of low performance among some students.

As a result, teachers often complain that some caregivers do not take an active

role in the child's education and view it as solely the teacher's responsibility without addressing the lack of support in the child's home. This may suggest that many residents perceive their role as separate from the teacher's, and formal education as a domain that is largely separate from their own. As a result, caregivers delegate the acquisition of Western knowledge to schools but do not necessarily identify themselves with it. This is also evident in published accounts written by teachers, who write that parents believe that "children's education is the teacher's business" (Worwor 2004: 92). Accordingly, many parents do not see themselves as having a role to play in their children's education (Tari 2004) and do "not realize is that as a parent, he is the first teacher, in the home" (Kalsuak 2004: 109). This is attributed to the absence of a sense of community ownership over schools, as villages tend to "regard schools as belonging to somebody else, such as the government, the church, or private owners" (Tari 2004: 103).

Low and erratic levels of investment in schooling also point to trade-offs that may explain these trends. One such factor are returns on investment in education:

> Many school leavers become liabilities to their communities: they cannot work with their hands in the gardens or on plantations. Nearly all of them have illusions about obtaining a white-collar job and often end up in Luganville and Port Vila as unemployed youth and parasites to their relatives (Tari 2004: 96).

It also appears that parents recognize this, as some observers report hearing complaints from parents about being made to pay expensive school fees with no results to show for (Tari 2004). The 'problematic' parenting behaviours above can thus be understood as indicating that parents prefer to invest their and their children's time in household labour and allocaring instead of schoolwork because the time, effort, and funds involved in completing their education do not pay off. Or alternatively, they do not pay off at a level that would merit such sustained investment (for women in particular, formal education only starts to pay off in greater access to paid work if they have achieved A-levels or higher, see results in Chapter 5).

Finally, communities expect that teachers will observe a code of conduct consistent with their own moral values, and thus apply local cultural models of teachers and teaching to schoolteachers, instead of merely importing Western models of teaching into their home lives. For example, perceptions about a person's suitability for teaching are based on more than just academic competence, but also on "[p]ersonal attitude, public relations, appearance, dress, behaviour, and respect" (Tari 2004: 101), which are

considered "integral parts of teacher education" (ibid.). Others write that kindergarten teachers should "have a mature attitude and a sense of responsibility, and to be respected and chosen by the community" (James 2004: 147). This has resulted in conflicts between schools and communities, and in communities filing complaints about individual teachers (Tari 2004) because they were "concerned about some teachers' general behaviour, which has been quite different to their expectations" (Tari 2004: 101).

I also frequently observed children being 'naughty', refusing to follow the teacher's commands or disturbing classes by talking amongst themselves. Elders have told me that children 'have to respect their father and mother before they can respect their teacher, who is not part of the family'. Failing that, children will not observe the code of respect necessary for appropriate conduct in village and school life. One teacher shared that disobedient behaviour was particularly problematic in Hog Harbour as the whole community was notoriously hostile and uncooperative, with frequent challenges to teachers' authority. During one incident, a group of noisy children who were playing on school grounds refused to climb down a tree they were playing on and challenged the person who had told them off (who was not local and a teacher's relative), with the words: 'did your grandfather plant this tree?' The boys were later disciplined by their principal, but the message was clear – 'foreigners' could not tell them what to do.

Fig. 2.17: Prenter Primary School, ca. 1970s. Picture taken from a display at Prenter.

Fig. 2.18: Prenter Primary School Today.

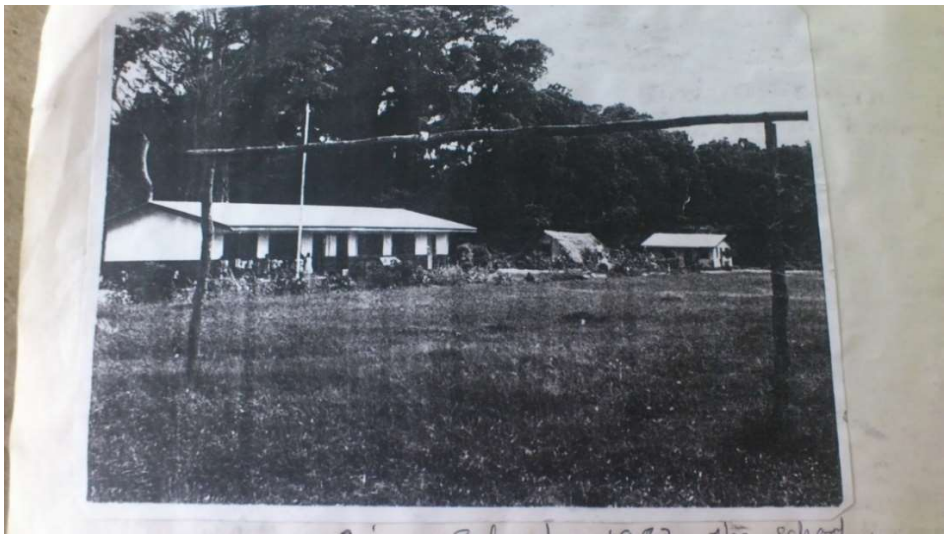


Fig. 2.19: Manua Primary School, 1983. Picture taken from an informant's photo album.

2.7 Religion and Worldview

2.7.1 Christianity

In both locations, villagers are devout Christians. Many residents are proud of their ancestors' association with missionaries, and local figures who were involved with missionaries are proudly remembered (for an account of the history of the missions see Miller 1987; Miller 1990). Churches accept some traditions such as bride price and exogamy, but other aspects of traditional culture such as cannibalism, blood vendettas,

and polygyny have disappeared. In both locations the Presbyterian church is the most prominent denomination, following by Neill Thomas Ministry (NTM, a Presbyterian splinter group which was established in the 1980s), Seventh-Day-Adventists, and Mormons. Many residents observe Sunday services, which include singing, readings, and sermons.

2.7.2 Spirits and Taboos

In addition to Christian practices, villagers also observe taboos and encounter spirits (some information on pre-Christian beliefs and practices on Efate, as observed in the colonial era, can be found in Macdonald 1893; Macdonald 1898; Somerville 1894; Macdonald 1913; for some information on Northeast Santo, see Harrison 1937: 382p; Miller 1990: 455). Taboos are tied to specific locations and the spirits that inhabit them, but due to intermarriage, migration, and travelling, stories about various local spirits and their associated taboos can be shared beyond that locality. The importance of observing particular taboos is a recurring feature in traditional storytelling. A Hog Harbour resident from Tanna island informed me that in her community, it was taboo for women to ride horses and travel on canoes, and that canoes would capsize if women went on them. She also strongly disapproved of Santo women travelling on horseback. A Hog Harbour resident who had studied in Pentecost told me that when Pentecost islanders come across a snake in their vegetable garden, they must not cry out, and that doing so would cause other snakes to come and swarm that place. Some snakes carry 'a spirit inside them', and when a person angers such a snake, it will 'follow them and cause trouble'. A teacher told me about a '*kastom* stone' near Lelepa island that 'eats' food that is thrown at it. I have also heard of a black snake living in the waters near that island, which demands that boats that pass by its territory must throw it some money, although the storyteller did not know the consequences of breaching this rule.

Some spirits may stalk particular locations or appear in people's dreams. I have been told of a changeling that haunts some areas of Santo island. At Hog Harbour, a teacher shared that she woke up one night to pray, but she could not move or turn her body. Paralyzed, she suddenly felt someone pulling her leg. She tried to call out to Jesus and her sons. Her sons heard her scream, but when they entered her room, they only saw her lying still in bed. She concluded that it might have been a spirit of some kind. Another resident shared that she had had a similar experience just a few days prior, seemingly confirming that theory.

Some entities are thought to inhabit stones (for a historical perspective on the role of stones in pre-colonial traditions see Somerville 1894; Harrison 1937: 354-358). These '*kastom* stones' are still part of the contemporary landscape and are thought to influence humans in various ways. In the bush behind Laathi village, near Hog Harbour, there are two '*kastom* stones', one male and one female. These are tied to the customary owners of that land, a set of related families that reside in the village and are thought to be its rightful landowners. These stones are said to have spirits dwelling in them and to possess special powers. For example, they clean themselves and are never dirty, even when they are surrounded by dirt and fallen leaves. Strangers cannot take a picture of these stones – whenever someone tries to take a photograph, the stones will not appear in the picture. Only members of the landowner's bloodline can take pictures. The area around them is taboo, and it is not permitted to cut down the bush there. When a stranger wants to enter the grounds and eat fruit or nuts that grow there, they must first ask the owners for permission. Otherwise, they will fall ill. These taboos have been transmitted down the bloodline of the rightful owners. The stones only accept residents and ownership claims from the line of the rightful heirs. Some years ago, a family from Hog Harbour tried to claim rights to the ground in that village. According to a re-telling of the events by a resident from the stones' village, the claimants came up to the village and disrespected the traditional owners, and even took it to court. After this incident, one after the other, three of the claimants died under mysterious circumstances. This was said to be the work of the stones. When the stones kill someone, they make a sign that resembles a soft, rolling earthquake. This announcement is only felt on village ground.

2.7.3 Traditional Medicines and Healers

In both locations, many villagers use traditional leaf medicines (*lif meresin*) and oils to treat illness. For example, some informants in both communities appear to view coconut oil as an all-purpose medicine for a number of different health conditions ranging from infections to headaches and cancer. At Hog Harbour, a resident explained that a local who died of leukemia would have survived if they had taken the proper leaf. In both locations, there were some leaves and treatments that everyone seems to know of. For example, some people make leaf medicines from papaya and passion fruit leaves, which are boiled in water. Papaya is said to help with dengue fever and is used when medical supplies at the clinic run out. In Paunangisu, I was told that it is dangerous to walk around with a baby at night. This is because spirits might try to grab the baby and disturb it, making

them cry. As a remedy, the petals of a flower are brushed over the baby's face. However, there are also treatments that only '*kastom* men' or traditional healers appear to know (for a colonial-era account of *kastom* men in Efate see Macdonald 1893). This latter knowledge is secret, and its proprietors will not share it with just about anyone. In Paunangisu, I was told of a *kastom man* who was sought out for medicinal spells. People consult him when children choke on fish bones. At Hog Harbour, some residents also consult oracles that appear to fuse traditional practices stemming from the *kastom man*'s divination of witchcraft attacks with Christian concepts. When a resident had some money stolen, he consulted a local girl 'who prays' to divine information about the culprit. The girl responded that the culprit was 'one of your own, one from your yard', and the man began to question his relatives.

2.7.4 Witchcraft

Witchcraft is a malicious application of magical powers and is commonly evoked to explain misfortunes such as sickness or death. In Paunangisu, I was told that witchcraft is often motivated by jealousy of another person's possessions or relationships. Witches are said to use the victim's personal possessions through contagious magic. People avoid leaving their hair lying around after cutting it because witches may use it to cast spells on them. At Hog Harbour, I was advised against leaving clothes, towels or shoes outside at night. It was said that witches come and rub leaves on people's possessions, which can cause sickness. One day during my stay, a local girl experienced a rash of sorts, with a red and swollen face. A *kastom man* determined that a witch had rubbed leaves against her towel at night, then the poison infected her when she used it on her face the following morning. Some witches also disturb their victim's thinking. In Santo, a former school principal had embezzled school funds and escaped to Luganville, from which he absconded to another school in inland Santo. He had reportedly been expelled from his home island after stealing from a relative and had been chased out from other communities previously. A teacher reflected on his disregard for social norms and his ability to get away with it and speculated that this may be due to witchcraft as well, using leaves to cloud other people's thinking until making his getaway.

To achieve their goals, witches are said to practice many nefarious rituals. For example, covens hold meetings in the bush. They bewitch someone by raising them from their sleep, then compelling them to walk to the coven's gathering place at night. There, the witches administer a cut to the throat or remove their organs, then send them back to

their home. After a few days, the victim drops dead. I have also been told that witches drink blood and behead chickens. Witches are also said to shapeshift and fly. That principal later fainted at his new location, was not breathing and could only be revived after several attempts by bystanders. He was then taken to hospital and remained in poor condition. Several residents attributed this incident to his witchcraft and explained that the witch had turned himself into a bird to fly but was shot down by a hunter. A Hog Harbour resident also told me of a classmate of hers from Ambrym island, who claimed to fly back to her home at nighttime and come back in the morning. The principal called her into his office to reprimand her, and the next day she disappeared. Witchcraft and its influence can also operate on their own. This was evident when an alleged witch had a new baby with his wife. It was said that the baby was severely disabled, cross-eyed with polydactyly and unable to sit up on its own or engage its caregivers. A local resident attributed this to some negative influence originating from the father's witchcraft, which had somehow harmed the baby, albeit unintentionally. Another resident commented that 'when the parents aren't good, the babies turn out like this'.

Witchcraft allegations are taken very seriously and suspects are subject to social censure. Some people are 'suspects' due to previous incidents, especially if some misfortune was tied to them. If further misfortunes occur, these may be taken as confirmation. When a household is suspected of harbouring a witch, many people will refuse to eat there for fear of poisoning. In Paunangisu, I was told that the funeral of an alleged witch had been boycotted by other residents. I was also told that recently, some young men had been taught black magic for killing and harming people by an outsider. The case was brought to trial by their elders, the culprits admitted everything, and were forced to throw their potions and trinkets into the sea. Otherwise, they would have been put to death. However, another resident shared that in general, and unlike the situation in Papau New Guinea, lynchings are not common in Vanuatu (however, colonial-era accounts suggest that witchcraft allegations were a factor in blood vendettas in the past, see Harrison 1937: 376 for an example).

While witchcraft allegations often start from some misfortune which demands an explanation, during early deliberations witchcraft is brought up as a possibility but can be rejected in favour of more mundane explanations. For example, one day in Paunangisu, C.'s chicken disappeared over night. C. considered witchcraft as a possible explanation. However, she considered witchcraft as just one of multiple possible scenarios, in addition to more mundane ones (such as that a cat came and ate the chickens). As a result,

discussions that consider witchcraft as an explanation for some misfortune do not necessarily result in allegations. For example, one day, C.'s relative B. injured his eye. Later, his wife had a dream: she was lying on the ground, then a moth flew towards her and landed on her eye. She then shared that the accident got her thinking: B. had been fixing up a fence and had been wearing protective goggles while working on the nails. Just before finishing up the last nail, he had taken his goggles off, and it was that nail that then injured him. Furthermore, he had been using the wrong type of nail for the materials he was working with, an oversight that was out of character for him. She volunteered that this may have been the result of a witchcraft attack meant to disturb his thinking. However, her husband then contradicted her and insisted that it had been his own mistake and suggested she should not read into it. Finally, not all diseases are attributed to witchcraft. Residents also accept germ theory, which is widely taught in schools, and 'white man's medicine'.

Not all witchcraft results in sickness or death. Another type is known as love magic or 'sweet mouth', which is designed to make other people fall in love with the practitioner. Some use 'sweet mouth' when they are in love but do not know how to approach their crush. Witches mix leaves into the victim's food and make them 'lose their head' and give in to the witch's advances. Relationships started through sweet mouth are considered unstable and involve much fighting because they 'were not meant to be'. In my experience, allegations of love magic can also serve to process conflicting feelings about stigmatized relationships. For example, in Paunangisu, love magic was presented to me as an explanation for homosexuality. A girl from another village wanted to bewitch her boy crush, so she put a love potion into his *laplap*. But by accident, that meal was eaten by a tomboy girl, who then fell in love with the first girl and proceeded to follow her around everywhere. This might suggest that appealing to love magic can deflect blame for stigmatized relationships onto the other person, consciously or subconsciously.

While qualitative, my observations on witchcraft suggest that people's ethnopsychology differs from Western notions of the mind, especially those in cognitive psychology. Specifically, they suggest that people do not view the mind as a closed container, where mental states are always the result of internal psychological processes. Instead, people's thoughts and behaviours can originate from external forces such as love magic and witchcraft attacks. That ni-Vanuatu people's concept of the mind differs from Western folk models is also evident in early ethnographies. For example, some ethnographers report that Mewun people believed that the soul had multiple parts,

including one in the heart, the breath, and the shadow (Deacon & Wedgwood 1934: 561p). The word for the aspect associated with the heart also meant ‘double’ and was also used for the spirit ‘doubles’ of the grave gifts for a sorcerer, which his ghost was said to use in the afterlife (Deacon & Wedgwood 1934: 562). Additionally, people had another soul aspect that could separate from the body even before death (Deacon & Wedgwood 1934: 562): “[w]hen a man is asleep his *nemahnenre* will wander about and visit other people and places” (ibid.). In other locations, such as Seniang, people did not distinguish between the core soul of the person and their ‘dream double’ because they believed them to be the same thing (Deacon & Wedgwood 1934: 562).

Finally, villages sometimes use witchcraft beliefs and allegations to negotiate boundaries between their notions of ‘tradition’ and ‘modernity’, and their place on that spectrum. Some areas of the country are believed to produce particularly potent witchcraft. This is true of the Big Nambas tribe on Malekula, where ‘*kastom* is strong’. At Hog Harbour, a resident claimed that Ambrym islanders make very potent poisons, and that men can use those to harm their partners when they don’t comply with their requests, for example if they refuse to give them money. As a result, a teacher at Hog Harbour shared that she felt apprehensive about going near places where ‘*kastom* is strong’, and locals expressed reservations about people from ‘bush’ settlements in inland Santo. The latter were said to only wear loincloths, eat snakes, frogs and lizards, and only use *kastom.* Locals therefore perceived themselves as distinct from ‘*man bush’*. In contrast, for a resident of Emua village in North Efate, Santo itself, along with Malekula and the outer islands, was ‘less civilized’ and represented the ‘real Vanuatu’, whereas Efate was more ‘Westernized’. However, villagers in both locations also drew a line between themselves and urbanites, remarking on the stark contrast in habits and attitudes between urban and rural communities, viewing the former as more ‘modern’. In this context, villagers sometimes use the term *man bush* jokingly to refer to themselves, often in situations where they are stumped by some new technology when visiting town. In this context, *man bush* signifies something like ‘country bumpkin’. However, I also experienced that witchcraft beliefs are applied to interpret events in urban areas and incidents that involve new technologies. During my stay, a young person was found dead in Port Vila, and their death was widely attributed to witchcraft. When asked, residents stated that witchcraft was also common in urban areas. This observation is also echoed by an urban ethnographer, who has noted that fear of witchcraft attacks is widespread in

Port Vila (Servy 2020). Furthermore, chain messages on messenger services warn about witches killing people through social media.

2.7.5 Moral Values

At both field sites, villagers emphasize values related to cooperation, harmony, and unity, and view these virtues as essential for achieving satisfying relationships with relatives and other members of one's community. In both locations, residents often emphasized that relatives should cooperate and help each other with work and money, and households sometimes assist each other with gardening work. There is strong moral discourse in favour of unity and consensus and supportive relationships within extended families and the community.

These concepts are further elaborated through a specific notion of fairness. At both field sites, ideas about fairness are often articulated by appealing to 'balance' between various segments of the community. At Hog Harbour, a teacher shared that there should be 'balance' in appointments at the primary school. Specifically, she felt that the three sections of Hog Harbour village should all be represented among school staff, and that hiring decisions should prioritize candidates from under-represented sections. She also shared that when her son trained to be a football referee, he was told that when there is an argument on the field, he must resolve it in a way that satisfies both sides. It therefore appears that the role of referees is viewed as facilitating compromise between conflicting parties and resolving disputes. This appears to differ from Western views about judicial authority, which are centred on enforcing a set of stable, impersonal rules. Impartiality is therefore tied to a rules-based legal ethos, whereas it appears that for ni-Vanuatu, impartiality is based on a personal ethos of balancing out competing interests without unfairly prioritizing the interests of one side over the other. This is evident in the way social conflict is articulated. At both locations, some residents accused school staff and principals of nepotism, and of favouring their own relatives when they should have sought to balance the interests of various community groups. These values are also evident in descriptions of chiefs, who are said to "provide counseling and mediate disputes; with community peace and harmony placed at the root of all decision making" (VMJCS 2016: 12). In Paunangisu, I was told that the chief's traditional role is to guide the communal resolution of disputes through establishing consensus, with no 'winners or losers'.

Villagers also emphasize respect for *kastom* or tradition, and with it respect for elders and chiefs. For example, some sources say that "[v]illage authority rests with the

chief and people of all ages respect his ultimate authority" (VMJCS 2016: 12). On Efate, I was told that traditionally, chiefs could punish people who spoke against or disrespected them. This attitude is also evident in name avoidance traditions and joking restrictions. At Hog Harbour, name avoidance was traditionally practiced for some relatives. For example, people do not address their parents by their given names. Conversely, parents address their children by their given names until they marry and have their own children; then they may be addressed as their child's mother or father. When young and single, brothers call each other by their given name, but this does not continue after marriage. Once they have children of their own, they address each other as their children's fathers (e.g., father of Joel), and the same goes for the relationship between brothers and sisters (e.g., mother of James), especially in reference to the firstborn child. The same goes for the son-in-law, although he may be referred to by name when he is not present. Informants have explained this to me as a sign of respect. Intriguingly, I was informed that unlike brothers, sisters continue to address each other by name even after marriage, although I have not been provided with an explanation for this. These naming rules also extend to other aspects of interaction, such as sitting close and joking. When young and single, brothers may sit and joke together freely, but after marriage, they are expected to sit down further away from each other and to limit any joking between them. Likewise, brothers-in-law should not joke or swear when sitting together because 'we respect our in-laws'. In Paunangisu, I was informed that avoiding joking is about 'respecting our elders', and thus uncles were among the classes of relatives with whom joking was prohibited. I was also told that calling one's mother and father by their given names was against *kastom* and that using proper terminology was a matter of respect.

However, in both locations I was also told that these avoidance rules and joking restrictions are being lost nowadays, and that many people now call 'forbidden' classes of relatives by their given names and joke with them freely. Some elders have attributed this to parents who are 'not strict with their children', and as a result they 'no longer respect traditions'. These comments were usually made with an emphasis on the need to keep local *kastom* intact. In both locations, elderly members of the community express anxiety about what they perceive as the erosion of traditional culture and indigenous languages and increasing Western and Chinese influence. For example, I have been informed that not all girls in Hog Harbour know how to weave traditional mats and baskets from pandanus leaves. This was attributed to the fact that they 'don't sit next to their mothers'. My informants put the blame for this on the younger generations. Some

elders say that in the past, people 'had to listen to their leader'. Now, there is 'too much freedom' and '*stronghed* everywhere'.

S*tronghed* (lit. 'strong head') is a popular insult, which people often use for obstinate, stubborn individuals, but also for naughty children. In a broader sense, this term refers to someone who refuses to comply with the wishes of authority figures such as chiefs and elders, who breaks social norms, or who refuses to submit to community consensus on some issue. In other words, a *stronghed* can be a person who fails to cooperate. I have been told that when there are 'too many strong heads', productive social relationships within the community are undermined. They also told me that in the home, 'children need to be taught respect and their culture', and failing that, customary norms and ways of life are lost. In Paunangisu, some residents felt that the absence of chiefly authority and the fact there had been so much dispute had produced social dysfunction, leading to a generation of 'undisciplined youth' because no one was there to 'look after the place'. Ultimately, this was considered to be the root cause of anti-social behaviour such as drunkenness, making noise, avoiding obligations, and abandoning partners to single motherhood.

2.8 Culture Summary

In rural areas of Efate and Espiritu Santo, children grow up in a 'kinship-intensive' environment shaped by the presence of extended families which are bound to each other through descent, marriage, and ceremonial exchange. Relatives share child-rearing responsibilities within the extended family, which is evident in the frequent practice of co-residence and adoption, and in the performance of life cycle rituals. In daily life, much cultural transmission follows the 'guided participation' model, with children as active participants in daily chores and alloparenting. Participants' moral ideology shows a holistic, interdependent, and communal orientation. Respect and obedience are valued, especially for parents, elders, and community leaders. Caregivers are aware of individualistic models of socialization but reject them due to the perceived incompatibility with their own values. While all the villages I visited are Christian, local supernatural beliefs remain present. Witchcraft beliefs suggest that the mind is perceived as porous: thoughts can originate from external influences, including supernatural ones, not just from internal mental processes. While most villagers rely on subsistence production, they also increasingly participate in the market economy and formal education, although this requires trade-offs that not all families are willing to make.

3. Development of Theory of Mind and Mental State Talk

3.1 Introduction

3.1.1 Background

In this chapter, I assess the development of Theory of Mind and mental state talk in ni-Vanuatu children. Theory of Mind refers to 'mind-reading', or the ability to mentally represent what others think, know, want, and feel. Much research has been devoted to the understanding of False Beliefs (understanding that others can hold subjective beliefs that conflict with external reality). Complex Theory of Mind is considered a key component of human social intelligence, which is in turn key to human adaptation (Dunbar 2003). Theory of Mind has also been implicated in cumulative culture – the gradual improvement, modification, and expansion of culturally learnt skills and techniques, which is a key mechanism of human adaptation to different environments (Tomasello 1999; Richerson & Boyd 2005; Henrich 2017). For example, Theory of Mind is thought to facilitate learning strategies such as teaching that we use to transmit knowledge from one generation to the next (Strauss, Ziv & Stein 2002; Ziv & Frye 2004; Davis-Unger & Carlson 2008; Bensalah et al. 2012; Ziv et al. 2016).

Until recently, this ability was thought to develop in a relatively fixed ontogenetic trajectory, with False Belief understanding -a key developmental milestone- emerging at 4-5 years of age. This view was initially based on studies performed with normally developing children from Western societies, where False Belief understanding emerges at ca. 4-5 years of age, at least when measured with verbal tasks (Wellman, Cross & Watson 2001; for a discussion of non-verbal tasks and the methodological challenges involved in them see Chapter 1). Early cross-cultural work indicated that this developmental shift is also present in Canada, India, Peru, Samoa, and Thailand (Callaghan et al. 2005). Furthermore, children from some small-scale societies, such as the Baka in Cameroon and Yap and Fais islanders in Micronesia, also passed False Belief tasks by age 5-6 (Avis & Harris 1991; Oberle 2009). Only children with developmental disorders such as Autism Spectrum Disorder (ASD) were though not to undergo these shifts (Baron-Cohen, Leslie & Frith 1985).

However, recent findings and theoretical shifts have challenged this notion. Heyes (Heyes & Frith 2014; Heyes 2020) has proposed that, much like literacy, mind-reading -or at least verbal or explicit Theory of Mind- is a culturally learnt skill that exhibits

considerable developmental plasticity (see also Chapter 1). In support of this view, ethnopsychology has revealed considerable variation in mental state reasoning among adults from different cultures. For example, while Westerners consider mental states to be of vital importance for understanding behaviour, many Pacific Islander societies possess an 'opacity doctrine' (Robbins & Rumsey 2008). People from these societies often assert that other people's minds are fundamentally unknowable and discourage each other from making assumptions about the thoughts and feelings of others (Robbins & Rumsey 2008). Other work has examined to what extent people from different cultural backgrounds draw on mental states to make moral judgments, specifically, to what extent they take into account an agent's knowledge and intent when making decisions about whether they should be punished for committing harmful actions. In this type of research, participants are presented with a story about a person who is duped into poisoning somebody (or some other unintentional offence). It has been found that adults from small-scale and kinship-intensive societies tend to place less importance on the intentions of the perpetrator than participants from Western societies (Barrett et al. 2016; Curtin et al. 2020). In other words, while the latter tend to place blame on the perpetrator only if they *intentionally* poisoned the other person, the former judge primarily on *outcome* when making decisions about whether they should be blamed and punished (Barrett et al. 2016; Curtin et al. 2020). However, across cultures, adults judge more harshly when malicious intent is involved (Barrett et al. 2016; Curtin et al. 2020). Furthermore, participants from small-scale societies shift to placing more importance on intent when primed to think about mental states (McNamara et al. 2019).

Research with children has further revealed cross-cultural differences in children's development of explicit or verbal Theory of Mind. For example, there is cross-cultural variation in the developmental sequence in which different Theory of Mind abilities are acquired. Chinese and Iranian children (Wellman & Liu 2004; Wellman et al. 2006; Shahaeian et al. 2011) understand that people differ in their access to knowledge before they understand that people can hold beliefs that conflict with the beliefs of others, but this is reversed in Western children. Other work has also found cross-cultural variation in the development of False Belief understanding. While Canadian children perform above chance levels at False Belief tasks by age 3.2 already, children from Hong Kong do not pass before age 5.3 (Liu et al. 2008), even though the trajectories of US and mainland Chinese children largely parallel each other (ibid.). Among Filipino children, only 15% of those older than 5 pass False Belief tasks (de Gracia, Peterson & de Rosnay

2016). Japanese children only pass False Belief tasks at 6-7 years of age (Naito & Koyama 2006). 4-8-year-old Junín Quechua children from Peru also had low pass rates (Vinden 1996). Furthermore, the conclusions of Callaghan et al. (2005) have been called into question due to the small size of their Samoan sample, and due to the fact that even in their study, only two thirds of 5-year-olds succeeded. Follow-up work showed that most Samoan children do not pass False Belief tasks before the age of 8 (Mayer & Träuble 2012; Mayer & Träuble 2015).

Even more extreme findings have been obtained in Vanuatu. Dixson (2016; Dixson et al. 2017) recruited participants from urban areas (Port Vila) and rural islands (Espiritu Santo, Nguna, and Tanna). Among Dixson's urban participants, a majority (66%) passed Location False Belief by the age of 7 (Dixson 2016). Location False Belief is another name for the Sally-Anne test, in which a character in a story places a toy in one of two containers and leaves the scene (see also Baron-Cohen, Leslie & Frith 1985). During their absence, another character removes the toy and places it in the other container. Then the first character returns and wants to retrieve their toy. To pass the test, the participant must predict that the protagonist will look in the first box, i.e., that they will act on their beliefs, not objective reality. However, among rural children, even 9-year-olds only passed this test at just above chance levels (57%) and the figures were similar for older children and adolescents (56% for ages 13-14 and < 50% for ages 10-12). This is a marked 'delay' in False Belief understanding, at least when measured against a Western yardstick. Furthermore, Dixson (2016) found that both urban and rural ni-Vanuatu children understood that people can hide their feelings before they understood False Beliefs, the reverse of what had previously been found in Western, Chinese, and Iranian children, resulting in a unique developmental sequence. However, like Chinese and Iranian children, ni-Vanuatu children understood Knowledge Access before they understood Diverse Beliefs.

3.1.2 Study Design and Questions

But is such a strong divergence realistic, and are these findings reliable? To examine this, I performed a Theory of Mind assessment in a rural area of North Efate (see Chapter 2 for cultural background), which is located in the same ethnolinguistic area as Nguna. The test design built on the previous study conducted by Dixson (2016), who adapted a Theory of Mind scale developed by Wellman and Liu (2004) to Vanuatu in collaboration with the Vanuatu Cultural Centre, which oversees field research there. The battery contains

nine tasks in total, presented in the following order: (1) Location False Belief; (2) Explicit False Belief; (3) Contents False Belief; (4) Appearance-Reality; (5) Diverse Desires; (6) Diverse Beliefs; (7) Knowledge Access; (8) Hidden Emotion; (9) Belief-Emotion. These tasks are designed to assess children's understanding of False Beliefs (1, 2, 3, 4); their ability to distinguish between the desires and beliefs of different people (5, 6); their ability to assess whether other people possess knowledge that they themselves have (7); and the affective-emotional components of theory of mind (8, 9). This final section measures children's ability to distinguish between facial expressions -external signs of emotionality- and internal emotional states (8). It also assesses their understanding of the relationship between (true and false) beliefs and emotional states (9) (see Tables 3.1 and 3.2 for task descriptions).

Each test presents the participants with a short story or scenario. After each scenario, the children are asked to respond to some questions about it. These include Target Questions (designed to assess the participants' understanding of the mental states relevant to the scenario) and Control Questions in the form of reality and memory checks (designed to assess the participants' memory of the relevant details in the scenario). These questions are taken from Dixson (2016). Additionally, I prompted participants to justify their responses to the Target Questions. Conceptually, the justification component was taken from the Theory of Mind Storybooks, a test battery developed by Blijd-Hoogewys et al. (2008). This test battery was developed to measure various aspects of Theory of Mind such as children's understanding of emotions, beliefs, desires, and distinctions between mental and physical processes (Blijd-Hoogewys et al. 2008). I chose to include justification questions because they are thought to reflect the Theory of Mind abilities of children more accurately (Blijd-Hoogewys et al. 2008). In contrast to Target Questions, which tend to be based on a forced-choice format, justifications are set up to probe children's mental state talk, i.e. their tendency to use mental state terms. This approach has been shown to have good construct validity, internal consistency, and test-retest reliability, is applicable to a wide age range (3-12 years), and reliably measures differences in Theory of Mind between normally developing children and those with developmental disorders such as PDD-NOS (Blijd-Hoogewys et al. 2008).

Justifications have been used in previous studies on cross-cultural differences in Theory of Mind and mental state talk. For example, Japanese children not only showed delayed development of False Belief understanding but were also less likely to engage in mental state talk than Western children (Naito & Koyama 2006). Instead of talking about

people's beliefs and desires, Japanese children emphasized people's behaviours, social rules, and situational cues (Naito & Koyama 2006). The authors attributed this to "a cultural difference in reasoning about human action" (Naito & Koyama 2006: 290). These findings fit in with results from observational studies, which have found cross-cultural differences (and continuities) in children's development of mental state talk. For example, Desire Terms (want, like) tend to precede Fact Belief talk (think, believe) across languages (Kristen et al. 2014). Furthermore, mental state talk increases during the preschool years in both Western and Japanese children (Ruffman, Slade & Crowe 2002; Suzuki & Nomura 2019). However, the increase was steeper in Western children, whose mental state talk nearly doubled between the age of 3 and 4, and who used mental state terms at nearly three times the rate of Japanese children by age 4 (Ruffman, Slade & Crowe 2002; Suzuki & Nomura 2019). Accordingly, justifications can be used to assess cross-cultural differences in communicating and conceptualizing mental states.

Furthermore, the approach with justifications has proven productive for showing when participants' responses are informed by culturally specific concepts that are not anticipated in psychometric scoring systems developed by Western researchers. For example, cross-cultural work on moral reasoning has found that Korean and British children respond differently to moral dilemmas, and that Korean children draw on moral concepts specific to their cultural background (Baek 2002). Accordingly, justifications may be useful for examining whether cultural norms and values are interfering with the participants' interpretation of the tasks. Finally, children's consistency in their use of mental state talk may be used to confirm the reliability of their responses to the test questions. For example, if children fail some False Belief tasks but communicate directly about people's beliefs in the justifications, then the results of the Target Questions may not be reliable.

I ask the following research questions: Does ni-Vanuatu children's understanding of Theory of Mind develop the same way it does in Western children? At what age do ni-Vanuatu children understand False Beliefs? At what age do ni-Vanuatu children understand other mental state concepts, such as Knowledge Access, Desires, and Emotions? Furthermore, does ni-Vanuatu children's mental state talk develop the same way it does in Western children? At what age do ni-Vanuatu children employ statements about Fact Beliefs? At what age do ni-Vanuatu children employ statements about Perceptual Access, Desires, and Emotions? Finally, is ni-Vanuatu children's performance on Theory of Mind tasks consistent with their tendency to use mental state talk? Does

children's tendency to engage in cognition talk (communication about thoughts and beliefs) reflect their performance in False Belief tasks? Does children's tendency to engage in other types of mental state talk (communication about Perceptual Access, Desires, and Emotions) reflect their performance in the relevant Theory of Mind tasks?

I predict the following: if Heyes' notion of mind-reading as a culturally evolved trait (Heyes & Frith 2014; Heyes 2020) is mistaken, ni-Vanuatu children's development of Theory of Mind should not diverge from the trajectories observed in Western children. Specifically, ni-Vanuatu children should develop False Belief understanding by 4-5 years of age. In contrast, if Dixson's (2016) extreme findings are reliable, they should replicate in my sample. If they do, this would be consistent with the idea that (explicit) Theory of Mind really is culturally learnt, and that culture has a dramatic effect on the ontogeny of social cognition. Furthermore, if ni-Vanuatu children's mental state talk develops the same way it does in Western children, then Desire Terms should precede cognition talk, and children's cognition talk should increase substantially towards the end of the preschool years, i.e., by age 5. Finally, if findings on ni-Vanuatu children's Theory of Mind are reliable, then their responses to the Justification Questions should be consistent with their performance on the relevant Theory of Mind tasks. This is the first study assessing mental state talk in ni-Vanuatu children.

3.2 Methods

3.2.1 Test Battery

Table 3.1: Test Battery Part I (Tasks 1-4)
(1) Location False Belief
The experimenter presents the participant with two male dolls playing football: Willie and Shem. Willie announces that he is tired now. He takes his ball and puts it in one of two differently coloured boxes. These boxes are placed some distance apart, at different sides of the table. He then goes home to take a nap. Once he is gone, Shem takes the ball and puts it in the other box. Then Willie returns from his nap. (1.1) Where is Willie going to look for his ball? [Target Question] (1.2) Why is that? Why is he going to look there? [Justification] (1.3) Where is the ball now? [Reality Check] (1.4) Which box did Willie put the ball in at the start? [Memory Check]
(2) Explicit False Belief
The experimenter presents the participant with a picture of a house with a tree next to it. They also present them with a female doll: Leiwia. Leiwia has lost her dog and is now looking for it. The dog could be hiding behind the house, or it could be hiding behind the tree. The assistant then informs the participant that the dog is hiding behind the tree, but Leiwia thinks her dog is hiding behind the house. (2.1) Where is Leiwia going to look for the dog? [Target Question] (2.2) Why is that? Why is she going to look there? [Justification] (2.3) Where is the dog now? [Reality Check]
(3) Contents False Belief
The experimenter presents the participant with a matchbox and asks them what they think is inside. Once the child has answered, the research assistant opens the matchbox to reveal a small sticker in the shape of a butterfly. The participant is asked to identify the contents. The experimenter then puts the sticker back inside the matchbox and presents the participant with a female doll: Annie. Annie has not opened the matchbox before and has never seen its contents. (3.1) What does Annie think is in the box? [Target Question] (3.2) Why is that? Why does she think that? [Justification] (3.3) Has she looked inside the box before? [Memory Check]
(4) Appearance-Reality
The experimenter presents the participant with a bar of soap that looks like a shell and asks them to identify this object. The experimenter then hands them the object and encourages them to explore, hold and smell it. Once the child has explored the object, the experimenter asks them what it really is. Once the child has responded, the experimenter asks: (4.1) What did you think this was the first time you saw it? [Memory Check] After the child has answered, the experimenter then produces a male doll: Samuel. Samuel has never held or smelt this object before. (4.2) What does Samuel think this is? [Target Question] (4.3) Why is that? Why does he think that? [Justification] (4.4) Has he held or smelt it before? [Memory Check]*

*The final memory check was added to the test battery to better parallel the structure of the questions in task 3. It was not included in Dixson (2016).

Table 3.2: Test Battery Part II (Tasks 5-9)
(5) Diverse Desires
The experimenter presents the participant with a female doll: Mary. The experimenter then presents them with a biscuit and a banana. (5.1) Which one do you like more? [Desire Question]. After the child has responded, the experimenter informs them about Mary's preference, which is the opposite of what the child indicated for themselves. The experimenter then announces that Mary will eat now. (5.2) Which food is Mary going to eat? [Target Question] (5.3) Why is that? Why is she going to eat that food? [Justification]
(6) Diverse Beliefs
The experimenter presents the participant with a female doll and with a picture of a house and a bush. The experimenter introduces the doll as Jane and explains that she has lost her cat and is looking for it. The cat may be hiding behind the house or behind the bush. The experimenter does not indicate where the cat is really hiding. (6.1) Where do you think the cat is hiding? [Belief Question] After the child has responded, the experimenter informs them about Jane's belief, which is the opposite of what the child indicated. (6.2) Where is Jane going to look? [Target Question] (6.3) Why is that? Why is she going to look there? [Justification]
(7) Knowledge Access
The experimenter presents the participant with a small box with a plain surface. The experimenter then asks the participants what they think is inside the box. Once the child has responded, the experimenter opens the box and reveals a toy animal inside. The experimenter places the toy back inside and closes the lid. The experimenter then produces a male doll: Tom. Tom has never looked inside the box before. (7.1) Does Tom know what is inside the box? [Target Question] (7.2) Why is that? How does/doesn't he know what's inside? [Justification] (7.3) Has he looked inside the box before? [Memory Check]
(8) Hidden Emotion
The experimenter shows the participant a sheet of paper with three cartoon faces drawn on it. One is smiling, one is neutral, and one is sad. The children are asked to identify the emotional states of the individual faces. The experimenter then produces a picture of a boy: Tasi. His facial expressions are not visible because he is drawn from the back. He is facing three other children who are laughing at him. The experimenter then recounts a story: the four children are playing together. But one of the three boys in the back starts making fun of Tasi and is mean to him. Then the others start laughing at him too. But he does not find it funny and it makes him feel bad. He does not want the others to see how he feels. He does not want the others to call him a baby. So he tries to hide his feelings. (8.1) After the first child starts laughing at him Tasi, what do the other children do? [Memory Check] (8.2) If they saw how he felt, what would they call him? [Memory Check] The experimenter then presents the drawing of the three smiley faces again. (8.3) How did Tasi really feel when they all laughed at him? [Target-Feel Question] (8.4) How did he make his face look when they laughed at him? [Target-Look Question] (8.5) Why is that? Why did he make that face? [Justification]

(9) Belief-Emotion
The experimenter presents the participant with a male doll: Song. The experimenter then produces a box of sweets and asks the child to identify what it is. After the child responds, Song explains that this is good because sweets are his favourite food. Song then leaves to go play. The experimenter opens the box and reveals that it contains leaves and twigs, not sweets. (9.1) What is Song's favourite food? [Memory Check] After the child has responded, the experimenter has Song return and explains that he has never looked inside the box. Song then asks the experimenter whether he can have the box. The experimenter complies and hands him the box. (9.2) How does Song feel now that he has the box? [Target Question] (9.3) Why is that? Why does he feel that way? [Justification 1] After the child has responded, the experimenter opens the box and lets Song look inside. (9.4) How does Song feel now that he has looked inside the box? [Emotion Control Question] (9.5) Why is that? Why does he feel that way? [Justification 2]

3.2.2 Procedure

All participants were tested individually in a quiet room at Manua School, a primary school and kindergarten near Paunangisu in North Efate (see Chapter 2 for ethnographic context). Prior to testing, I obtained verbal consent to work with the children from the principal, school staff, and the chairman of the school board, who acts as a representative of the community. The school was provided with an information letter from the Vanuatu Cultural Centre to confirm that it had approved the research. A female research assistant took on the role of experimenter while I recorded the children's responses from a corner of the testing area. The research assistant was a resident of Paunangisu and thus familiar to some of the children. She was fluent in Bislama (pidgin English, the lingua franca of Vanuatu and language of instruction at school), English, and Ngunese (*Nakanamanga*, the indigenous language of North Efate). After obtaining verbal assent from the children themselves, the experimenter narrated each scenario while simultaneously acting them out with dolls and toys (see Tables 3.1 and 3.2 and Fig. 3.1 for task materials), some of which were borrowed from a playgroup in Paunangisu. This approach differs slightly from Dixson's (2016), who simulated scenarios with cardboard cut-outs, toys, and pictures. Cardboard cut-outs were replaced with dolls to make the scenarios more engaging. Whenever the characters embodied by the dolls left the scene, they were placed out of sight. If the participant answered any of the Control Questions (reality and memory checks) incorrectly, the experimenter repeated the story before posing the questions again. The second attempt then counted towards the participant's rating. The experimenter did not indicate whether any of the target responses were correct.

Unlike Dixson (2016), who applied all tasks in one go, I broke up the test battery into two parts of roughly equal length (Tasks 1-4 and Tasks 5-9). This was done in order not to exhaust the youngest children's attention spans. However, as in Dixson (2016), within each section all tasks were administered in the same order to minimize experimenter error. Altogether, each half of the experiment took ca. 8-12 min per child. Testing was performed in Bislama. Some of the younger children requested that their mothers wait for them outside the testing room, which we complied with.

The research assistant was briefed about the general theoretical background of the study, but blind to the specific hypothesis tested. The assistant was trained to perform all tasks prior to testing. Additionally, the test battery was piloted with the same research assistant, with another adult, and an adolescent standing in as the participant. The research assistant was also provided with a research protocol in Bislama, which was available throughout testing. The research protocol was translated by myself in collaboration with the research assistant and a relative, who checked the translations against the English originals. Any unclear points were resolved through discussion. The draft was then evaluated again by another resident to identify possible ambiguities. The full protocol is available on OSF: https://osf.io/pnqxy/ (Identifier: DOI 10.17605/OSF.IO/PNQXY).

3.2.3 Sample

We initially tested N = 194 children. However, some children were excluded because they only took part in one session of the assessment (n = 8) or refused to complete all the tasks (n = 3), because they recognized the soap in the Appearance-Reality task (n = 2) or guessed the contents in the Knowledge Access task (n = 1), and due to experimenter error (n = 5). The final sample included N = 175 participants (90 female) and ranged from Kindergarten to 3rd graders. Participant ages ranged from 3.5 to 11.8 years (mean = 6.98, SD = 1.60). The birthdates of 9 children were unknown; their ages were estimated based on the mean age of their class. All descriptive statistics were calculated in R *v.3.5.1* (R Core Team 2018) and *plyr* (Wickham 2011).

Fig. 3.1: Stimuli.

3.2.4 Scoring

I initially recorded the children's responses *verbatim* and later coded the transcripts as follows: 1= correct and 0 = incorrect for the Target and Control Questions (see Table 3.3). Some tasks have more than one Control Question (Location False Belief: Reality and Memory Questions; Appearance-Reality: Memory Questions 1 and 2; and Hidden Emotion: Memory Questions 1 and 2). In those cases, the Control Questions were coded together. If both were correct, they received a combined score of 1. If one or both were incorrect, the controls received a combined score of 0. The Emotion-Control Question in the Belief-Emotion task was treated as another Target Question as it assesses the child's understanding of the character's changed emotional state and does not function as a Memory Check. Therefore, the ratings from the Target Question and the Emotion-Control Question were combined into a shared rating. If both answers were correct, they were rated 1, if one or both were incorrect, they were rated 0. The Target-Feel and Target-Look Questions in Hidden Emotions were also rated together following the same system. I then calculated summary scores for the Target and Control Questions, with additional summary scores for children's performance on all tasks with a False Belief component (Location False Belief, Explicit False Belief, Contents False Belief, Appearance-Reality, and Belief-Emotion).

The Justification Questions were scored based on a descriptive rating system in Blijd-Hoogewys et al. (2008) (see Table 3.4); the responses were then assigned a point score based on the same source (see Table 3.5). Justifications were rated as correct and received a point score if they indicate that the participant understands the Theory of Mind concept targeted in the task. Responses that directly mentioned the mental state terms *targeted in the task* were rated higher than other responses. For example, in the Location False Belief task, Fact Belief statements ("Because he thinks his ball is in that box") scored 2 points and Previous Location explanations ("Because that's where he put his ball before he left") scored 1. Or in Contents False Belief, Perception Criterion statements ("Because she's never looked inside the matchbox") scored 2, and External Characteristics explanations ("Because it looks like matchbox on the outside") scored 1. All answers that did not include the correct response category *as specified for the task* were rated as irrelevant or incorrect and scored 0. Maximum scores always equal 2 so all tasks are weighted equally. The Belief-Emotion task has two Justification Questions. For the descriptive ratings, these two responses were coded separately. However, for the

points ratings, the two responses were scored together in a combined rating. I then calculated summary scores for the points ratings.

Unlike Blijd-Hoogewys et al. (2008), who only scored justifications if the associated Target Questions had been answered correctly, I scored all justifications. Blijd-Hoogewys et al.'s (2008) approach discards a lot of data even though the responses of children who did not pass the Target Questions could still be informative, especially if they point to misunderstandings or idiosyncratic interpretations. Furthermore, some types of answers are of particular interest because they indicate that the participants do not possess the Theory of Mind abilities assessed in the Target Questions (see Table 3.5 for details).

Task	Question	Correct Response
Location False Belief	Target	Blue
Explicit False Belief	Target	House
Contents False Belief	Target	Matches
Appearance-Reality	Target	Shell
Diverse Desires	Target	Opposite of Desire
Diverse Beliefs	Target	Opposite of Belief
Knowledge Access	Target	No
Hidden Emotion	Target-Feel	Negative Emotion
	Target-Look	Neutral *OR* Positive Expression
Belief-Emotion	Target	Positive Emotion
	Emotion-Control	Negative Emotion

Table 3.3: Answer Key Target Questions.

Category	Description	Tasks
No answer	The child did not answer the question.	All
Unintelligible	The answer was unintelligible.	All
Don't know	The child said that they did not know the answer.	All
Uninterpretable	Bizarre answer with no reference to the question or scenario, or answers that are difficult to interpret within the context of the story.	All
Reiteration	The child merely repeats the question or their answer to the previous Target Question. Or they make a vague statement to the effect of 'because that's how it is'.	All
Own Reference Frame	The child makes up another context to the story. This context expands on the narrative in the scenario, continues the story, or provides an ad-hoc justification that bypasses the relevant elements in the story. E.g., the child establishes a connection between a character and a hidden object when none was stated in the scenario or imports such concepts from another story in the test. Or the child establishes context for senses, perceptions, and mental representations that were not indicated in the scenario. Alternatively, the child may shift the goalposts within the narrative to invent a reason why a character might solve their problem or know the answer after all.	All
Contradiction**	The child's response directly contradicts the answer they gave to the previous Target Question.	All
Factual Error**	The child conveys incorrect information about the scenario, e.g., by confusing the names or actions of different characters in the story or by giving the wrong locations of animals and objects mentioned in the story.	All
External Characteristics	The child refers to the external characteristics of an object in the scenario without describing the character's mental state. These comments may refer to an object's shape, size or appearance. In tasks with food items, they may also refer to the food's taste, quality or ripeness.	All
Value Judgment	The child makes a moral or normative judgment about a character's actions and what they should do.	All
General Knowledge	The child draws on a generality, i.e., normal or natural circumstances, to explain what the character should do or think. These statements are phrased in general terms.	All
Situational Reference	The child dwells on some general circumstance in the scenario without referring to the mental states *targeted in the task*. These circumstances may relate to the intentions, wishes and desires of characters as stated in the story, but in tasks that test children's understanding of knowledge or beliefs, not desires.	All
Desire Term	The child describes what the character wants or prefers using relevant mental state terms, in tasks that *directly target* children's understanding of desires.	DD, BE
Perception Criterion	The child describes how characters in the story use their senses to gain knowledge, using terms such as seeing, hearing, touching, and smelling. Alternatively, they may refer to physical actions that grant perceptual access, such as whether a character has opened a container or not.	CFB, AR, KA, BE

True Location, Actions, Contents or Identity Explanation*	The child refers to the real location or identity of an object or the real contents of a container even though the character should not be aware of them. Alternatively, the child refers to actions the target character should not be aware of.	LFB, EFB, CFB, AR, KA, BE 1
Previous Location Explanation*	The child explains the character's actions by referring to the previous location of a hidden object, i.e., the child refers to the location the target character should be aware of.	LFB
Fact Belief	The child describes what the character thinks or believes using the relevant mental state terms.	LFB, EFB, DB, BE
Emotion Term**	The child describes the character's emotions using mental state terms such as feeling good, sad, or angry without referring to the intentions *targeted in the task*. E.g., the child describes how a character feels inside without taking note of their intention to conceal their emotions or to change the behaviour of other characters as indicated in the story.	HE
Hidden Intention**	The child explains how and/or why the protagonist conceals their emotions to prevent an unwanted reaction from the other characters in the story.	HE
Belief-Reality Confusion**	The participant confounds their own belief with the true location of an object or animal, i.e., the child claims that the animal is really at the location where they thought it was. Alternatively, they confound a character's stated belief with the true location of the animal, i.e., the child claims that the animal is really where the character thought it was. This does not directly contradict the information provided in the story as the true location of the animal was not established, but it bypasses the mental states *targeted in the task*.	DB

Table 3.4: Coding Scheme for Justification Questions (Descriptive Ratings). Tasks are abbreviated as follows: LFB=Location False Belief; EFB=Explicit False Belief; CFB=Contents False Belief; AR=Appearance Reality; DD=Diverse Desires; DB=Diverse Beliefs; KA=Knowledge Access; HE=Hidden Emotion; BE=Belief-Emotion. Not all codes are applicable to all tasks. For example, Fact Belief is only applicable to tasks with a False Belief component (Location False Belief, Explicit False Belief, Contents False Belief, and Belief-Emotion) and tasks where a character's beliefs feature in other ways (Diverse Beliefs). In the same way, Desire Term is only applicable to tasks with a desire component (Diverse Desires, Belief Emotion). Notes: *These codes were just one category (Location Possession Explanation) in Blijd-Hoogewys et al. (2008). They were separated here to better account for differences in understanding of what characters can or cannot know about the locations, actions, contents, objects in the story. **These codes were added because there was no equivalent in Blijd-Hoogewys et al. (2008).

Task	Correct Response Categories		Incorrect Response Categories
	Score = 2	Score = 1	Score = 0
Location False Belief	Fact Belief	Previous Location	True Location*
Explicit False Belief	Fact Belief	-	True Location*
Contents False Belief	Perception Criterion	External Characteristics	True Contents*
Appearance-Reality	Perception Criterion	External Characteristics	True Identity*
Diverse Desires	Desire Term	-	Factual Error *OR* External Characteristics *OR* Value Judgment**
Diverse Beliefs	Fact Belief	-	Factual Error *OR* Belief-Reality Confusion***
Knowledge Access	Perception Criterion	-	True Contents*
Hidden Emotion	Hidden Intention	-	Emotion Term *OR* Situational Reference****
Belief-Emotion	Fact Belief	Desire Term	True Contents*

Table 3.5: Coding Scheme for Justification Questions (Correct vs Incorrect Responses). Notes: *These responses are classed as incorrect because they do not predict the doll's choices and feelings from the doll's beliefs or perceptual access, but instead from the true contents of a container, the true identity of an object, or the true location of an object or animal, even though the doll should not be aware of them. **These responses are classed as incorrect because they do not predict the doll's choices from the doll's stated preferences, but instead confound the doll's preference with the child's own preference (Factual Error), focus on characteristics of the food item in question (External Characteristics), or make normative judgments about food (Value Judgment). ***These responses are classed as incorrect because they do not predict the doll's choices from the doll's beliefs, but instead confound the child's beliefs with physical reality (Belief Reality Confusion) or they confound the child's beliefs with the doll's beliefs (Factual Error). ****These responses are classed as incorrect because they paint a picture of the boy directly responding to the bullying (Situational Reference) and/or expressing his real feelings (Emotion Term). They do not account for the fact that he is attempting to conceal his feelings. All other responses are classed as irrelevant and also receive a score of 0.

3.2.5 Inter-Rater Reliability

30% of children, who were randomly selected, had their responses rated by a second coder, an undergraduate research assistant who was blind to the hypothesis and the theoretical background of the study. I assessed inter-rater reliability by calculating percentage agreement (0 tolerance) and unweighted Cohen's kappa using the *irr* package (Gamer et al. 2019; *v.0.84.1*) in R *v.3.5.1* (R Core Team 2018). Inter-rater agreement was excellent for the Target Questions (agreement = 99.4%, $\kappa = 0.99$, $z = 22.8$, $p = 0$) and Controls (agreement = 99.7%, $\kappa = 0.98$, $z = 19$, $p = 0$) and very good for the Justifications (agreement = 85.5%, $\kappa = 0.84$, $z = 61.7$, $p = 0$). All personally identifiable information of the children was omitted from the data shared with the second coder.

3.2.6 Analysis

3.2.6.1 Task Comprehension (Control Questions)

I analyzed children's performance on the Control Questions to examine their understanding of the task scenarios, and to assess whether there were any tasks whose basic premise the children failed to grasp. I calculated descriptive statistics and used Spearman correlation to test whether children's understanding of the task scenarios improved with age (predictor: age; outcome: Control Question summary score).

3.2.6.2 Theory of Mind Performance (Target Questions)

I analyzed children's performance on the Target Questions to examine their performance on Theory of Mind. I calculated descriptive statistics for each task, binning participants into age groups (3-4, 5-6, 7-8, and 9-11 years old). I then ran logistic regressions (on continuous age data) to assess whether participants' performance improved with age, and to examine the developmental trajectory (predictor: age; outcomes: Target Question scores in individual Theory of Mind tasks). I also calculated descriptive statistics for the various summary scores (Overall and False Belief) and used Spearman correlation to assess whether children's cumulative performance improved with age (predictor: age; outcomes: Target Question summary scores). I then used logistic regressions with gender and an age-gender interaction to examine whether gender affected children's performance across tasks (predictor: sex; outcomes: Target Question scores in individual Theory of Mind tasks). This was done to check whether girls had more difficulty with male-gendered scenarios and vice versa, and to account for possible gender effects on social

cognition. I also performed a closer analysis of participants aged 3-5 years. This was done because previous studies have identified age 4-5 as an important milestone in False Belief understanding, at least among Western children. Accordingly, I assessed whether the proportion of children who passed the False Belief Target Questions increased between those ages. As there was just one 3-year-old, I compared 4-year-olds (n = 18) and 5-year-olds (n = 35), with a cut-off at 6.0 years of age. I used Pearson's chi-square, combined with Fisher's exact test where the assumptions of the chi-square test were violated (predictor: age (4 or 5); outcomes: Target Question scores in individual Theory of Mind tasks).

3.2.6.3 Mental State Talk (Justification Questions)

I assessed children's use of mental state talk by calculating descriptive statistics for their responses to the justification questions. I then created binary dummy variables to isolate the types of mental state talk targeted in the individual tasks (see Table 3.5) and ran logistic regressions to assess whether participants' tendency to use mental state talk increased with age, and to examine the developmental trajectory (predictor: age; outcomes: use of mental state talk (present or absent) for Justifications in individual Theory of Mind tasks). I then calculated descriptive statistics for the summary scores and used Spearman correlation to test whether children's aggregate scores (their overall tendency to use mental state talk) increased with age (predictor: age; outcomes: Justification summary scores). I then used logistic regressions to assess whether children's gender affected their tendency to engage in mental state talk (predictor: sex; outcomes: use of mental state talk (present or absent) for Justifications in individual Theory of Mind tasks). Finally, I assessed whether children's performance in the Theory of Mind assessment was consistent with their use of mental state talk. To this end, I examined whether children's performance on the Target Questions affected their tendency to engage in mental state talk. I ran logistic regressions with children's Target Question performance in the individual Theory of Mind tasks as the predictor and use of mental state talk (present or absent) as the outcome.

3.2.6.4 Language Use

Some children spontaneously requested Ngunese instead of Bislama, which we complied with. I assessed how frequently this occurred and created binary dummy variables for the languages used (with Bislama = 1 and all or some Ngunese = 0) and ran logistic

regressions to examine whether children's choice of testing language was affected by age (predictor: age; outcome: choice of testing language). I also assessed whether children's language of instruction affected their performance in the Theory of Mind assessment (Target Questions) and their tendency to use mental state talk (Justifications). To this end, I ran further logistic regressions (predictors: age and testing language; outcomes: Target Question scores and use of mental state talk (present or absent) for Justifications in individual Theory of Mind tasks) and examined whether adding language as a predictor improved model fit when compared to simpler models that only included age as a predictor. Likelihood ratio tests were performed with *lmtest* (Zeileis & Hothorn 2002).

In all analyses, participants who failed controls on any of the tasks considered in that analysis were excluded with *dplyr* (Wickham et al. 2018; *v.0.7.7*). I plotted the results in *ggplot2* (Wickham 2016), *ggthemes* (Arnold 2019; *v.4.2.0*), and *scales* (Wickham 2018; *v.1.0.0*). Given the limitations of null-hypothesis significance testing, the results of logistic regressions were interpreted with reference to odds ratios (OR, where OR > 1 is indicative of higher odds of an outcome occurring while OR < 1 is indicative of lower odds of an outcome occurring; OR = 1 is indicative of a null effect and greater distance from 1.0 is indicative of larger effect sizes). The results of Spearman correlations were interpreted with reference to Spearman's rho (r_s, where positive values are indicative of a positive correlation while negative values are indicative of a negative correlation between two variables; $r_s = 0$ is indicative of a null effect and greater distance from 0 is indicative of larger effect sizes; values vary between -1 and +1). The results of chi-square tests were interpreted with reference to the phi coefficient (interpretation resembles other correlation coefficients), which was calculated using the *psych* package (Revelle 2021; *v.2.1.9*). P-values were nevertheless included in all results tables.

3.3 Results

3.3.1 Task Comprehension and Theory of Mind (Control Questions)

Nearly all children passed the Controls in Belief-Emotion (97.1%), Contents False Belief (97.7%), and Knowledge Access (96.6%) (see also Table 3.12). 9 out of 10 passed in Explicit False Belief (91.4%), Appearance-Reality (90.3%), and Hidden Emotion (90.9%). However, Location False Belief (85.1%) had a lower pass rate. This was largely due to preschoolers, of whom only 60% passed the Control Questions in this task, which then increased to complete or nearly complete passing (≥ 93.5%) for primary schoolers.

The mean pass rate (92.7%) approaches Dixson's (95%) (2016). On average, participants passed Control Questions on 6.5 out of 7 tasks (mean = 6.49, SD = 1.02), and this score increased with age, with a moderate-to-large effect (see Table 3.8).

3.3.2 Theory of Mind Performance (Target Questions)

A clear majority passed the Target Questions in Diverse Desires (78.9%), Appearance-Reality (74.1%), Knowledge Access (72.8%), and Belief-Emotion (72.4%) (see also Table 3.12). However, only just under half passed Diverse Beliefs (45.7%) and Location False Belief (45.0%). Only a small minority passed Explicit False Belief (28.8%), Hidden Emotion (15.7%) and Contents False Belief (11.7%). 5-year-olds were more likely to pass than 4-year-olds in Location and Contents False Belief but had similar or even lower pass rates in Explicit False Belief and Appearance-Reality (see Table 3.6 and Fig. 3.2). In all these cases, the 95% confidence intervals of the odds ratios either overlapped 1 or could not be calculated (which was the case in Location False Belief where none of the 4-year-olds passed), indicating null effects (see Table 3.6). For 4- and 5-year-olds, pass rates stagnated below the 50% mark in Location, Explicit, and Contents False Belief. However, in both groups, a slight majority passed Appearance-Reality (~60%), and pass rates on Belief-Emotion crossed the 50% mark between the ages of 4 and 5 (40.0% to 63.6%), although the size of the effect was small.

Children's age trajectories differed considerably between the individual False Belief tasks. The odds of passing Explicit and Contents False Belief either did not increase with age or only at negligible levels, with confidence intervals overlapping 1 (see Table 3.7 and Fig. 3.3); pass rates for all ages stagnated below 50%. However, the odds of passing Location False Belief, Appearance-Reality, and Belief-Emotion increased with age (see Table 3.7 and Fig. 3.3 and 3.4). In Location False Belief, children's performance remained under the 50% mark until the age of 8, but most 9-11-year-olds passed (75.0%). In Appearance-Reality, around half of 3-4-year-olds passed (54.6%) and this increased gradually to a strong majority of 9-11-year-olds (90%). In Belief-Emotion, few 3-4-year-olds passed, but this increased to a majority of 5-8-year-olds (70.8-75.4%) and a strong majority of 9-11-year-olds (95%). The odds of passing also increased with age in some of the other tasks (see Table 3.7 and Fig. 3.4) such as Knowledge Access, where over half of 3-6-year-olds passed, and this increased further to a strong majority of 9-11-year-olds (95%). Other tasks had a stagnant trajectory. In Diverse Desires, all ages passed at high rates (≥ 71.0%), including the youngest cohorts, and the confidence interval was

consistent with a null effect. In Diverse Beliefs, pass rates only took off among older children: 3-8-year-olds passed at rates of below 50% before increasing to a majority of 9-11-year-olds (70%) (see Table 3.7). Finally, Hidden Emotion had a negative trajectory, where being older was associated with lower odds of passing: half of 3-4-year-olds passed (likely due to chance), but this *decreased* to very low levels for older children.

On average, participants passed 4.5 Target Questions out of 9 (mean = 4.65, SD = 1.70), and this summary score increased with age (see Table 3.8). On average, participants only passed 2.5 False Belief tasks out of 5 (mean = 2.46, SD = 1.17), but this too increased with age (see Table 3.8), although in both cases effect sizes were small-to-medium. As performance in Location False Belief, Appearance-Reality, and Belief-Emotion increased with age, I performed a post-hoc analysis to examine whether children's performance was consistent across those tasks. Passing Location False Belief slightly increased the odds of passing Appearance-Reality, but the confidence interval was consistent with a null effect, with a stronger effect for Belief-Emotion (see Table 3.9). Passing Appearance-Reality slightly increased the odds of passing Belief-Emotion, although again confidence intervals overlapped 1 (see Table 3.9). Girls and boys passed most tasks at very similar rates (see Table 3.10). In all tasks except Knowledge Access, confidence intervals were consistent with null effects (see Table 3.10).

Table 3.6: Comparison of 4-and 5-year-olds on False Belief (Target Questions)

Fisher Test

Task	% Pass Age 4	% Pass Age 5	OR [95% CI]	p	n*	df
Location False Belief	0.0%	23.1%	Inf [0.26, Inf]	0.56	32	1
Explicit False Belief	33.3%	20.0%	0.51 [0.11, 2.52]	0.47	50	1
Contents False Belief	5.9%	9.1%	1.59 [0.12, 89.13]	1	50	1
Appearance-Reality	60.0%	60.7%	1.03 [0.17, 5.58]	1	38	1

χ^2-Test

Task	% Pass Age 4	% Pass Age 5	χ^2	phi	p	n*	df
Belief-Emotion	40.0%	63.6%	1.48	0.22	0.22	48	1

*n = Number of participants in the subset who passed the relevant Control Questions.

Fig. 3.2: False Belief Target Question Pass Rates of 4- and 5-Year-Olds (Tasks 1-4 and 9).

Fig. 3.3: Target Question Pass Rate by Task and Age Group (Tasks 1-4 and 9).

Fig. 3.4: Target Question Pass Rate by Task and Age Group (Tasks 5-8).

Table 3.7: Effect of Age on Theory of Mind (Target Questions)

	Pass Rates by Age Group					Logistic Regressions (df = 1)	
Task	**3-4**	**5-6**	**7-8**	**9-11**	**n**	**OR [95% CI]**	**p**
LFB	14.3%	36.4%	46.3%	75.0%	149	1.43 [1.14, 1.82]	0.003
EFB	37.5%	25.0%	31.2%	26.3%	160	0.99 [0.79, 1.22]	0.91
CFB	5.6%	6.3%	15.9%	20.0%	171	1.29 [0.96, 1.76]	0.09
AR	54.6%	62.1%	82.6%	90.0%	158	1.55 [1.20, 2.03]	0.001
DD	84.2%	83.6%	71.0%	85.0%	175	0.83 [0.66, 1.04]	0.11
DB	42.1%	46.3%	39.1%	70.0%	175	1.10 [0.91, 1.32]	0.34
KA	66.7%	58.5%	81.2%	95.0%	169	1.52 [1.20, 1.95]	< 0.001
HE	50.0%	15.5%	14.5%	0.0%	159	0.60 [0.40, 0.80]	< 0.001
BE	37.5%	70.8%	75.4%	95.0%	170	1.48 [1.18, 1.90]	0.001

Table 3.8: Effect of Age on Summary Scores (Target and Controls)

	Spearman Correlation			Descriptive Statistics: mean (SD)				
				Age Groups				
Outcome	**r_s**	**p**	**n**	**3-4**	**5-6**	**7-8**	**9-11**	**Total**
Controls	0.49	< 0.001	175	5.00 (1.63)	6.40 (1.02)	6.86 (0.35)	6.95 (0.22)	6.49 (1.02)
Target	0.24	0.008	124	3.60 (0.55)	4.29 (1.29)	4.64 (1.94)	5.68 (1.45)	4.65 (1.70)
False Bel.Target	0.31	< 0.001	131	1.33 (0.82)	2.19 (0.97)	2.58 (1.29)	3.11 (0.94)	2.46 (1.17)

Table 3.9: Relationships between False Belief Tasks (Target Questions) – Logistic Regressions

Predictor	**Outcome**	**OR [95% CI]**	**p**	**n**
LFB	AR	1.80 [0.82, 4.10]	0.15	143
	BE	2.36 [1.09, 5.42]	0.03	149
AR	BE	2.06 [0.92, 4.53]	0.07	156

Table 3.10: Effect of Sex on Theory of Mind (Target Questions)

	Descriptive Statistics			Logistic Regressions			
	Pass Rates by Sex			Sex (M.) (df = 1)		Sex-Age Interactions (df = 3)	
Task	**Female**	**Male**	**n**	**OR [95% CI]**	**p**	**OR [95% CI]**	**p**
LFB	42.9%	46.8%	149	1.17 [0.61, 2.25]	0.63	1.15 [0.71, 1.85]	0.58
EFB	26.8%	30.8%	160	1.21 [0.61, 2.42]	0.58	1.36 [0.88, 2.13]	0.17
CFB	13.8%	9.5%	171	0.66 [0.25, 1.68]	0.39	0.85 [0.46, 1.59]	0.60
AR	76.9%	71.3%	158	0.74 [0.36, 1.52]	0.42	0.77 [0.44, 1.31]	0.34
DD	78.9%	78.8%	175	1.00 [0.48, 2.07]	0.99	0.77 [0.47, 1.22]	0.27
DB	42.2%	49.4%	175	1.34 [0.74, 2.43]	0.34	1.01 [0.69, 1.48]	0.96
KA	82.8%	62.2%	169	0.34 [0.16, 0.69]	0.003	1.03 [0.61, 1.71]	0.91
HE	12.5%	19.0%	159	1.64 [0.69, 4.02]	0.26	1.54 [0.78, 3.27]	0.23
BE	73.3%	71.4%	170	0.91 [0.46, 1.79]	0.79	1.39 [0.86, 2.29]	0.19

3.3.3 Mental State Talk (Justification Questions)

3.3.3.1 Fact Belief Statements

In most tasks, only few children used Fact Belief statements, with exceedingly low numbers in Location False Belief (1.3%), Explicit False Belief (9.4%), Diverse Beliefs (17.1%), and Belief-Emotion: Question 1 (15.9%), the only exception being Belief-Emotion: Question 2 (26.5%) (see also Table 3.12). In most tasks, the odds of using this type of mental state talk increased with age, although the strength of this effect differed across tasks (see Table 3.11 and Fig. 3.5). In Explicit False Belief, Fact Belief statements were nearly absent among 3-6-year-olds and increased only slightly for older children (10.5-18.0%). In Belief-Emotion: Question 1, Fact Belief statements were absent among 3-4-year-olds and only a minority of 9-11-year-olds (30.0%) used them. This was different in Diverse Beliefs and Belief-Emotion: Question 2 (see Table 3.11 and Fig. 3.5). In Diverse Beliefs, the use of Fact Belief increased substantially with age, from very low numbers in 3-6-year-olds to over a half of 9-11-year-olds (55.0%). In Belief-Emotion: Question 2, Fact Belief statements were absent from 3-4-year-olds, but increased to a half in 9-11-year-olds (50.0%). At the other end of the spectrum, in Location False Belief, Fact Belief statements stagnated near the bottom for all ages and the confidence interval overlapped 1, showing a null effect.

Fact Belief statements were always outnumbered by alternative responses. This was the case for 'correct' alternative responses that did not include Fact Belief statements (see Table 3.12), such as Previous Location explanations in Location False Belief (20.1%) and Desire Terms in Belief-Emotion: Question 1 (30%). Situational References also outnumbered Fact Belief statements in all tasks (Location False Belief: 15.4%; Explicit False Belief: 33.8%; Diverse Beliefs: 32.6%; Belief-Emotion: Question 1: 20.6%; Question 2: 36.5%). In some cases, incorrect Justifications – i.e., answers that are consistent with not possessing False Belief understanding (see Table 3.5) - outnumbered correct ones (True Location in Location False Belief (35.6%) and Explicit False Belief (32.5%); Belief-Reality Confusion in Diverse Beliefs (29.1%)). Belief-Emotion was the only exception from this pattern as True Contents explanations were very rare (Question 1: 5.9%).

Fig. 3.5: Increase of Fact Belief Statements with Age (Tasks 1, 2, 6, 9).

3.3.3.2 Perceptual Access

Children's use of Perception Criterion statements differed considerably between tasks (see Table 3.12). Only few children mentioned Perception Criteria in Contents False Belief (13.5%) and Appearance-Reality (19%), but just over half used this response in Knowledge Access (53.3%). The odds of using Perception Criterion increased with age in all tasks, although again, effect sizes differed between tasks (see Table 3.11 and Fig. 3.6). In Contents False Belief, Perception Criterion answers were very uncommon among 3-6-year-olds, but then increased to just under half of 9-11-year-olds (45%). In Appearance-Reality, the use of Perception Criterion increased from low numbers in 3-6-year-olds to a fourth in older children (25-26.1%). In Knowledge Access, Perception Criterion was absent in 3-4-year-olds, but then increased to a majority of 7-8-year-olds (72.5%) and 9-11-year-olds (95%).

Contents False Belief, where most participants had failed the Target Question, had a higher share of 'incorrect' justifications (i.e. True Contents and Identity explanations; 20.5%) than Appearance-Reality (5.7%) and Knowledge Access (16.6%), and a lower share of alternative 'correct' Justifications (External Characteristics; 6.4%), which were more common in Appearance-Reality (25.9%) (see Table 3.12). Furthermore, Contents False Belief also showed a high number of ambiguous or difficult-to-interpret responses (such as No answer, Factual Errors, Contradictions, Reiterations etc). In this task, 1 in 4 participants declined to answer the Justification (26.9%), 1 in 7 constructed Own Reference Frames (14%), and other difficult-to-interpret responses made up nearly 1 in 5 of the remaining responses (18.7%). As a result, over half of the Justifications on this task were ambiguous (59.6%) (!). In contrast, Own Reference Frames were very uncommon in Knowledge Access (5.9%), a smaller number of participants declined to answer the question (11.2%), and all other unclear responses made up only 13% combined. Appearance-Reality also had fewer No answer responses (17.7%) and Own Reference Frames (10.1%), and a lower percentage of further unclear or contradictory responses (21.6% combined).

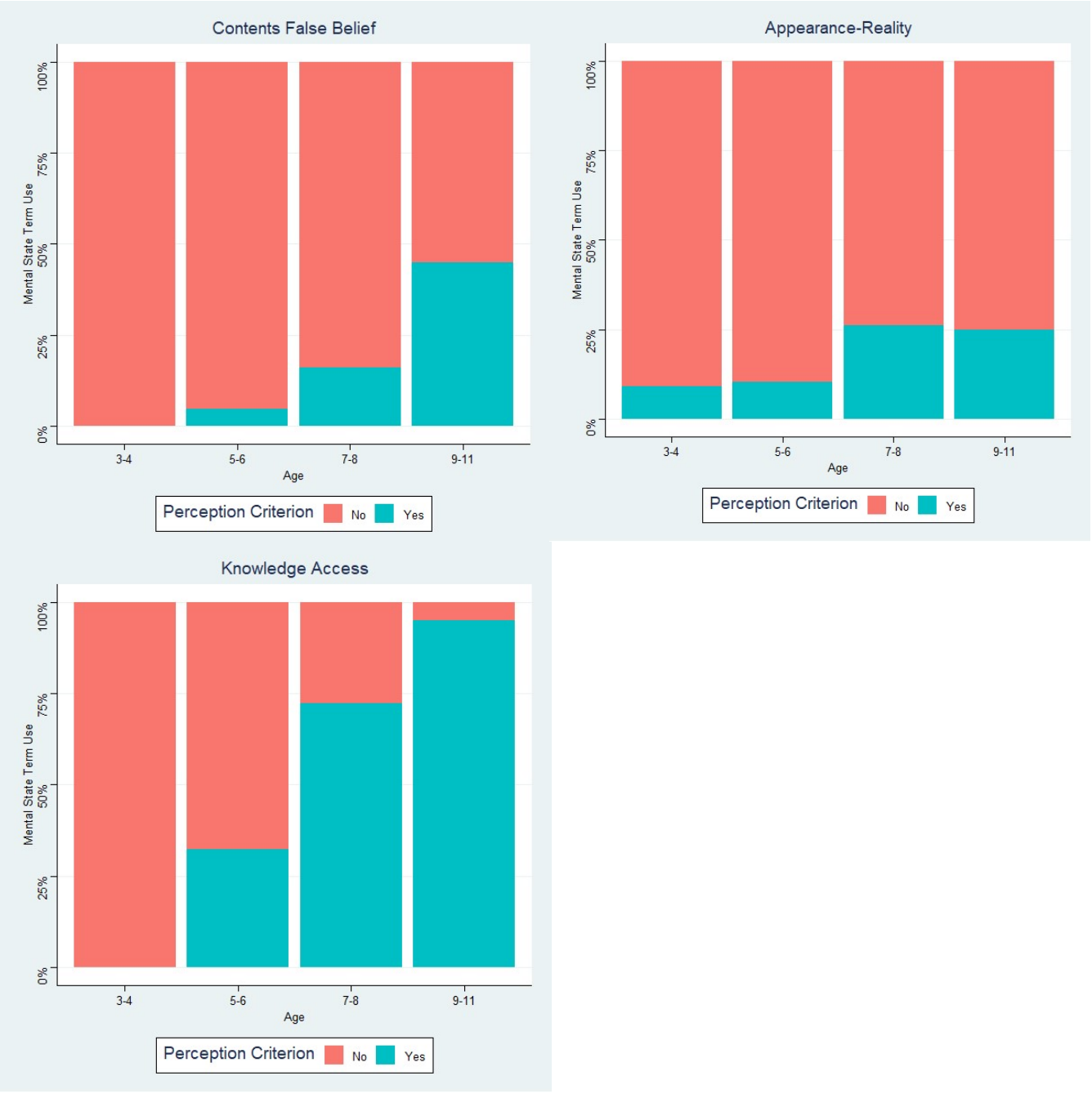


Fig. 3.6: Increase of Perception Criterion Statements with Age (Tasks 3, 4, 7).

3.3.3.3 Emotions and Desires

In Diverse Desires, a plurality mentioned Desire Terms (40%), and the odds of using this type of mental state talk increased with age (see Table 3.11 and Fig. 3.7). While Desire Terms were very uncommon among 3-4-year-olds, they increased gradually until age 7-11, where just over half used them (53.6-55%). Conversely, responses mentioning External Characteristics of the food items (14.3%) and Value Judgments (8.6%) were less common, as were Situational References (16.6%) (see Table 3.12). In Hidden Emotion, answers referring to Hidden Intentions were very rare and the confidence interval overlapped 1, indicating a null effect for age (see Table 3.11 and Fig. 3.7). In contrast, answers mentioning Emotion Terms (32.1%) and Situational References (47.8%) were much more common (see Table 3.12).

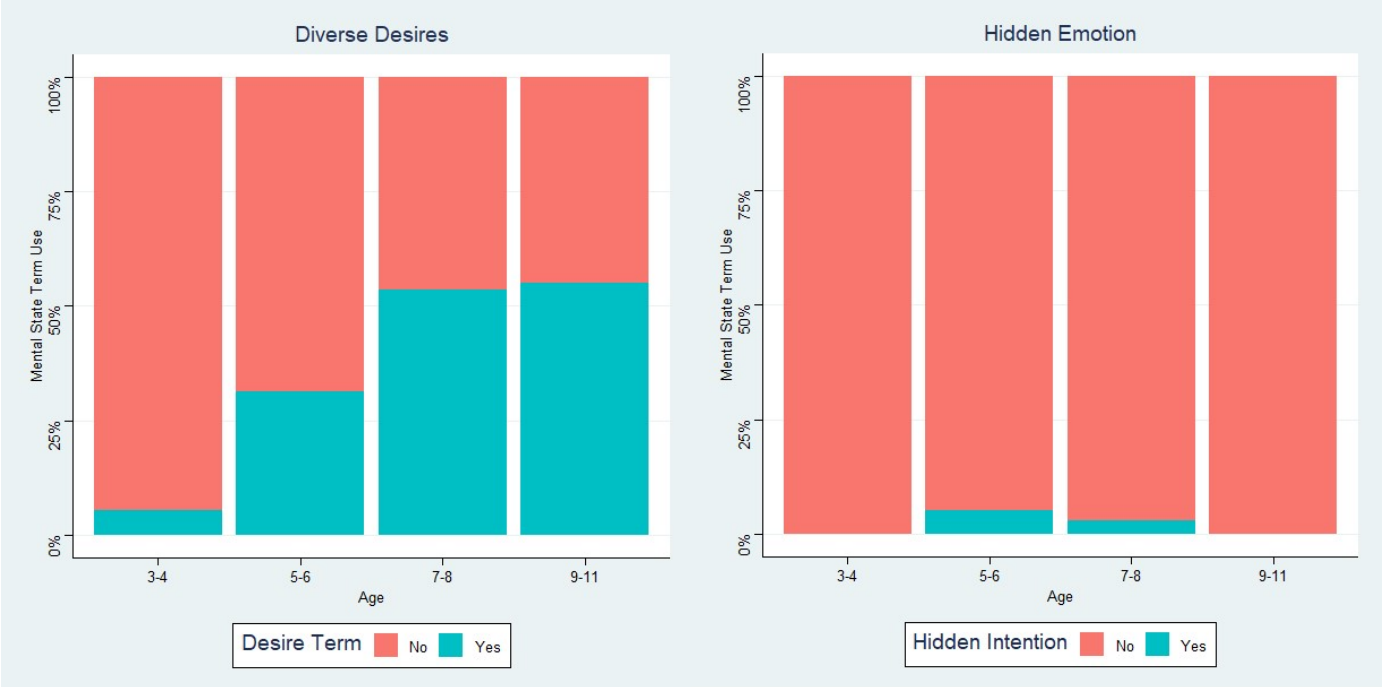


Fig. 3.7: Increase of Desire Terms and Hidden Intention Statements with Age (Tasks 5, 8).

Table 3.11: Effect of Age on Mental State Talk (Justifications)					
Descriptive Statistics		**Use by Age Group**			
Task	**Type**	**3-4**	**5-6**	**7-8**	**9-11**
Location False Bel.	Fact Belief	0.0%	1.8%	1.5%	0.0%
	Previous Loc.	0.0%	3.6%	26.9%	50.0%
Explicit False Belief	Fact Belief	0.0%	3.1%	18.0%	10.5%
Contents False Bel.	Perception Crit.	0.0%	4.7%	15.9%	45.0%
	External Char.	0.0%	1.6%	13.0%	5.0%
Appearance-Reality	Perception Crit.	9.1%	10.3%	26.1%	25.0%
	External Char.	0.0%	10.3%	34.8%	55.0%
Diverse Desires	Desire Term	5.3%	31.3%	53.6%	55.0%
Diverse Beliefs	Fact Belief	0.0%	6.0%	21.7%	55.0%
Knowledge Access	Perception Crit.	0.0%	32.3%	72.5%	95.0%
Hidden Emotion	Hidden Intention	0.0%	5.2%	2.9%	0.0%
Belief-Emotion 1	Fact Belief	0.0%	12.3%	18.8%	30.0%
	Desire Term	31.3%	41.5%	20.3%	25.0%
Belief-Emotion 2	Fact Belief	0.0%	18.5%	33.3%	50.0%
	Desire Term	12.5%	15.4%	5.8%	0.0%
Logistic Regressions (df = 1)					
Task	**Type**	**OR [95% CI]**		**p**	**n**
Location False Bel.	Fact Belief	0.82 [0.29, 2.10]		0.68	149
	Previous Loc.	2.38 [1.67, 3.62]		< 0.001	149
Explicit False Belief	Fact Belief	1.64 [1.16, 2.43]		0.008	160
Contents False Bel.	Perception Crit.	2.14 [1.52, 3.20]		< 0.001	171
	External Char.	1.50 [1.01, 2.32]		0.05	171
Appearance-Reality	Perception Crit.	1.33 [1.02, 1.76]		0.04	158
	External Char.	2.00 [1.51, 2.75]		< 0.001	158
Diverse Desires	Desire Term	1.58 [1.28, 1.98]		< 0.001	175
Diverse Beliefs	Fact Belief	2.33 [1.69, 3.42]		< 0.001	175
Knowledge Access	Perception Crit.	2.82 [2.11, 3.95]		< 0.001	169
Hidden Emotion	Hidden Intention	0.85 [0.46, 1.53]		0.60	159
Belief-Emotion 1	Fact Belief	1.36 [1.04, 1.81]		0.03	170
	Desire Term	0.86 [0.69, 1.06]		0.16	170
Belief-Emotion 2	Fact Belief	1.71 [1.34, 2.23]		< 0.001	170
	Desire Term	0.70 [0.48, 0.99]		0.05	170

Table 3.12: Frequency of Response Categories by Task										
	LFB	**EFB**	**CFB**	**AR**	**DD**	**DB**	**KA**	**HE**	**BE**	
Controls Pass	85.1%	91.4%	97.7%	90.3%	-	-	96.6%	90.9%	97.1%	
Target Pass	45.0%	28.8%	11.7%	74.1%	78.9%	45.7%	72.8%	15.7%	72.4%	
Justifications	**LFB**	**EFB**	**CFB**	**AR**	**DD**	**DB**	**KA**	**HE**	**BE1**	**BE2**
None	19.5%	16.9%	26.9%	17.7%	14.3%	8.0%	11.2%	6.9%	6.5%	7.1%
Unintelligible	-	0.6%	0.6%	-	-	-	-	-	-	-
Don't Know	2.0%	0.6%	1.2%	-	1.7%	1.7%	0.6%	1.3%	1.2%	1.2%
Uninterpretable	0.7%	-	7.0%	7.6%	2.3%	1.7%	2.4%	2.5%	7.1%	5.9%
Reiteration	-	0.6%	5.3%	3.8%	1.1%	2.3%	9.5%	3.1%	1.8%	0.6%
Own Ref. Fr.	0.7%	2.5%	14.0%	10.1%	-	2.9%	5.9%	1.3%	4.1%	1.2%
Contradiction	-	0.6%	4.7%	3.2%	-	1.7%	0.6%	1.3%	-	-
Factual Error	4.7%	2.5%	-	6.3%	1.1%	1.1%	-	-	1.8%	1.8%
External Char.	-	-	6.4%	25.9%	14.3%	-	-	-	0.6%	-
Value Judg.	-	-	-	-	8.6%	-	-	0.6%	-	-
Gen. Know.	-	-	-	0.6%	-	1.1%	-	-	-	0.6%
Situational Ref.	15.4%	33.8%	-	-	16.6%	32.6%	-	47.8%	20.6%	36.5%
Desire Term	-	-	-	-	40.0%	-	-	-	30.0%	9.4%
Perception Crit.	-	-	13.5%	19.0%	-	-	53.3%	-	4.7%	9.4%
True Location	35.6%	32.5%	20.5%	5.7%	-	-	16.6%	-	5.9%	-
Prev. Location	20.1%	-	-	-	-	-	-	-	-	-
Fact Belief	1.3%	9.4%	-		-	17.1%	-	-	15.9%	26.5%
Emotion Term	-	-	-	-	-	-	-	32.1%	-	-
Hidden Intent.	-	-	-	-	-	-	-	3.1%	-	-
Bel.-Real. Conf.	-	-	-	-	-	29.1%*	-	-	-	-

*Some (0.6%) gave a response that matched both Belief-Reality Confusion and Factual Error.

3.3.3.4 Summary Scores and Gender Effects

On average, participants scored 5 points out of 18 (mean = 5.23, SD = 3.70) across all tasks, and point scores increased substantially with age, which was associated with a large effect (see Table 3.13). On the False Belief tasks, children scored very low, on average only scoring 2.5 points out of 10 (mean = 2.50, SD = 2.12), although this too increased with age, showing a large effect (see Table 3.13). Due to the differences in observed trajectories, I again performed post hoc analyses to examine whether children's use of Fact Belief statements was consistent across tasks. Using Fact Belief statements in Explicit False Belief substantially increased the odds of using Fact Belief statements in Diverse Beliefs and Belief-Emotion: Question 1 (see Table 3.14). A different pattern was found for Belief-Emotion: Question 2, where the confidence interval overlapped 1, indicating a null effect. Using Fact Belief statements in Location False Belief increased the odds of using this type of mental state talk in Diverse Beliefs and Belief-Emotion: Question 1, but again the confidence interval for Belief-Emotion: Question 2 was consistent with a null effect (see Table 3.14). Girls and boys used mental state talk at

similar rates; while boys had slightly lower odds of using most types of mental state talk, confidence intervals were consistent with null effects for sex (see Table 3.15).

Table 3.13: Effect of Age on Summary Scores (Justifications)

	Spearman Correlation			Descriptive Statistics: mean (SD)				
				Age Groups				Total
Outcome	**r_s**	**p**	**n**	**3-4**	**5-6**	**7-8**	**9-11**	
Overall	0.57	< 0.001	124	0.20 (0.45)	3.34 (2.74)	6.07 (3.71)	8.00 (2.65)	5.23(3.70)
False Belief	0.53	< 0.001	131	0.17 (0.41)	1.49 (1.32)	3.05 (2.27)	4.00 (1.91)	2.50(2.12)

Table 3.14: Relationships between Fact Belief Statements of Different Tasks– Logistic Regressions

Predictor	Outcome	OR [95% CI]	p	n
EFB	DB	13.26 [4.25, 46.67]	< 0.001	160
	BE 1	4.59 [1.40, 14.35]	0.009	157
	BE 2	1.96 [0.62, 5.83]	0.23	157
LFB	DB	4.25 [0.16, 109.70]	0.31	149
	BE 1	3.80 [1.17, 11.76]	0.02	149
	BE 2	1.81 [0.57, 5.40]	0.29	149

Table 3.15: Effect of Sex on Mental State Talk

		Descriptive Stat.		Logistic Regressions				
		Use by Sex		Sex (M.) (df = 1)		Sex-Age Interactions (df = 3)		
Task	**Type**	**Female**	**Male**	**OR [95% CI]**	**p**	**OR [95% CI]**	**p**	**n**
LFB	Fact Belief	1.4%	1.3%	0.88 [0.03, 22.65]	0.93	0.74 [0.10, 5.67]	0.76	149
EFB	Fact Belief	7.3%	11.5%	1.65 [0.57, 5.15]	0.36	1.31 [0.62, 2.90]	0.48	160
CFB	Perception	16.1%	10.7%	0.63 [0.25, 1.52]	0.31	1.34 [0.62, 3.20]	0.47	171
AR	Perception	23.1%	15.0%	0.59 [0.26, 1.31]	0.20	1.76 [0.99, 3.34]	0.06	158
DD	Desire	44.4%	35.3%	0.68 [0.37, 1.25]	0.22	0.96 [0.62, 1.48]	0.85	175
DB	Fact Belief	17.8%	16.5%	0.91 [0.41, 2.01]	0.82	2.01 [0.95, 4.84]	0.09	175
KA	Perception	60.9%	45.1%	0.53 [0.28, 0.97]	0.04	0.93 [0.48, 1.77]	0.81	169
HE	Intention	1.3%	5.1%	4.21 [0.61, 83.43]	0.20	2.04[0.45,20.01]	0.41	159
BE 1	Fact Belief	16.3%	15.5%	0.94 [0.41, 2.15]	0.89	2.89 [1.53, 6.11]	0.002	170
BE 2	Fact Belief	27.9%	25.0%	0.86 [0.43, 1.70]	0.67	1.40 [0.84, 2.41]	0.21	170

3.3.4 Consistency between Target Questions and Justifications

Passing the Target Questions substantially increased the odds of using Fact Belief statements in most tasks (see Table 3.16). The only exception was Location False Belief, where the confidence interval was consistent with a null effect. In that task, Target Question performance was instead strongly predictive of children's tendency to use Previous Location explanations. Passing the Target Question also substantially increased the odds of using Perception Criterion in Knowledge Access, but the same was not found in Contents False Belief and Appearance-Reality, where confidence intervals were consistent with a null effect. In those tasks, Target Question performance was instead more strongly predictive of children's tendency to use External Characteristics references. Passing the Target Question was also associated with substantially higher odds of using Hidden Intention statements in Hidden Emotion. Finally, passing the Target Question slightly increased the odds of using Desire Terms in Diverse Desires, but again, confidence intervals were consistent with a null effect.

Table 3.16: Effect of Theory of Mind (Target Questions) on Mental State Talk (Justifications)

		Descriptive Statistics			Logistic Regressions (df = 1)	
Task	**Type**	**% TOM Fail***	**% Pass***	**n**	**OR [95% CI]**	**p**
LFB	Fact Belief	1.2%	1.5%	149	1.23 [0.05, 31.43]	0.89
	Previous Loc.	1.2%	43.3%	149	61.81 [12.49, 1121.89]	< 0.001
EFB	Fact Belief	0.9%	30.4%	160	49.45 [9.40, 912.95]	< 0.001
CFB	Perception	12.6%	20.0%	171	1.74 [0.46, 5.35]	0.37
	External Char.	1.3 %	45.0%	171	60.95 [13.76, 434.63]	< 0.001
AR	Perception	14.6%	20.5%	158	1.51 [0.60, 4.34]	0.41
	External Char.	12.2%	30.8%	158	3.20 [1.25, 9.90]	0.02
DD	Desire Term	29.7%	42.8%	175	1.77 [0.83, 3.99]	0.15
DB	Fact Belief	2.1%	35.0%	175	25.04 [7.14, 159.0]	< 0.001
KA	Perception	8.7%	69.9%	169	24.41 [9.07, 85.56]	< 0.001
HE	Intention	1.5%	12.0%	159	9.00 [1.42, 71.33]	0.02
BE 1	Fact Belief	2.1%	21.1%	170	12.33 [2.50, 223.44]	0.02
BE 2	Fact Belief	8.5%	33.3%	170	5.38 [2.00, 18.76]	0.003

*Refers to the % of children who had failed / passed the Target Question and then used the relevant mental state terms.

3.3.5 Language Effects

In the first testing session, most children had all tasks explained to them in Bislama (78.9%). In the second testing session, this percentage increased slightly (86.3%). The odds of choosing Bislama increased substantially with age as older children were more comfortable with Bislama (see Table 3.17). In some of the tasks, Bislama-instructed children had higher pass rates than Ngunese-instructed children, but models that

controlled for age usually did not significantly improve over the baseline, meaning that these trends were probably accounted for by the fact that younger children were more likely to choose Ngunese (see Table 3.18). Bislama-instructed children were more likely to use mental state talk, but again, models that controlled for age did not significantly improve over an age-only baseline in most tasks (see Table 3.19).

Table 3.17: Effect of Age on Choice of Bislama

Logistic Regressions

Session	OR [95% CI]	p	n
1	2.63 [1.89, 3.90]	< 0.001	175
2	3.10 [2.02, 5.28]	< 0.001	175

Descriptive Statistics: Choice of Bislama by Age Group

Session	3-4	5-6	7-8	9-11	Total
1	36.8%	68.7%	94.2%	100.0%	78.9%
2	47.4%	82.1%	97.1%	100.0%	86.3%

Table 3.18: Effect of Language on Theory of Mind (Target Questions)

	Descriptive Statistics		Likelihood Ratio Test (df = 2)		
Task	**% Pass Ngunese***	**% Pass Bislama**	**χ^2**	**p**	**n**
LFB	26.1%	48.4%	1.18	0.55	149
EFB	23.5%	30.2%	0.98	0.61	160
CFB	11.4%	11.8%	6.41	0.04	171
AR	64.0%	75.9%	3.08	0.21	158
DD	87.5%	77.5%	0.91	0.63	175
DB	50.0%	45.0%	1.08	0.58	175
KA	59.1%	74.8%	3.70	0.16	169
HE	44.4%	12.1%	5.97	0.05	159
BE	43.5%	76.9%	3.75	0.15	170

* % of Ngunese- / Bislama-instructed children who passed the Target Question.

Table 3.19: Effect of Language on Mental State Talk (Justifications)

	Descriptive Statistics			Likelihood Ratio Test (df = 2)		
Task	**Type**	**% Ngunese**	**% Bislama**	**χ^2**	**p**	**n**
LFB	Fact Belief	0.0%	1.6%	0.91	0.63	149
EFB	Fact Belief	0.0%	11.9%	3.64	0.16	160
CFB	Perception	2.9%	16.2%	0.86	0.65	171
AR	Perception	4.0%	21.8%	5.33	0.07	158
DD	Desire Term	4.2%	45.7%	9.20	0.01	175
DB	Fact Belief	0.0%	19.9%	2.04	0.36	175
KA	Perception	9.1%	59.9%	3.25	0.20	169
HE	Intention	0.0%	3.5%	1.73	0.42	159
BE 1	Fact Belief	0.0%	18.4%	5.43	0.07	170
BE 2	Fact Belief	0.0%	30.6%	6.77	0.03	170

* % of Ngunese- / Bislama-instructed children who used the relevant mental state terms.

3.4 Discussion

3.4.1 Summary of Results

Pass rates for most Control Questions were high, indicating that most children understood the premise of the tasks, although preschoolers were more likely to struggle with this aspect. Children's cumulative performance on Theory of Mind increased with age, but trajectories differed considerably between tasks, including between different tasks with a False Belief component. While children's performance in Explicit and Contents False Belief did not increase much with age, this was the case in Location False Belief, Appearance-Reality and Belief-Emotion. In Location False Belief, 75% passed at 9-11-years-old, and in the latter two tasks, 5-year-olds did not pass beyond 65%, and a more decisive increase to >90% occurred instead at 9-11 years. Therefore, even if Location False Belief, Appearance-Reality, and Belief-Emotion reflect ni-Vanuatu children's true Theory of Mind abilities better than Explicit and Contents False Belief, these results suggest a slower developmental trajectory when compared to Western populations, where normally developing children tend to pass classic False Belief tasks by 5 years of age. This is consistent with Heyes' idea that mind-reading (or at least the explicit, verbalized aspects of it) is culturally evolved (Heyes & Frith 2014; Heyes 2020). Conversely, even the youngest children passed Diverse Desires and Knowledge Access at high rates. This is consistent with Wellman and Woolley's (1990) suggestion that children understand desires before they understand beliefs. Accordingly, the results also indicate that there are some cross-cultural regularities in Theory of Mind development. This suggests that there may be some cognitive constraints that structure the ontogeny of mindreading across cultures, and that some mental state concepts are more easily acquired regardless of the socio-cultural context.

Children's cumulative mental state talk increased with age. However, children's tendency to engage in mental state talk varied depending on the specific mental state that was the subject of conversation, resulting in a higher incidence and steeper growth curve for Desire Terms than for Fact Belief statements in most tasks. In most tasks, Fact Belief statements were outnumbered by responses that referred to some general aspect of the situation (such as the fact that the animal was lost). In all Fact Belief tasks, Fact Belief statements were absent or nearly absent from the Justifications of 3-6-year-olds. While this remained true even for older children in Location False Belief, older children's tendency to engage in mental state talk increased in Belief-Emotion: Question 2 (where

a third of 7-8-year-olds and half of 9-11-year-olds made such statements) and Diverse Beliefs (over half of 9-11-year-olds). This is not consistent with the idea that children's cognition talk increases substantially during the preschool years (Ruffman, Slade & Crowe 2002; Suzuki & Nomura 2019). Conversely, just under a third of 5-6-year-olds used Desire Terms, and this increased to over a half by age 7-8. This is consistent with claims that Desire Terms precede Fact Belief talk across languages (Kristen et al. 2014). Again, this is consistent with the idea that, while timings differ, there are some cross-cultural regularities in the development of mental state communication due to shared cognitive constraints.

Children's responses in the Justifications were generally consistent with their performance in the Target Questions. Accordingly, children who responded correctly to the Target Questions were generally also more likely to use the relevant mental state terms. This is consistent with previous studies that found an association between children's understanding of Theory of Mind and mental state talk (Barreto et al. 2018). However, in ni-Vanuatu children this was only the case if no alternative, non-mentalizing yet 'correct' responses were available. Whenever it was possible to answer the Justification Question in a non-mentalizing way (e.g by referring to the Previous Location of the football), children's performance in the Target Questions was more strongly reflected in their use of these alternative justifications. This may suggest that ni-Vanuatu children actively avoid Fact Belief statements when possible. Gender had no consistent or only weak effects on children's mental state reasoning and verbalization, and language effects usually disappeared after controlling for age.

The low pass rates for the Target Questions in Explicit and Contents False Belief, both here and in Dixson (2016), probably do not reflect the true trajectory of False Belief understanding for ni-Vanuatu children. Over half of the Justifications in Contents False Belief were unclear or ambiguous, indicating that many participants may have misunderstood the purpose of that task. Furthermore, in tasks such as Belief-Emotion children not only passed the Target Questions but also communicated directedly about mental states at much higher rates than expected from their responses in low-performance tasks.

3.4.2 Comparison with Previous Findings

My findings are only partially consistent with Dixson's (2016). As in Dixson (2016), Diverse Desires, Appearance-Reality, Knowledge Access, and Belief-Emotion form a

block of tasks that is passed at higher rates than others. Conversely, the three designated False Belief tasks (Location False Belief, Explicit False Belief, and Contents False Belief) have lower pass rates, with Diverse Beliefs placed somewhere in the middle. However, the position of particular tasks varies between samples and studies (see Table 3.20). Accordingly, developmental sequences from common Theory of Mind scales do not just vary between distinct cultural groups, but also between different samples from the same cultural background.

Differences in False Belief performance are of particular interest. Among Dixson's (2016) urban participants, a majority (66%) passed Location False Belief by the age of 7. However, among rural children, even 9-year-olds only passed at just above chance levels (57%) and the figures were similar for older children and adolescents (56% for ages 13-14 and <50% for ages 10-12). Conversely, in this study, a clear majority of 9-11-year-olds passed this task (75%). Of particular interest are also Dixson's (2016) findings on Nguna island, which is located a short boat ride away from my own field site. Pass rates on the Location False Belief task (45%) were higher in my sample than in Dixson' (2016) Ngunese participants (26.9%), even though the latter also included adolescents (n = 52; ages 3-14). The pass rate in my sample was also higher than that of Ngunese adolescents (ages 12-14), nearly two thirds (61.5%) of whom failed. My results therefore do not support Dixson's (2016) contention that among rural ni-Vanuatu, even adolescents do not understand False Beliefs, and are more in line with findings from other non-Western populations, where children tend to pass False Belief tasks between 6-8 years of age (Naito & Koyama 2006; Mayer & Träuble 2012; Mayer & Träuble 2015).

As in Dixson's (2016) rural sample, Diverse Desires were passed before Knowledge Access and Knowledge Access was passed before Diverse Beliefs. However, the pattern I identified for these tasks most closely resembles the sequence found in Chinese and Iranian children (Wellman et al. 2006; Shahaeian et al. 2011) (see Table 3.21). As in Dixson (2016), Hidden Emotion came before Contents False Belief, and Contents False Belief came last. However, I only found a minor difference between those two tasks (15.7% for Hidden Emotion vs 11.7% for Contents False Belief). This contrasts sharply with Dixson's (2016) findings, where Hidden Emotion was passed at much higher rates (urban: 53.3%; rural: 60.2%) than Contents False Belief (urban: 31.8%; rural: 23.7%). Again, this partially reconciles my findings with results from Chinese and Iranian but also Western children, where Hidden Emotion follows after Contents False Belief, at least when only the developmental sequence itself is considered (Wellman et al. 2006;

Shahaeian et al. 2011). When only similarity in placement is considered (i.e. how many tasks occupy the same slot in the sequence), my findings resemble the trajectories in Chinese, Iranian, urban ni-Vanuatu, and rural ni-Vanuatu participants equally well, with three tasks in each occupying the same slot as in my sample. However, only Chinese, Iranian, and urban ni-Vanuatu share a partial trajectory of three tasks in the exact same order and placement with my sample (Wellman et al. 2006; Shahaeian et al. 2011; Dixson 2016).

Finally, ni-Vanuatu children's tendency to prefer Situational References over Fact Belief statements mirrored some trends observed in Japanese children, who prioritize information about people's behaviours, social rules, and situational cues over beliefs and desires (Naito & Koyama 2006). However, ni-Vanuatu children's tendency to refrain from mental state talk was not uniform, and children were much more likely to talk about wants and desires than about beliefs.

Table 3.20: Comparison of Performance in Theory of Mind Scales in ni-Vanuatu Children (All Tasks)

Sample	Scale
Dixson: urban (N = 258, ages 4 - 9)	KA (88.8%) > DD (86.9%) > AR (72%) & BE (72%) > DB (64.5%) > EFB (54.2%) > HE (53.3%) > LFB (51.4%) > CFB (31.8%)
Dixson: rural (N = 187, ages 4 - 14)	DD (94.1%) > KA (84.7%) > AR (74.6%) > BE (66.1%) > HE (60.2%) > DB (50.8%) > EFB (49.2%) > LFB (41.5%) > CFB (23.7%)
Current Study (N = 175, ages 3 - 11)	DD (78.9%) > AR (74.1%) > KA (72.8%) > BE (72.4%) > DB (45.7%) > LFB (45%) > EFB (28.8%) > HE (15.7%) > CFB (11.7%)

Table 3.21: Comparison of Sequential Attainment in Theory of Mind Scales Across Cultures (Tasks 3, 5, 6, 7, and 8)

Sample	Scale	Source
US & Australia	**DD** > DB > KA > CFB > HE	Wellman et al. (2006); Shahaeian et al. (2011)
China & Iran	**DD > KA > DB** > CFB > HE	Wellman et al. (2006); Shahaeian et al. (2011)
Dixson Vanuatu Urban	KA > DD > **DB > HE > CFB**	Dixson (2016)
Dixson Vanuatu Rural	**DD > KA** > HE > DB > **CFB**	Dixson (2016)
Current Study	**DD > KA > DB > HE > CFB**	

3.4.3 Explanations for Cross-Cultural Variation in Theory of Mind Development

Why should the developmental trajectory in ni-Vanuatu children differ from that in other cultures? The fact that children prioritized Situational References over Fact Belief

statements in most relevant tasks is consistent with the idea that Pacific Islanders consider the mind to be opaque and therefore avoid mentalizing (Robbins & Rumsey 2008). However, if mentalizing were indeed subject to a sweeping taboo of this kind, then all types of mental state talk should be affected equally.

Another possibility is that the observed differences are caused by cross-cultural differences in child-rearing practices and caregiver communication. Evidence on between-individual variation in Western countries suggests that child-rearing practices affect children's developing Theory of Mind. Caregivers who engage in more and more diverse mental state talk, and especially those who communicate more about thoughts and beliefs, have children with improved Theory of Mind performance, including False Belief understanding (Ruffman, Slade & Crowe 2002; Tompkins et al. 2018). Likewise, mothers who discipline children by encouraging them to reflect on mental states ("How did that make your father feel?") have children with improved mental state reasoning (Pears & Moses 2003). These correlations hold for populations from a range of different ethnic and cultural backgrounds. For example, among Pacific Islander families living in New Zealand, caregivers' use of mental state talk, expressed in their use of desire, cognition, and emotion terms, also predicted their children's Theory of Mind (Taumoepeau 2015). Conversely, discipline strategies that rely on intimidation and power assertions, such as yelling, appealing to the parent's natural authority, and beatings, have an adverse effect (Pears & Moses 2003). Data from China indicate that training children to talk more about others improves their Theory of Mind performance (Lu, Su & Wang 2008). Caregivers' mental state talk in turn contributes to children's prosocial behaviour and social competence (Drummond et al. 2014; Bekar et al. 2018), although these effects may not translate to cultures where people conceive of prosociality as adherence to kin obligations (as opposed to respecting other people's personal feelings).

Differences in caregiver communication and mental state language have also been documented on the cross-cultural level. For example, Japanese mothers engage in less mental state talk than English-speaking mothers and so do their children, which may be a factor in Japanese children's slower development of Theory of Mind (Suzuki & Nomura 2020). Furthermore, Junín Quechua children's failure to pass False Belief tasks has been attributed to the relative lack of mental state vocabulary in their native language (Vinden 1996). During my stay in North Efate, I did not encounter many instances of abstract communication or cognition talk between adults and children. More commonly, children were instructed through direct commands, by stressing the importance of submitting to

the authority of their elders, reminders about social norms and obligations, and corporal punishment (see also Chapter 2 for ethnographic context).

These child-rearing practices may in turn be related to characteristics of the local value system and the role that mental states play in it. Dixson (2016) has suggested that the 'holistic' orientation of ni-Vanuatu and other Melanesian cultures contrasts starkly with the more 'individualistic' values prevalent in Western societies, and that this may explain children's performance. This idea ties into the notion of 'individualistic' and 'kinship-intensive' cultures, and that 'individualistic' cultures place a greater emphasis on a person's mental states when making moral judgments about them (Barrett et al. 2016; McNamara et al. 2019; Curtin et al. 2020). In my own experience living in North Efate, ni-Vanuatu communities emphasize social harmony, unity, consensus, and the structural roles and obligations that tie individuals to their corporate kin groups (see also Chapter 2 for ethnographic context). Specifically, ni-Vanuatu communities, and presumably other 'consensus' cultures as well, value the suppression of tension, conflict, and anti-social sentiments, but also of open defiance and criticism of authority figures. Conflicts are often handled during family meetings, and these meetings aim to terminate disagreements and produce consensus. As a result, there is a cultural bias against being a *stronghed*, or a person who just follows their own thinking, defying social norms, obligations, and authority. Children have many opportunities to absorb these messages, not just in their homes but also in church and school and during village feasts and other social occasions. This may encourage children to prioritize social relationships and situational cues, and not the minds of individuals, when they reason about social situations. The most polemical conclusion one might draw from this is that 'better' Theory of Mind, as measured in the pass rates of Target Questions and the tendency to use mental state talk, merely represents similarity to 'WEIRD' forms of thinking about human behaviour.

3.4.4 Explanations for Differences between Tasks

However, it remains unclear why ni-Vanuatu children's performance should differ so starkly between the different False Belief tasks, and why some should produce such low estimates that are contradicted by children's Theory of Mind performance and mental state communication in other tasks. These disparities differ from findings in US children, who pass Explicit and Contents False Belief and Belief-Emotion at similar rates (Wellman & Liu 2004). One reason might be that some of the responses were motivated

by idiosyncratic interpretations of the scenarios that are difficult to control for. After all, cognitive assessments of the kind performed for this study are inherently social situations. In addition to processing the content of the tasks, children are likely to also process, reason about, or intuit the goals and motivations of the experimenter. As a result, children may be as likely to make assumptions about what is going on in the mind of the experimenter as they are to infer the mental states of the characters in the story. This might interfere with the straightforward, face-value reading of the experimental scenarios intended in the research design and is particularly difficult to account for in the cross-cultural application of test protocols. Specifically, it might be that unlike Western children, ni-Vanuatu children (falsely) intuit that the experimenter wants to hear what the characters *should* do to obtain a successful outcome (e.g. to find the animal), or that the experimenter is testing them on what the *correct* course of action would be for a character.

If true, this explanation suggests that ni-Vanuatu children struggle with the 'as if' nature of the testing situation, and as a result are preoccupied with trying to anticipate the experimenter's intentions, which may be compounded by a lack of familiarity with hypothetical scenarios. If true, then the setting the experiment was performed in may have motivated the children to interpret the task in this manner. As noted above, all testing was performed at a local primary school. Vanuatu's education system has colonial roots and, at least in my experience, has a 'Victorian' character as it tends to emphasize obedience and the need for students to respect the teacher's authority. Accordingly, conducting testing on school grounds may have inadvertently primed the children to try and intuit what the experimenter wants to hear. Another possibility is that children were importing conventions from traditional storytelling into their understanding of the testing situation. Many traditional stories focus on the importance of keeping taboos and make the listeners privy to a morale that is understood to be shared between a storyteller and their audience. Accordingly, it might be that the participants were trying to demonstrate that they had internalized the privileged 'bird's eye view' accorded to them in the story. The Justifications indicate that at least in Contents False Belief, misinterpretations of some kind may in fact be the cause of children's low pass rates on that task.

Another possibility is that the wording of the tasks may have inadvertently contributed to a prescriptive interpretation (i.e. that children thought they should respond with what the characters *should* do instead of what they *will* do). This is due to some peculiarities of Bislama as a pidgin language, where many words and constructions have multiple and therefore ambiguous meanings. Specifically, Bislama sometimes confounds

future tense with imperative. For example, the use of imperative in Bislama can parallel English constructions (*go*!) (Crowley 2004: 89pp). Alternatively, Bislama speakers may insert 2nd person pronouns before the verb (*yu go*!) (Crowley 2004: 89pp). However, this simple imperative can appear rude in Bislama and is commonly reserved for people one knows well or when communicating with children and animals (Crowley 2004: 89pp) In other situations, Bislama speakers sometimes use weakened or polite alternatives, which are constructed by inserting the future tense indicator *bae* before the command (*bae yu go*!), by inserting the word try (*yu traem go*!), by inserting the word first (*yu go fastaem*!), or by a combination of some of the above (Crowley 2004: 89pp). In future tense constructions, *bae* normally appears before the subject if the latter is a pronoun (*bae mi go*), although it can appear after the subject if it is a noun (*tija bae i go)* (Crowley 2004: 93p). *Bae* can also be combined with already (*finis*) to express that something should be done right now, or that something should have been done already (*bae yumitu fidim ol pig finis*) (Crowley 2004: 94). Statements about what some agent should do can also be expressed with the conditional marker *sapos* (*kamiong sapos i pas long bus antap*) or simply with should (*oli sud swim long dei*) (Crowley 2004: 94). The situation in Ngunese is unclear. While some grammars clearly distinguish between imperative (*qa* or "go") and future tense (*wo*) (Ray 1887: 414p), others note a connection: the imperative (*p̃a*) is also used for incomplete or ongoing action (Schütz 1969: 25), and the future tense indicator (*woo*) must be preceded by *p̃a* or *ga* (Schütz 1969: 27), which marks intention (Schütz 1969:26) (e.g. *p̃a woo umai* or "you will come", see Schütz 1969: 27).

The *bae* + pronoun construction was used in the Target Questions of Location False Belief, Explicit False Belief, and Diverse Beliefs, but not in Contents False Belief, Appearance-Reality, and Belief-Emotion. As *bae* cannot be completely disentangled from prescriptive statements, it might be that some children perceived the use of future tense as carrying prescriptive intent, rather than being merely predictive. This might explain why children performed better on Appearance-Reality and Belief-Emotion than on Location False Belief and Explicit False Belief. However, this cannot explain the very low pass rates in Contents False Belief because the Target Question of this task was formulated in present tense. It also cannot explain why pass rates should fluctuate at or below chance levels in Diverse Beliefs. While the Target Question of this task is formulated in future tense, the correct location of the hidden pet is never provided. As a result, there is little room to interpret the task in a prescriptive manner. Furthermore, when I presented the translated protocols to a key informant for review, I enquired specifically

whether the phrasing confounds expressions about what people *will* do with expressions about what people *should* do. However, the informant did not consider the phrasing problematic. During the trial run with a teenager, the teenager responded to all Target Questions correctly and clearly understood the predictive nature of the questions and intended answers.

Alternatively, ni-Vanuatu children may have a stronger underlying preference for successful story outcomes and thus choose incorrect answers because correct answers are predicated on erroneous judgment on part of the characters. Accordingly, ni-Vanuatu children may have an underlying antipathy towards attributing erroneous judgments to the story characters. However, this seems unlikely because in my personal experience, children living at the field site do not hesitate to correct each other in daily life. Another possibility is that children establish their own connections between characters and objects that then conflict with the desired face-value reading of the story. This is evident in some of the Own Reference Frame-type responses to the Justification questions. For example, some scenarios establish a connection between an animal or an object and a person (e.g. an animal belongs to the person, and the person is looking for it). Some participants transferred this relationship to other stories such as the Knowledge Access and Contents False Belief tasks, even though the latter emphasized that the character had never seen the contents of the container before ("because that's his rooster" or "because she's looking for her butterfly"). Alternatively, children may fail some tasks because they interfere with their ecological knowledge. For example, in Contents False Belief some children may not predict that a character will look behind the house because lost animals may be more likely to hide in the bush. However, this seems unlikely because children rarely referred to generalities ("she will look behind the bush because animals sometimes go to the bush to hunt").

Others combined Own Reference Frame responses with an original Perception Criterion, i.e., they predicted the character's behaviour from a sense that is not targeted or cued in the task ("he's unhappy because he can already smell the leaves inside the box of chocolates" or "because she can hear the butterfly flap its wings inside the matchbox"). These answers show that children sometimes expand on the story in ways that integrate an 'incorrect' Target response into a coherent narrative. These answers are of particular interest to ethnopsychology because some ethnographers have found that different societies prioritize the senses differently. While Western cultures are said to prioritize visual information, many small-scale societies are said to prioritize other senses such as

hearing, feeling, and smell (Classen 1990; but see Ewart 2008). Own Reference Frame responses were indeed more common in Contents False Belief than in other tasks, which lends support to this idea.

A more plausible alternative is that the placement of Control Questions and the structure of the tasks impact children's interpretations. In Belief-Emotion and Appearance-Reality, the first Control Question is placed before the Target Question, which is reversed for the other False Belief tasks. In Appearance-Reality in particular, the first Control Question ("When you first saw this, what did you think it was?") reminds the children of their own False Belief at the beginning of the task and thus may have emphasized that the purpose of the task was to intuit the (false) belief of the character. In Belief-Emotion, the first Control Question reminds the children of the character's desires ("What is his favourite food?") rather than their own prior beliefs, but the structure of the task still recapitulates the general pattern of Appearance-Reality. First, an object is revealed (shell/box of smarties), then it is revealed that the object is really something else or has unexpected contents (soap/twigs and leaves), and only then the (still naïve) character is introduced into the scenario. This set-up gives children a chance to experience a False Belief which is then corrected, which they can then project onto the character. Other False Belief tasks (such as Explicit False Belief) do not require the child to adjust their own mental states, and this might have made the purpose of those tasks less transparent to participants. While the pattern of object presentation – unexpected contents – character introduction is also found in Contents False Belief, there is no leading Control Question before the Target Question, and the purpose of that task may thus be less obvious. The idea that the structure of the tasks, rather than some unique idiosyncrasy in ni-Vanuatu children's perceptions, may be responsible also receives support from previous work. For example, Cantonese-speaking children were also more successful in Appearance-Reality than in Location and Contents False Belief (Tardif, Wellman & Man Cheung 2004).

3.4.5 Limitations

The study design has several limitations. First, the test protocol only assesses explicit Theory of Mind, which is articulated through language. Some have argued that explicit theory of mind is somewhat distinct from implicit Theory of Mind, which is processed 'automatically' during social interactions and present among toddlers already (Barrett et

al. 2013; but see Chapter 1 for the debate about the existence of and evidence for (and against) implicit Theory of Mind). As explicit Theory of Mind is communicated through language, between-individual variation in language ability affects children's performance in Theory of Mind tasks. For example, phonological working memory and verbal ability constrain Theory of Mind performance (Jenkins & Astington 1996; Hasselhorn, Mähler & Grube 2005). This poses challenges in the multi-lingual context of Vanuatu. Standardized assessments of language ability are not available for Bislama nor for any of the indigenous languages of Vanuatu. Furthermore, as a pidgin, Bislama is grammatically less complex and possesses a smaller dictionary than full languages, which may pose challenges for constructing an equivalent assessment of children's verbal ability. Accordingly, my study could only control for language in a very limited capacity.

Another limitation concerns the protocol itself. As in Dixson (2016), all tasks were performed in the same order across participants. As stated above, this was done to minimize experimenter error. Additionally, the two segments of the test were not counterbalanced between participants. Otherwise, children would have had time to inform their peers about important aspects of the test (e.g. that the shell was in fact a soap). I therefore cannot rule out task order effects entirely, although they cannot explain the pattern found in the False Belief tasks. If children had learnt how to perform correctly during the testing process, their performance should have increased gradually from task to task. However, children's performance gradually increased in Location False Belief (1), then stagnated at low levels in Explicit and Contents False Belief (2, 3), then increased again for Appearance-Reality (4) and Belief-Emotion (9).

Finally, one of the emotional states used in the stories may not be salient at the field site. When translating the test protocol, the experimenter and other locals pointed out to me that Bislama does not have a word for 'neutral', and thus no term for a neutral facial expression. I was informed that the closest equivalent was 'alright' (*stret nomo*) or 'a little bit happy' (*glad smol*). When we asked the children to identify the expressions of the three faces in the Hidden Emotion task, many children struggled to identify the neutral face and needed help from the research assistant, although most of them correctly identified the happy and sad faces.

3.4.6 Outlook

Future work should modify the test protocol to distinguish between the possible explanations outlined above. For example, the test protocol could add a statement that

clarifies that the test questions should not be interpreted in a prescriptive manner, and that it is appropriate to say that the character will follow their own thinking, even if that thinking is flawed ("But pay attention: in some of the stories, the people in the story can make a mistake!"). Alternatively, the testing session could start with a trial story during which the experimenter draws the participant's attention to the mental states of the characters in that story. Given that the children in my sample were more likely to consider the character's beliefs in Belief-Emotion, future studies might also try to use tests that target False Beliefs about other people's feelings rather than about objects and locations (see Smith-Flores & Feigenson 2020). In one such task, Sally and Anne buy ice cream and are looking forward to having some, then Anne leaves (Smith-Flores & Feigenson 2020). Once Anne is gone, Sally accidentally drops her ice cream on the floor (Smith-Flores & Feigenson 2020). The child is asked how Sally feels now, and how Anne thinks that Sally feels now (Smith-Flores & Feigenson 2020). This design could be adapted for use with ni-Vanuatu children. Alternatively, future studies could invert the structure of the test questions. Instead of asking the participants to *predict* what a character will do in the future, the experimenter could ask them to *interpret* what a character has already done. In such a test, the experimenter could tell the participants a complete story where a person has already acted on a False Belief. The experimenter could then ask the child why the character did that and assess whether they referred to the character's beliefs in their responses.

Furthermore, future work should combine verbal assessments with non-verbal methods such as interactive game tasks. In this type of test, an experimenter instructs the participant to move objects in a grid (see Begeer et al. 2010 for an example). Some objects are visible to both people, but others are occluded from the experimenter and only visible to the participant (Begeer et al. 2010). When following instructions, the participant has to take into account which objects the experimenter can see (and thus, which ones they can and cannot be referring to) (Begeer et al. 2010). Results from these tasks have been taken to complicate findings from verbal tasks. For example, adolescents and adults with Autism Spectrum Disorder are less likely to use mental state talk than neurotypical peers but succeed in this communication game, showing that they can take the other player's perspective into account (Begeer et al. 2010).

Neuroimaging work could also be beneficial. Previous studies have monitored participants' neural activity as they were performing False Belief tasks and found that mind-reading recruits the temporo-parietal junctions (TPJ), precuneus, and medial

prefrontal cortex (Gweon et al. 2012). Results show concrete differences between younger and older children that correspond to task performance, with changing activity patterns as children begin to process complex Theory of Mind (Gweon et al. 2012). Specifically, children's performance on complex Theory of Mind tasks was related to functional activity in the right TPJ (Gweon et al. 2012). It is of particular interest to document whether neural shifts related to mental state inference happen in ni-Vanuatu children in the same way as for Western children. If the ontogeny of neural activity and organization also shows culturally specific trajectories, this would strongly favour Heyes' notion of mind-reading as a culturally learnt ability that relies on cultural neural reuse (see Heyes & Frith 2014; Heyes 2020).

Additionally, future work should document systematically the role of mental state reasoning in children's cultural environment. While ethnographic impressions indicate that some Pacific Islander societies avoid communicating about mental states, these observations have not been quantified or compared systematically to caregiver communication in Western settings. Accordingly, this assumption should be tested to identify possible causal pathways for cross-cultural differences in children's mental state reasoning. Particularly desirable are systematic data on cross-cultural differences in the role of mental states in moral judgment, child-rearing practices, and discipline, especially in Vanuatu and other locations with a divergent trajectory of Theory of Mind.

4. Development of Teaching

4.1 Introduction

4.1.1 Background

In this chapter, I assess the development of teaching in ni-Vanuatu children. Teaching - cooperative learning in which knowledgeable individuals modify their behaviour in a way that facilitates learning for others (Caro & Hauser 1992) – is increasingly recognized as an important mechanism of social learning (Thornton & Raihani 2008). Teaching has been found in some non-human animals, including meerkats (*Suricata suricatta*) (Thornton & McAuliffe 2006), tandem-running ants (*Temnothorax albipennis*) (Richardson & Franks 2006), pied babblers (*Turdoides bicolor)* (Raihani & Ridley 2008), superb fairywrens *(Malurus cyaneus*) (Kleindorfer et al. 2014), and golden lion tamarins (*Leontopithecus rosalia*) (Troisi et al. 2018). In humans, teaching may occur in a variety of ways such as verbal instruction, commands, feedback, manual demonstrations, or opportunity scaffolding, in which the teacher provides the learner with an object to explore under supervision (Kline 2015; 2017).

Some have argued that language-assisted teaching was a key factor in the evolution of human culture, and especially cumulative culture (van Schaik, Pradhan & Tennie 2019). Cumulative culture is a process in which improvements on existing skills, tools, and techniques are added to the behavioural repertoire of a population and retained across generations, outpacing what any individual can create when left to their own devices (Tomasello, Kruger & Ratner 1993; Boyd & Richerson 1996; Tomasello 1999). However, beneficial innovations must be transmitted with high fidelity across generations to accumulate (Muthukrishna & Henrich 2016). Some have argued that high-fidelity learning is facilitated by a package of prosocial traits such as imitation, intersubjectivity, and teaching (Tomasello, Kruger & Ratner 1993; Dean et al. 2012). In the same vein, Csibra and Gergely (2011) have proposed that natural pedagogy -the transmission of cultural knowledge through communication- is an independently selected cognitive system that facilitates the transmission of opaque skills. These include complex technologies whose modes of operation and adaptive functions are not intuitively obvious to a naïve learner (Csibra & Gergely 2011). In support of this, experimental work suggests that teaching, especially verbal instruction, is most beneficial for technically demanding tasks such as complex knotwork and stone tool making (Morgan et al. 2015; Caldwell,

Renner & Atkinson 2017; Lombao, Guardiola & Mosquera 2017). As a result, some have proposed that in humans, language and teaching co-evolved, and that language originally evolved to teach increasingly complex and hard-to-learn skills to kin (Laland 2017).

Despite its relevance to the cumulative culture debate, empirical work on teaching in the evolutionary human sciences is still limited. Much work draws on behavioural ecology and focuses on functional questions related to cooperation and possible drivers promoting the evolution of teaching in different species (Caro & Hauser 1992; Thornton & Raihani 2008; Kline 2015; see also Chapter 1 for further detail). Methodologically, this approach has focused on theoretical modelling (Fogarty, Strimling & Laland 2011) and observational studies of teaching in hunter-gatherers and other non-industrialized populations. For example, in foraging and mixed-subsistence societies, adults let children accompany them on hunting trips and sometimes facilitate learning by focusing on easy prey, explaining plant and animal knowledge, and providing them with opportunities to make their first kills (MacDonald 2007). Aka hunter-gatherer children receive verbal instructions, negative feedback, and commands (Boyette & Hewlett 2017). Caregivers also use cues such as pointing, eye contact, and child-directed speech to direct an infant's attention and provide information (Hewlett & Roulette 2016). Chabu hunter-gatherer children's play-hunting is often guided by older children, and during hunting trips adults respond to questions, demonstrate how to perform vital skills, tease them about mistakes, correct them, and provide them with carcasses to practice (Dira & Hewlett 2016). Finally, anthropologists are increasingly becoming aware that children are not merely passive recipients of teaching, but they also teach others. For example, among Hadza and BaYaka hunter-gatherers, children spend much of their time in play groups with other children and are more often taught by peers than by adults (Lew-Levy et al. 2020). While this work has documented cultural variation (and continuities) in teaching practices, it has not explored how children learn to teach, and how teaching develops during ontogeny.

In contrast, this problem has been explored in developmental psychology and cognitive science. Specifically, developmental psychologists have argued that human teaching is a 'natural cognition' that is ubiquitous in human cultures and develops 'naturally' during ontogeny - i.e., it flows downstream from regular social interactions without direct instruction (Strauss, Ziv & Stein 2002; Strauss & Ziv 2012). In other words, we reliably and effortlessly develop the ability to teach without being taught how to and start teaching at an early age, even though teaching is a complex skill (Strauss, Ziv & Frye 2015). They have proposed that teaching is a species-typical trait of humans that

depends on an advanced Theory of Mind – the ability to simulate what others think, want, and feel. An instructor will teach better if they can form a more accurate representation of the learner's skill level. In other words, to transmit information efficiently, a teacher must understand that the learner knows less than themselves or might hold False Beliefs -misconceptions that conflict with external reality (Strauss, Ziv & Stein 2002; Strauss & Ziv 2012). As a result of its focus on Theory of Mind, this literature defines teaching first and foremost by the *intention* to transmit knowledge to another person (Strauss, Ziv & Stein 2002; Strauss & Ziv 2012). Proponents of this view have argued that the ontogeny of teaching is linked to the that of Theory of Mind, and specifically to the development of False Belief understanding, which emerges at ca. 4-5 years of age in Western societies (Wellman, Cross & Watson 2001).

In support of this, it has been found that 5-year-olds not only outperform 3-year-olds in Theory of Mind tasks, but also communicate differently when asked to teach a game or puzzle to a naïve peer. While 3-year-olds tend to teach by demonstration or by making moves for the learner, 5-year-olds use more verbal communication (Strauss, Ziv & Stein 2002; Ziv et al. 2016). The quality of verbal communication also develops, from short direct instructions in 3-year-olds to more abstract rule explanations in 5-year-olds (Ziv et al. 2016). 5-year-olds are also more likely to use comprehensive or combined teaching strategies where they combine verbal statements with demonstrations (Davis-Unger & Carlson 2008). Furthermore, children in this age group are more responsive to the learner's actions, which is evident in their higher tendency to ask learners whether they understood the rules, to offer rule reminders, and to respond to errors (Strauss, Ziv & Stein 2002; Davis-Unger & Carlson 2008). 5-year-olds also use more contingent teaching, where they adjust their teaching strategies based on the learner's level of understanding, for example by using less abstract teaching when the learner evidently does not understand the material (Ziv et al. 2016). Finally, children's tendency to use verbal teaching and combined teaching is closely correlated with Theory of Mind even after controlling for age and language ability, as children with more advanced Theory of Mind and especially with better False Belief understanding use fewer demonstrations, more verbal teaching, more rule explanations, and more contingent teaching (Strauss, Ziv & Stein 2002; Ziv et al 2016). Building on this, qualitative studies have documented three distinct developmental steps: at first, children rely exclusively on nonverbal demonstrations, merely letting the learner observe; then, children begin to accompany their demonstrations with some verbal information and begin to show an interest in the

learner's behaviour (Bensalah 2011). Finally, once children possess advanced Theory of Mind, they start to monitor the learner's behaviour, actively involving them in the task (Bensalah 2011).

4- and 5-year-olds also show more metacognitive reflection, indicating increasing insight into how learning occurs (Strauss, Ziv & Stein 2002; Davis-Unger & Carlson 2008). For example, when asked how they taught a game to their partner, 3-year-olds tend to merely redescribe *what* they taught (e.g., the rules of the game), whereas 4- and 5-year-olds are more likely to describe *how* they communicated with their partner, and to reflect on the transmission process between themselves, the experimenter, and the learner (Davis-Unger & Carlson 2008). Additionally, 3-year-olds tend to describe or demonstrate their *actions* ('I pushed the truck.'), whereas 5-year-olds are more likely to use *communication* terms such as teach, tell, or explain ('I told him to push it.') (Strauss, Ziv & Stein 2002). This has been taken to show that 5-year-olds consider verbal explanations to be the most important component of teaching, whereas 3-year-olds think of teaching as demonstration (Strauss, Ziv & Stein 2002). Furthermore, when asked how they knew whether their partner had actually learnt the game, 3-year-olds tend to refer to themselves, by using *their own teaching* as evidence that learning occurred ('I know that he learnt it because I taught him.'), whereas 4- and 5-year-olds are more likely to refer to the learner, by using *the learner's actual behaviour* as evidence that learning occurred ('I know that he understood it because he played very well.') (Strauss, Ziv & Stein 2002; Davis-Unger & Carlson 2008). Again, these shifts have been linked to children's developing Theory of Mind (Strauss, Ziv & Stein 2002).

Based on these results, some have argued that in humans, teaching is developmentally reliable and that teaching is indeed a 'natural cognition' (Strauss, Ziv & Frye 2015). However, the above studies were all conducted in industrialized, Western societies such as Israel (Strauss, Ziv & Stein 2002; Ziv et al. 2016), France (Bensalah 2011), and the United States (Davis-Unger & Carlson 2008), with a lack of research in small-scale, non-industrialized societies (see Strauss, Ziv & Frye 2015). As a result, it remains unclear whether the documented developmental trajectories generalize beyond industrialized societies, and especially, whether they generalize to populations with purported differences in the development of Theory of Mind (for further detail on cross-cultural variation in Theory of Mind development see Chapter 3). This is problematic because social anthropologists have long argued that teaching is itself culturally learnt (Lancy 2015a). Likewise, Heyes (2012; 2018) has proposed that the mechanisms that

enable cultural evolution are developmentally plastic, themselves socially learnt, and thus subject to cultural evolution. Building on this, Heyes has argued that this includes Theory of Mind (Heyes & Frith 2014) and pedagogy (Heyes 2016b), suggesting that we should expect cross-cultural variation in the ontogeny of teaching.

4.1.2 Study Design and Research Questions

In this chapter, I address this gap by implementing a peer teaching game that has been used in previous work (Strauss, Ziv & Stein 2002; Davis-Unger & Carlson 2008; Ziv et al. 2016) with ni-Vanuatu children on the island of Espiritu Santo, who have been found to experience delays in the development of Theory of Mind (Dixson 2016; Dixson et al. 2017; see also Chapter 3). In this paradigm, the participants play a game adapted from the commercial board game 'Color Train' by Jumbo (Strauss, Ziv & Stein 2002; Davis-Unger & Carlson 2008; Ziv et al. 2016). Each round of the experiment involves one experimenter and two children, one of whom acts as 'teacher' who first learns the game from the experimenter and then teaches the game to a peer 'learner'. In the original sources (Strauss, Ziv & Stein 2002; Davis-Unger & Carlson 2008; Ziv et al. 2016), the game is played as follows: players move a toy truck forward along a game board, then stop next to one of a series of flowers placed at the side of the board. They then roll a dice: if the colour on the dice matches the colour of the flower the truck is stopped next to, the player can take the flower and place it on their side of the board. If the colours do not match, the player cannot take the flower. Three sides of the dice feature colours matching the flowers on the game board. The three other sides feature a smiley face (the player can take another turn), a sad face (the player loses their turn), and a multi-coloured flower (the player can turn the dice and make it match the colour of the flower they are stopped next to). The first player to collect three differently coloured flowers wins the game, and players can only collect a flower if they have not won that colour already. After the end of the game task, the 'teacher' is asked two short interview questions designed to tap their metacognitive reflection about teaching and their tendency to take the learner's perspective into account.

For the purpose of this study, I simplified the game, only retaining the most essential conditional rules (move truck forward, take flower when colours match, do not take flower when colours do not match) and removing and replacing the more complicated subsidiary rules (happy face, sad face, and multi-coloured flower) with a simpler one (a star shape placed on all three non-flower sides of the dice, which indicates

that the player should roll the dice again). I also removed the condition that players could only collect flowers if they had not won the same colour before. Accordingly, the first player to collect three flowers now wins the game, regardless of colour. In sum, I reduced the number of game rules from eight to five. This was done after consulting with a local research assistant, who felt that children at the field site would not be able to memorize the eight-rule game. Game objects such as trucks, flowers, and roads are familiar to the children at the field site.

I also administered a four-task Theory of Mind test battery that assessed children's understanding of False Beliefs and Knowledge Access (Location False Belief, Explicit False Belief, Contents False Belief, and Knowledge Access), with tasks taken from a Theory of Mind scale developed by Wellman and Liu (2004) that has been used in previous research in Vanuatu (Dixson 2016; Dixson et al. 2017; see also Chapter 3). Contrary to previous studies, the participants also had to justify their responses to the Theory of Mind questions, based on a design devised by Blijd-Hoogewys et al. (2008). This was done to have another measure of children's ability to understand and communicate about mental states (see also Chapter 3 for further detail).

I ask the following research questions: Does ni-Vanuatu children's teaching develop with the same ontogenetic trajectory as it does in Western children? Specifically, do ni-Vanuatu children shift from teaching by demonstration or gestural teaching to relying mostly on verbal communication and combined teaching by the age of 5? And do ni-Vanuatu children shift from short commands to abstract rule explanations by the age of 5? Furthermore, does ni-Vanuatu children's metacognitive reflection about teaching develop with the same ontogenetic trajectory as it does in Western children? When asked about how they taught the game to their partner, do ni-Vanuatu children move from merely restating the rules of the game or describing their play behaviour, to describing how they communicated with their partner and reflecting on the transmission process by the age of 5? When asked about how they know that the learner learnt to play the game, do ni-Vanuatu children shift from referring to their own teaching as evidence that learning occurred, to describing the learner's behaviour as evidence that learning occurred by the age of 5? Finally, does ni-Vanuatu children's teaching depend on Theory of Mind? Do children who perform better on Theory of Mind also use more abstract verbal teaching strategies? And do children who perform better on Theory of Mind also show more metacognitive reflection about teaching?

If proponents of the 'natural cognition' view are correct (see Strauss, Ziv & Stein

2002; Strauss & Ziv 2012; Strauss, Ziv & Frye 2015), then the developmental trajectory identified in Western children should also translate to my sample. Specifically, ni-Vanuatu children should shift from teaching by demonstration or gestural teaching to relying mostly on verbal communication and combined teaching, and from short commands to abstract rule explanations by the age of 5. Furthermore, ni-Vanuatu children should shift from merely restating the rules of the game or describing their play behaviour to describing how they communicated with their partner and reflecting on the transmission process by the age of 5. Ni-Vanuatu children should also shift from referring to their own teaching as evidence that learning occurred to describing the learner's behaviour as evidence that learning occurred by the same age. Conversely, if Heyes' notion of the cultural evolution of teaching is more accurate (2012; 2016b; 2018), we would not expect the Western trajectory to necessarily translate to other cultural contexts. Furthermore, if the proponents of the 'mentalistic' account of teaching are correct (see Strauss, Ziv & Stein 2002; Strauss & Ziv 2012; Strauss, Ziv & Frye 2015), then children who perform better on Theory of Mind and mental state talk should use more abstract verbal teaching strategies and should express more metacognitive reflection about teaching, and these shifts should happen later in ni-Vanuatu children due to their different trajectory in Theory of Mind. To the best of my knowledge, this is the first time this design has been implemented in a small-scale society, and the first time this has been tested in a population with a reported deviation in Theory of Mind development.

4.2 Methods

4.2.1 Peer Teaching Task

4.2.1.1 Procedure

The game task is divided into three parts: a familiarization phase, a game phase, and a short interview.

Familiarization Phase: The experimenter shows the game apparatus to the participant and announces that he will show them how to play a game, and that they will play it together afterwards. He proceeds to teach the game in four distinct stages. (**1**) First, he explains the rules of the game, integrating verbal explanations with physical demonstrations. The experimenter presents the game board and points out the utensils (see Fig. 4.1), then shows how to make a move. This involves moving a toy truck along a road and stopping it next to a plastic flower. He then explains the next move in the

game. This involves rolling a dice and checking whether the colour on the dice matches the colour of the plastic flower. The experimenter explains that when the colours match, the player can take this plastic flower and place it on a spot on the game board that is shaped like a tree. When the colours do not match, the player cannot take the flower. The experimenter then demonstrates another round and explains the other sides of the dice, which show thee red stars. If the dice lands on a red star, the player must roll the dice again. Finally, he explains the overall goal of the game: the first player to collect three flowers wins. **(2)** The experimenter then invites the child to take a practice turn. He first takes a turn of his own, then the child takes a turn. The experimenter provides further instruction if the child is unsure what to do. (**3**) The experimenter then performs five Rule Checks to ensure that the participant understood the game: (3.1) Which way do we move the truck? Forwards, following the arrows on the road, or backwards? [Direction of Moves] (3.2) If the colour on the dice matches the colour on the flower, can we take the flower or not? [Colour Matching] (3.3) If the colour on the dice doesn't match the colour on the flower, can we take the flower or not? [Colour Not Matching] (3.4) What do we do if we roll a red star? Do we roll the dice again or not? [Red Star] (3.5) If you're the first one to collect three flowers, do you win the game or do you lose? [Game Goal] If a child fails a rule check, the experimenter repeats the relevant information and poses the question again. This process is repeated up to four times per question. (**4**) The experimenter then proceeds to play the game with the child until one of them has won three flowers. During this stage, he is responsive to the child's behaviour by providing further explanations, responding to questions, and correcting errors.

Game Phase: After the end of the familiarization phase, the experimenter tells the child that they can now teach the game to a classmate. It is emphasized that this peer has never seen the game before and does not know how to play. The children are left to play until one of them has won the game or 10 minutes have elapsed.

Interview: After the end of the game phase, the 'learner' is instructed to return to the classroom. The 'teacher' is then asked two short questions about their experience during the game: (**1**) How did you teach the other child how to play? and (**2**) How do you know that they learned how to play? Question (1) is designed to tap into children's reflections about their teaching strategies. Question (2) taps into their reflections about others' learning.

All testing was conducted in a quiet room at Hog Harbour Primary School on Espiritu Santo. Prior to testing, I obtained verbal consent to work with the children from

the chief's council, the principal, schoolteachers, and the chairman of the schoolboard. The school was provided with an information letter from the Vanuatu Cultural Centre, which confirmed that it had approved the research. Caregivers were provided with an information sheet. I also obtained verbal assent from the children themselves; from the 'teacher' child at the start of the familiarization phase and from the 'learner' child at the start of the game phase. Some of the younger children requested that their mothers wait for them outside the testing area, which we complied with.

The role of experimenter was performed by a research assistant, a local resident fluent in Bislama, English and Wanohe (the indigenous language of Hog Harbour), who was working as a teacher's aide at the primary school at the time. Accordingly, the participants were already familiar with him. As stated above (see Section 4.1.2, Study Design and Research Questions), prior to data collection, I had consulted with the research assistant about the design implemented in previous work (Strauss, Ziv & Stein 2002; Davis-Unger & Carlson 2008; Ziv et al. 2016) and modified the game rules accordingly. Prior to testing, I trained the research assistant by demonstrating the protocol for the familiarization phase and by playing multiple game rounds with him. During testing, I recorded children's responses to the Rule Checks and Interview Questions *verbatim* on paper forms. I filmed all game phases from a corner of the testing area, with a handheld mobile phone camera (Samsung Galaxy xCover). The research assistant remained in the testing area throughout the game phase. All testing was conducted in Bislama. I based my protocol on the standardized instructions provided in Davis-Unger and Carlson (2008), which I translated into Bislama. The translation was then checked by a primary school teacher who was fluent in both English and Bislama. Ambiguities were resolved through discussion. A copy of the testing protocol was available to the research assistant throughout testing. Depending on how long children played, one session took ca. 10-15 minutes to complete. All materials (see Fig. 4.1) were purchased in London. The full protocol is available on OSF: https://osf.io/pnqxy/ (Identifier: DOI 10.17605/OSF.IO/PNQXY).

Fig. 4.1: Game Task Materials.

4.2.1.2 Game Phase Scoring

I coded the children's game videos with a coding scheme capturing various verbal, gestural, and combined teaching strategies (see Table 4.1). Categories are based on the coding template used in Davis-Unger and Carlson (2008). Each game is divided into two phases: a *teaching phase* (which corresponds to all explanations and demonstrations performed before inviting their partner to play, or failing that, before their partner starts their first move) and a *play phase* (which corresponds to all interactions performed after inviting their partner to play, or after their partner starts their first move). For each teaching strategy, I recorded whether it was present during the relevant game phase (=1) or not (=0). Furthermore, I summed up all instances of each category to yield the number of times a given strategy is used during the *teaching phase* and the number of times a strategy is used during the *play phase.* For example, if a child uses 4 Verbal Explanations during the teaching phase, their number score for this category is 4.

Furthermore, I recorded children's teaching styles. This variable captured participants' overall approach to teaching and structuring information, namely, whether they used teaching through abstract communication (i.e., they verbally walked their partner through the rules of the game before starting to play =1) or whether they emphasized 'learning by doing' or learning-through-participation (i.e., they merely made a move and then invited their partner to play, or alternatively, they told their partner to make a move without expounding on the rules of the game =0). Some children fit neither category because they played a whole round by themselves (across the whole board or by collecting three or more flowers for themselves) before re-setting the game board or inviting their partner to join, expecting their partner to learn from observation alone. These were grouped into a separate category (= X). I also recorded the length of the teaching phase, measured in seconds. The *teaching phase* begins when the teacher starts to speak or act. It ends when the child says something to the effect of 'Let's play now', tells their partner to start their turn, or gestures for them to play. If there is no invitation to play, the teaching phase ends when their partner rolls the dice or moves the truck, i.e., the first move they perform upon joining the game. In ambiguous cases, the teaching phase also ends when the partner joins the game. For example, if the child invites their partner to play but then explains a rule another time or demonstrates a move and only then their partner touches the truck or rolls the dice. Or if a child has finished explaining and their partner picks up the dice, then the child performs another demonstration and only then their partner rolls the dice. The *play phase* begins when the teaching phase is finished and ends when the children stop playing, or when the experimenter declares that the game is finished.

Category (Phase)	Explanation	Example
Verbal Statement (Teaching)	The child describes or explains the game moves. Each step described in an action sequence counts as a separate verbal statement. Repetitions of an action within the same sentence do not count as separate statements.	"If you are next to the pink flower, you roll the dice. Then you can take the flower." This sequence consists of 2 verbal statements. *OR* "Roll the dice, then take the flower." This sequence also consists of 2 verbal statements.
Demonstration* (Teaching)	The child manually demonstrates how to perform an aspect of the game without a supporting verbal explanation. If a child performs multiple actions in a sequence, each move counts as a separate demonstration.	The child moves the truck, rolls the dice, and then takes a flower. Then they move the truck to the next flower. This sequence consists of 4 demonstrations in total.
Verbal Statement Combined with Demonstration or Gesture (Teaching)	The child explains the rules while *simultaneously* demonstrating the corresponding moves or performing gestures for illustration. This category is additive to Verbal Statement and they are therefore not mutually exclusive. For example, if a child uses 5 verbal statements and supports 3 of those with a demonstration or gesture, then the Verbal Statement score is 5 and the Combined score is 3. Each accompanying move counts separately.	The child moves the truck then throws the dice while explaining their move: "First you have to push the truck, then throw the dice like this." This sequence consists of 2 combined actions in total. *OR* The child points to the arrows on the gameboard while explaining: "You have to push the truck in this direction." This sequence consists of 1 combined action.
Abstract Elaboration (Teaching and Play)*	The child makes a conditional statement that explains the rules of the game on an abstract level by establishing decision rules. This category is additive to Verbal Statement and they are therefore not mutually exclusive. For example, if a child uses 5 verbal statements and 3 of those are abstract conditional statements, then the Verbal Statement score is 5 and the Abstract Elaboration score is 3.	"If you roll the red star, you roll the dice again." This sentence consists of 1 abstract elaboration. *OR* "If you roll the right colour, you can take the flower." This sentence also consists of 1 abstract elaboration.
Checking In (Teaching)	The child asks a question to confirm that their partner has understood the game.	"So, do you understand how to play now?"
Rule Reminder (Play)	The child prompts their partner to recall the rules of the game using terms such as 'think' or 'remember'.	"Remember, you have to follow the arrows." *OR* "Think about what I just told you."
Verbal Command* (Play)	The child tells their partner what to do while playing the game.	Imperative statements such as "Push the truck!"
Move Commentary* (Play)	The child describes or comments on a game move while playing with their partner. This does NOT include abstract statements.	The child rolls blue next to the blue flower and comments: "That's the right one!" before taking it.

Table 4.1: Coding Scheme for Teaching Strategies. *I added 'Demonstration' (without verbal communication), which was not in Davis-Unger and Carlson (2008), to account for the use of non-verbal teaching methods. I also added 'Verbal Command', 'Move Commentary', and 'Abstract Elaboration' to differentiate between levels of abstraction in children's verbal teaching.

4.2.1.3 Interview Scoring

I scored children's responses to the Interview Questions with a coding scheme based on Davis-Unger and Carlson (2008) and Strauss, Ziv and Stein (2002) (see Table 4.2). When multiple categories are present in an answer, the more highly rated category is coded for. All responses not fitting the categories in the coding scheme are rated 0. This category also includes difficult to code answers or vague statements about knowledge such as 'at first he didn't know how to play but now he knows how to play'.

Question	Category	Description	Score
(1) Method of Teaching -How did you teach the game to your partner?	Rule Description	The child merely repeats the rules of the game without referring to their own teaching.	1
	Play Reference*	The child describes how they played the game with their partner without referring to communication terms such as teach, tell, show or explain.	2
	Teaching Reference	The child describes how they taught the game to their partner using communication terms such as teach, tell, show or explain.	3
	Metacognitive Reference	The child reflects on their own teaching and/or extrapolates from the pattern of learning and teaching they have just participated in. Applicable if the child relates the full sequence research assistant-participant-partner or alternatively if they talk about their own or their partner's ability to teach more children.	4
(2) Evidence of Learning - How do you know that your partner learnt to play the game?	Play or Teaching Reference**	The child describes how they taught the game to their partner. Accordingly, they use *their own teaching* as proof that their partner learnt to play the game. It is not important whether they used communication terms such as teach, tell, show or explain, or whether they merely referred to game moves they showed to their partner.	1
	Behaviours Observed in the Learner	The child draws on the actions *of their partner* to determine whether they learnt to play the game. Accordingly, they use their partner's behaviour as a marker of learning. The child must refer to something their partner said or did during the session instead of merely stating 'he learnt the game', 'now he knows' or 'now he understands'.	2

Table 4.2: Coding Scheme for Interview Questions. *This category has no equivalent in Davis-Unger and Carlson (2008). I created it to account for descriptions of teaching that made no direct reference to communication terms. ** Davis-Unger and Carlson (2008) required the use of communication terms in this category. This was relaxed here to group all responses that mentioned the teacher's but not the learner's behaviour into one category.

4.2.2 Theory of Mind Assessment

4.2.2.1 Test Battery

Table 4.3: Theory of Mind Test Battery
(1) Location False Belief
The research assistant presents the participant with two female dolls playing with a shell. The dolls are introduced by name: Shelly and Anne. Shelly announces that she is tired now. She takes her shell and puts it in the red box. She then goes home to take a nap. Once she is gone, Annie takes the shell and puts it in the blue box. Then Shelly returns from her nap. (1.1) Where is Shelly going to look for her shell? [Target Question] (1.2) Why is that? Why is she going to look there? [Justification] (1.3) Where is the shell now? [Reality Check] (1.4) Which box did Shelly put the shell in at the start? [Memory Check]
(2) Explicit False Belief
The research assistant presents the participant with a picture of a house with a tree next to it. The research assistant also presents them with a male doll and introduces him by name: Maui. Maui has lost his rooster and is now looking for it. It is emphasized that the rooster could be hiding behind the house, or it could be hiding behind the tree. The assistant then informs the participant that the rooster is hiding behind the house, but Maui thinks his fowl is hiding behind the tree. (2.1) Where is Maui going to look for the rooster? [Target Question] (2.2) Why is that? Why is he going to look there? [Justification] (2.3) Where is the fowl now? [Reality Check]
(3) Contents False Belief
The research assistant presents the participant with a matchbox and asks them what they think is inside. Once the child has answered, the research assistant opens the matchbox to reveal some coloured buttons. The participant is asked to identify the contents. After the child has answered, the research assistant puts the buttons back inside the matchbox and presents the participant with a male doll that is introduced by name: Henry. Henry has never opened the matchbox before and never looked inside. (3.1) What does Henry think is in the box? [Target Question] (3.2) Why is that? Why does he think that? [Justification] (3.3) Has he looked inside the box before? [Memory Check]
(4) Knowledge Access
The research assistant presents the participant with a small box with a plain surface and asks them what they think is inside. Once the child has responded, the research assistant opens the box and reveals a plastic toy in the shape of a carrot inside. The research assistant places the toy back in the box and closes the lid. The research assistant then produces a female doll and introduces her by name: Olive. Olive has never opened the box or looked inside before. (4.1) Does Olive know what is inside the box? [Target Question] (4.2) Why is that? How does/doesn't she know what's inside? [Justification] (4.3) Has she looked inside the box before? [Memory Check]

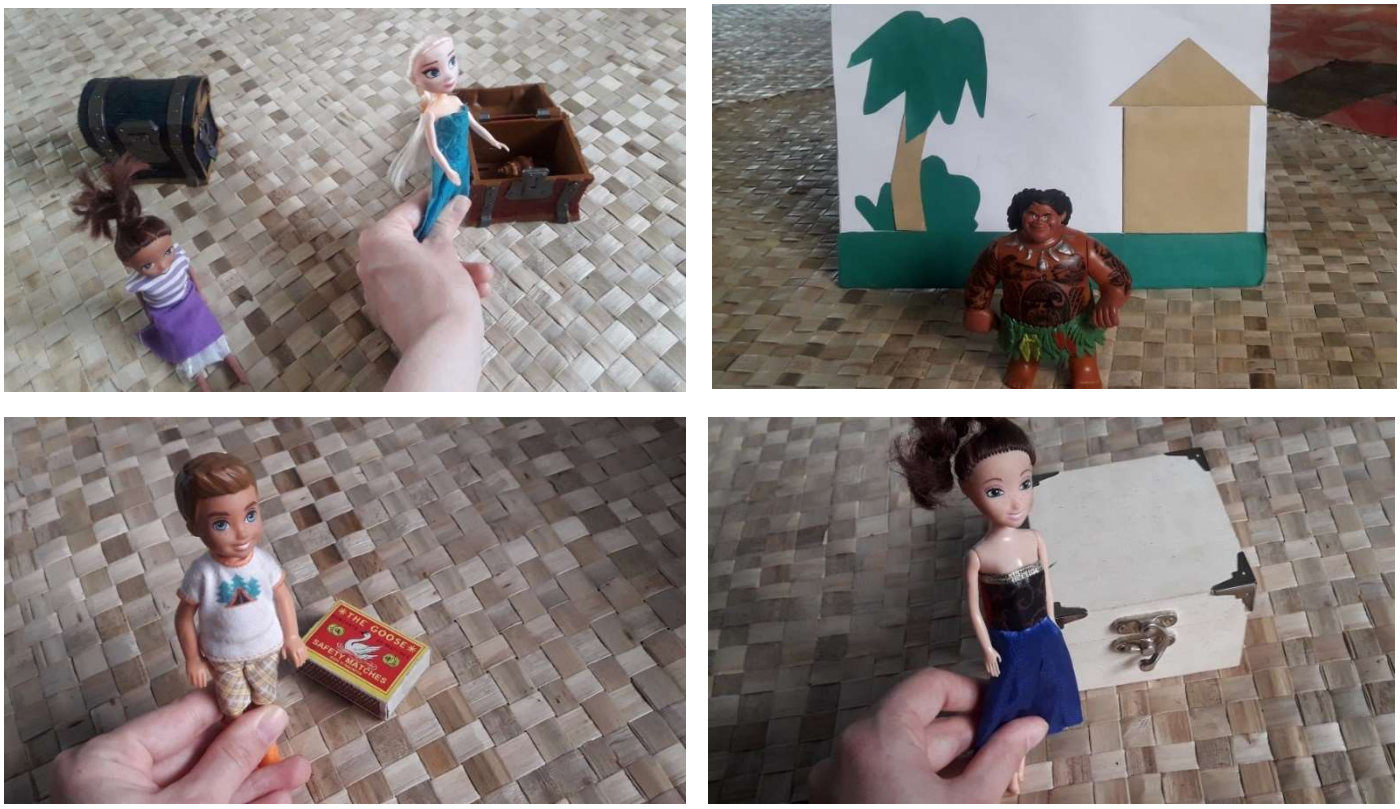


Fig. 4.2: Theory of Mind Task Materials.

4.2.2.2 Procedure and Scoring

Again, all testing was conducted in a quiet room at Hog Harbour Primary School on Espiritu Santo. With regard to verbal permissions from the community and school staff, the same procedure was followed as for the game task. I also obtained verbal assent from the children themselves prior to the start of each session. Some of the younger children requested that their mothers wait for them outside the testing area, which we complied with. The Theory of Mind tasks were presented by the same research assistant who also presented the game task. We followed the same procedure as in Chapter 3: the research assistant acted as experimenter while I recorded children's responses *verbatim* from a corner of the testing area. Testing was conducted in Bislama, with the same script used as in the North Efate study (see also Chapter 3). As Dixson (2016) had visited the same area for his Theory of Mind study some years before, I introduced some minor modifications to the stories by swapping the genders of all characters, the locations of hidden objects and animals, and using different hidden objects in tasks featuring

containers. Ahead of testing, I again trained the research assistant in a separate session, and an instruction protocol in Bislama was available for reference throughout testing. Again, scenarios were presented in the same order as in Dixson (2016). I coded children's responses to the Target Questions following the same logic as in Chapter 3 (1= correct, 0 = incorrect; see Table 4.4). I rated children's responses to the Justification Questions based on the system devised by Blijd-Hoogewys et al. (2008) that was also followed in Chapter 3.

Task	Question	Correct Response
Location False Belief	Target	Red
Explicit False Belief	Target	Tree
Contents False Belief	Target	Matches
Knowledge Access	Target	No

Table 4.4: Answer Key Target Questions.

4.2.3 Sample

I initially tested N = 126 children on the 4-part Theory of Mind test battery. Some children (n = 3) were excluded because they chose to interrupt their testing session. The final sample included N = 123 participants (56 female) and ranged from Kindergarten to 3rd graders. Participant ages ranged from 3.8 to 11.3 years (mean = 7.63, SD = 1.89). The birthdates of 2 children were unknown; their ages were estimated based on the mean age of their class, rounded to one decimal.

Following the procedure in Strauss, Ziv and Stein (2002), I then selected half of participants to take on the teacher role in the game task (the child who learns the game and then teaches a peer). In order to qualify for the teacher role, primary schoolers had to respond to all the Target and Control Questions in the Theory of Mind assessment and pass all the Control Questions without repetitions. Children who did not meet these conditions were sorted into the learner role. The selection rules were relaxed for preschoolers. In order to qualify for the teacher role, the latter had to pass all the Control Questions in the Theory of Mind assessment with no more than one repetition across all four tasks. I then used the sample function (without replacement) in R *v.3.5.1* (R Core Team 2018) on the remaining students to randomly select the number of participants required to make each class into 50% learners. I then used the cbind function to randomly group teachers and learners into pairs. All teachers taught another student from their own

class.

Among the children who completed the Theory of Mind test, N = 62 were assigned the teacher role in the game task, of which N = 61 were tested. One 'teacher' could not be tested because they had left for another island to attend a family function and were away for the remainder of my stay at the field site. Some participants were excluded because they refused to teach or engage their peer (n = 3) or because they engaged their partner in unstructured play instead of teaching the game (n = 3). The final sample for the game task therefore consisted of N = 55 participants (24 female), also ranging from Kindergarten to 3rd graders. This set's ages were calculated based on the date of testing for the game task and ranged from 4.7 to 11.4 years (mean = 8.09, SD = 1.67). The birthdate of one 'teacher' was unknown; their age was estimated based on the mean age of their class, rounded to one decimal. All descriptive statistics were calculated in R *v.3.5.1* (R Core Team 2018) and *plyr* (Wickham 2011). The Theory of Mind and game sessions were presented 1-2 weeks apart.

4.2.4 Inter-Rater Reliability

30% of children had their responses to the Theory of Mind test battery rated by a second coder, a research assistant who was blind to the hypothesis tested and the general theoretical background of the study. I assessed inter-rater reliability by calculating percentage agreement (0-tolerance) and unweighted Cohen's kappa using the *irr* package (Gamer et al 2019; *v.0.84.1*). Inter-rater agreement was excellent for the Target Questions (agreement = 98.6%, $\kappa = 0.97$, $z = 11.8$, $p = 0$) and Controls (agreement = 100%, $\kappa = 1$, $z = 12.2$, $p = 0$) and good for the Justifications (agreement = 83.1%, $\kappa = 0.80$, $z = 24.4$, $p = 0$). The same research assistant also double-coded 30% of the teaching phases in the game task videos as well as the game task interviews. I used 0-tolerance agreement and unweighted Cohen's kappa for all categorical measures (teaching style, teaching strategy absent/present, and interview questions) and the intraclass correlation coefficient (two-way model comparing consistency of single values) for the continuous measures (frequency of teaching strategies). Inter-rater agreement was excellent for the Interview Questions (agreement = 100%; $\kappa = 1$, $z = 10.4$, $p = 0$) and good for the categorical teaching phase measures (agreement = 89.0%; $\kappa = 0.78$, $z = 7.95$, $p < 0.001$). Inter-rater consistency for the continuous measures was also good (ICC = 0.98 [95% CI: 0.96, 0.98], $F = 81.4$, $p < 0.001$). All personally identifiable information was omitted from the data shared with the second coder.

4.2.5 Analysis

4.2.5.1 Teaching Strategies (Game Task Teaching and Play Phase)

I calculated descriptive statistics for children's performance on the Rule Checks and used Spearman correlation to examine whether children's understanding of the game rules improved with age (predictor: age; outcome: number of repetitions in the Rule Checks). I also calculated descriptive statistics for children's behaviour in the teaching phase, binning participants into 4-6- (n = 12), 7-8- (n = 17), and 9-11-year-olds (n = 22), with cut-offs at 6.9 and 8.9 years of age (there was only one 4-year-old). I then ran pairwise Wilcoxon comparisons (with p-value adjustment for multiple testing) to compare the teaching strategies of children who had used different teaching styles. After excluding children in the 'other' teaching category (=X) with *dplyr* (Wickham et al 2020; *v. 0.8.5*), I used logistic regressions (binomial GLM with logit-Link function) and Spearman correlation to investigate whether children's tendency to use abstract verbal teaching styles and strategies (as opposed to purely gestural and participatory teaching) increased with age (based on continuous age data) (predictor: age; outcomes: teaching style (binary) for logistic regressions and individual teaching strategies (number of instances) for Spearman). I ran further logistic regressions to examine whether gender had an effect on children's teaching styles (predictor: sex; outcome: teaching style (binary)). I also ran logistic regressions to examine whether children's teaching style was related to their initial understanding of the game, measured as the number of repetitions they needed during the Rule Checks (predictor: number of repetitions in the Rule Checks; outcome: teaching style (binary)). This was done to control for the possibility that children who struggled more with the game rules may be less confident to assume the teacher role, and thus less likely to walk their partner through the game. I then performed the same analyses for children's teaching strategies during the play phase. For the latter, I excluded n = 2 children because the learner refused to play the game and due to experimenter error (who intervened during game play).

4.2.5.2 Metacognitive Reflection on Teaching (Game Task Interview)

I calculated descriptive statistics for children's responses to the Interview Questions. After excluding unscorable responses (=0) with *dplyr* (Wickham et al. 2020; *v. 0.8.5*), I used Spearman correlation and logistic regressions (binomial GLM with logit-Link function) to investigate whether children's interview scores increased with age (predictor:

age; outcome: scores in Interview Questions 1 and 2). To this end, I created a column with binary values for Interview Question 2 using *dplyr* (Wickham et al. 2020; *v.0.8.5*). I also examined whether children's responses to the two questions were related by running a logistic regression with Interview Question 1 as the predictor and Question 2 as the outcome variable. I also used Wilcoxon rank-sum tests and logistic regressions to examine whether children's teaching style affected their metacognitive reflection (predictor: teaching style; outcome: scores in Interview Questions 1 and 2). Children who played a whole round by themselves were omitted from this analysis because only three of them had scorable responses in the Interview Questions.

4.2.5.3 Theory of Mind and Mental State Talk and Relationship with Teaching Style

I calculated descriptive statistics for the Theory of Mind Target and Justification Questions. Participants who failed Control Questions on any of the tasks included in a particular analysis were excluded with *dplyr* (Wickham et al. 2020; *v. 0.8.5*). After excluding children in the 'other' teaching category (=X), I then ran logistic regressions to examine whether children's Theory of Mind (i.e. their cumulative score on the Target Questions) and mental state talk (i.e. their point score in the Justifications) affected their teaching style (predictors: Theory of Mind and mental state talk scores; outcome: teaching style). After excluding children with unscorable responses (=0), I also ran Spearman correlations and further logistic regressions to examine whether children's Theory of Mind scores affected their metacognition about teaching (predictors: Theory of Mind and mental state talk scores; outcomes: scores in Interview Questions 1 and 2).

I plotted the results in *ggplot2* (Wickham 2016), *ggthemes* (Arnold 2019; *v.4.2.0*), and *scales* (Wickham 2018; *v.1.0.0*). Given the limitations of null-hypothesis significance testing, the results of logistic regressions were interpreted with reference to odds ratios (OR, where OR > 1 is indicative of higher odds of an outcome occurring while OR < 1 is indicative of lower odds of an outcome occurring; OR = 1 is indicative of a null effect and greater distance from 1.0 is indicative of larger effect sizes). The results of Spearman correlations were interpreted with reference to Spearman's rho (r_s, where positive values are indicative of a positive correlation while negative values are indicative of a negative correlation between two variables; $r_s = 0$ is indicative of a null effect, while greater distance from 0 is indicative of larger effect sizes; values vary between -1 and +1). For pairwise comparisons and Wilcoxon rank-sum tests, Wilcoxon effect sizes were

calculated (r_w is interpreted like correlation coefficients but only takes positive values, calculated with the package *rstatix* (Kassambara 2021; *v.0.7.0*)); this analysis was run in a more recent version of R (*v. 4.1.1*). P-values were nevertheless included in all results tables.

4.3 Results

4.3.1 Teaching Strategies (Game Task Teaching Phase)

On average, participants needed few repetitions in the Rule Checks, and this correlated negatively with age (see Table 4.5). While 4-6-year-olds needed 2.5 repetitions on average, older children usually did not need any (see Table 4.5).

During the teaching phase, most children used verbal statements (80.0%), physical demonstrations (85.5%), and combined methods (74.5%) (see also Table 4.13). However, only half used abstract elaborations or statements about conditional rules (47.3%) and only one child checked in with their partner (1.8%). Participants showed distinct teaching styles. Half of participants emphasized learning-through-participation (49.1%), and slightly fewer used a prior walk-through (43.6%). Only few children played a whole round by themselves (n = 4 or 7.3%). As implied in the definition, children who initiated with a walk-through made more verbal statements, used more combined teaching methods, and used more abstract elaborations than children who used learning-through-participation, with large effect sizes for all these comparisons (see Table 4.6 and Fig. 4.4). They also taught slightly longer, which was associated with a medium effect size (see Table 4.6 and Fig. 4.4). Conversely, children who used learning-through-participation gave slightly more demonstrations than children who used the more abstract teaching approach, although the size of this effect was small-to-medium (see Table 4.6 and Fig. 4.4). Children who played a whole round by themselves spent the longest time before engaging their partner and are outliers on teaching strategies, with an excessive number of demonstrations while none of them made verbal statements of any kind (see Table 4.6). Accordingly, they were excluded from age analyses.

The odds of using the more abstract walk-through approach increased with age (see Table 4.7). Up to age 8, most children used the participatory teaching style, with only a third of 4-6-year-olds (33.3%) and 7-8-year-olds (35.3%) using the more abstract walk-through approach. The latter only became common at later ages, being used by two thirds of 9-11-year-olds (63.6%) (see Table 4.7 and Fig. 4.4). Children's teaching style was also

shaped by their initial understanding of the game rules; the odds of using the more abstract walk-through approach declined as the number of repetitions during the Rule Checks went up (see Table 4.7). Accordingly, children who needed more repetitions were less likely to use the more abstract teaching style. However, post-hoc ANOVA model comparisons revealed that this effect is probably accounted for by the fact that children's performance on the Rule Checks was itself closely related to age: a combined model incorporating both age and rule repetitions, plus an interaction term, only very slightly improved on an age-only baseline model (see Table 4.7). Boys were slightly less likely to use the more abstract teaching style than girls, but the confidence interval overlapped 1 and post-hoc ANOVA model comparisons revealed that a combined model incorporating both age and sex, plus an interaction term, did not improve model fit compared to an age-only baseline (see Table 4.7).

Scatterplots revealed that, when it comes to individual teaching strategies, some of the youngest children were outliers with excessively long teaching times and many more verbal statements than other children their age (see Fig. 4.3). This was the case for children with uncooperative partners, which required repeated teaching episodes before they eventually joined the game, and for children who got distracted momentarily before they resumed teaching. This was particularly common in younger children and in part caused by the coding scheme, where I cut off ambiguous cases in the teaching phase when the partner joined the game. I therefore excluded children who had experienced such delays to the start of the play phase when analyzing age patterns for individual teaching strategies. Effect sizes for teaching duration, verbal statements, demonstrations, and combined teaching hovered around zero, indicating that there were no substantial age trends for these strategies (see Table 4.8). However, the use of abstract elaborations increased with age with a medium-sized effect, from around 1 such statement in 3-4-year-olds to around 2 in 9-11-year-olds (see Table 4.8). Accordingly, older children did not necessarily talk more, but they communicated at a higher conceptual level. Including children with delays did not alter these effect sizes substantially: effects for teaching duration, verbal statements, demonstrations, and combined teaching remained small, while the use of abstract elaborations correlated positively with age, again with a medium-sized effect (see Table 4.9).

Table 4.5: Effect of Age on Need for Rule Repetitions							
Descriptive Statistics							
	Age Groups				**Spearman Correlation**		
Outcome	**4-6**	**7-8**	**9-11**	**Total**	**r**	**p**	**n**
No. Repetitions	2.50 (2.53)	0.58 (0.84)	0.36 (0.66)	0.98 (1.66)	-0.41	0.002	55

Table 4.6: Comparison of Teaching Styles				
Descriptive Statistics		**mean (SD)**		
Outcome	**PT**	**AWT**	**WR***	**n**
Duration (s)	38.56(36.24)	50.21(34.28)	228.50(124.11)	55
Verbal Statement	2.70 (3.54)	6.50 (2.96)	0.00	55
Demonstration	3.59 (3.10)	2.21 (2.30)	37.00 (17.38)	55
Combined	2.26 (2.73)	5.92 (2.96)	0.00	55
Abstract Elaboration	0.07 (0.27)	2.75 (1.26)	0.00	55
Pairwise Wilcoxon Comparisons		**p-values / r_w**		
Outcome	**PT vs AWT**	**PT vs WR**	**AWT vs WR**	**n**
Duration	0.03 / 0.30	0.005 / 0.53	0.005 / 0.57	55
Verbal Statement	<0.001/ 0.62	0.02 / 0.44	0.003 / 0.60	55
Demonstration	0.05 / 0.28	0.002 / 0.58	0.002 / 0.60	55
Combined	<0.001/ 0.58	0.03 / 0.40	0.004 / 0.58	55
Abstract Elaboration	<0.001/ 0.90	0.63 / 0.10	0.002 / 0.61	55

* PT = Participation-Teaching; AWT = Abstract Walk-Through; WR = Whole Round.

Table 4.7: Effects on Children's Teaching Style					
Descriptive Statistics					
Predictor	**Use of Abstract Walk-Through**				
Age					
4-6	33.3%				
7-8	35.3%				
9-11	63.6%				
Rule Repetitions					
0-1	62.5%				
2 or More	15.4%				
Sex					
Male	43.3%				
Female	52.4%				
Logistic Regressions					
Predictor	**OR [95% CI]**		**p**	**n**	**df**
Age	1.55 [1.09, 2.31]		0.02	51	1
Rule Repetitions	0.49 [0.23, 0.85]		0.03	51	1
Sex (M.)	0.70 [0.22, 2.13]		0.53	51	1
ANOVA Model Comparisons					
	AIC	**Res. Deviance**	**Deviance**	**n**	**df**
Age (Baseline)	68.40	64.40		51	
Age and Rule Rep.	66.78	60.78	3.62	51	2
Age and Sex	71.16	63.16	1.24	51	2

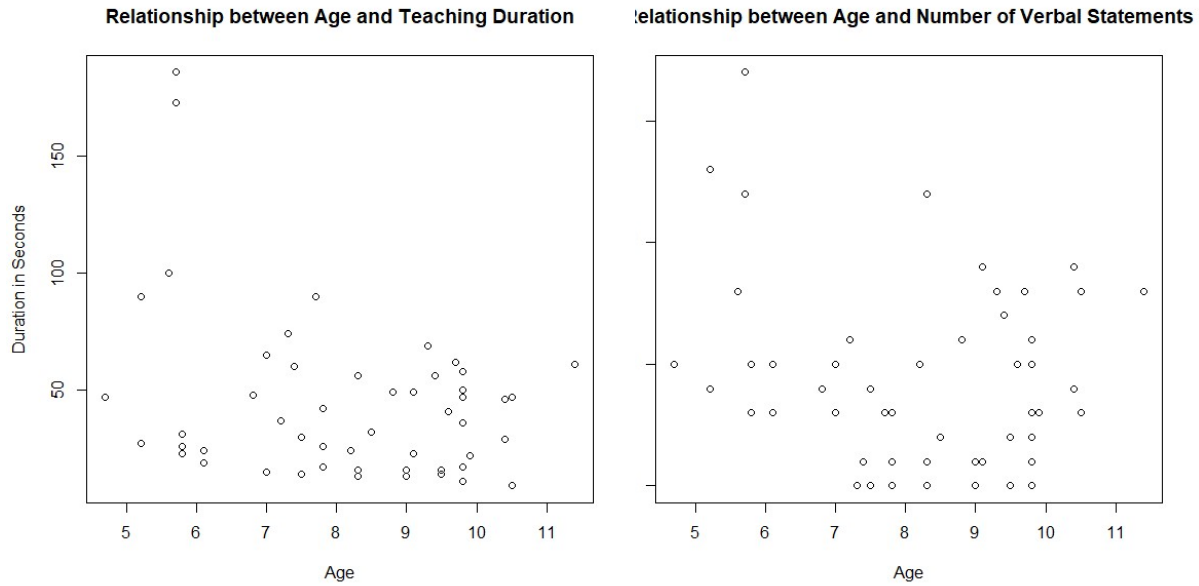


Fig. 4.3: Scatterplots of children's teaching strategies and teaching duration.

Table 4.8: Effect of Age on Frequency of Teaching Strategies (no Delays)

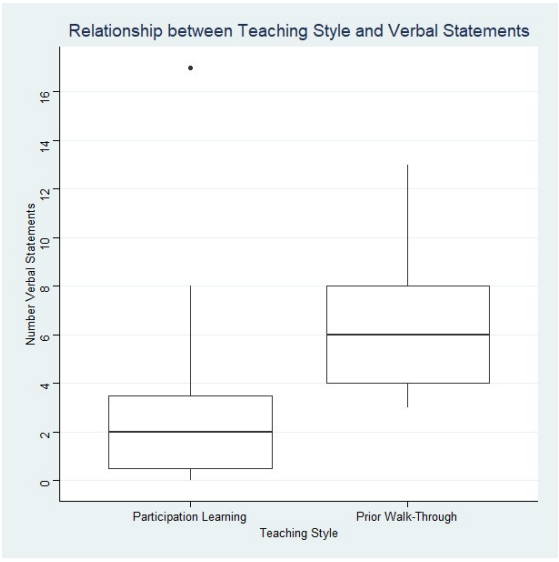
	Descriptive Statistics: mean (SD) – Age Cohorts			**Spearman Correlations**		
Outcome	**4-6**	**7-8**	**9-11**	**r_s**	**p**	**n**
Duration (s)	36.00 (23.51)	30.31 (17.08)	34.43 (18.45)	0.05	0.74	42
Verbal Statement	5.25 (3.24)	3.62 (3.36)	4.05 (3.15)	0.01	0.94	42
Demonstration	2.13 (1.64)	2.00 (1.29)	2.86 (2.39)	0.07	0.66	42
Combined	5.13 (2.90)	3.31 (3.15)	3.57 (3.23)	-0.04	0.80	42
Checking In*	0.00	0.00	0.00	-	-	42
Abstract Elabor.	1.00 (1.20)	1.15 (1.77)	1.76 (1.67)	0.32	0.04	42

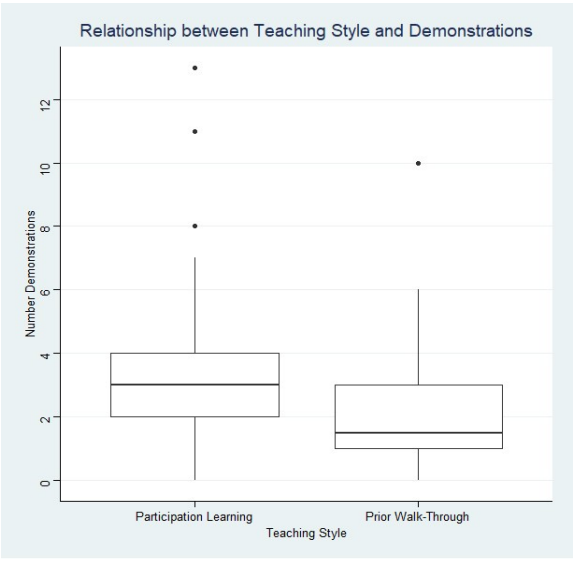
*The only child who checked in with their partner had a delay in their teaching phase.

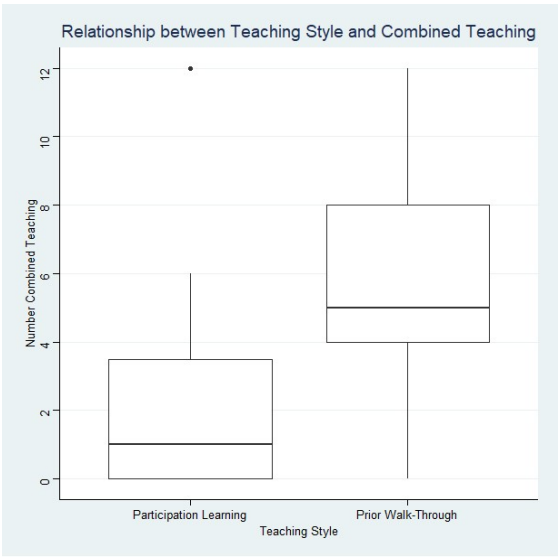
Table 4.9: Effect of Age on Frequency of Teaching Strategies (with Delays)

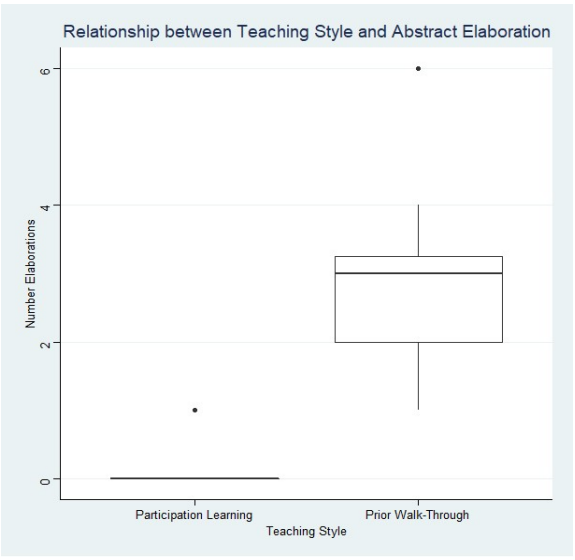
	Descriptive Statistics: mean (SD) – Age Cohorts			**Spearman Correlations**		
Outcome	**4-6**	**7-8**	**9-11**	**r_s**	**p**	**n**
Duration (s)	66.17 (59.11)	38.82 (23.40)	36.00 (19.45)	-0.19	0.17	51
Verbal Statement	7.00 (4.55)	3.06 (3.13)	4.23 (3.19)	-0.10	0.47	51
Demonstration	2.67 (3.58)	3.29 (2.93)	2.82 (2.34)	0.02	0.89	51
Combined	6.08 (3.32)	2.76 (2.93)	3.77 (3.29)	-0.13	0.37	51
Checking In*	0.17 (0.58)	0.00	0.00	-	-	51
Abstract Elabor.	1.00 (1.21)	0.88 (1.62)	1.86 (1.70)	0.33	0.02	51

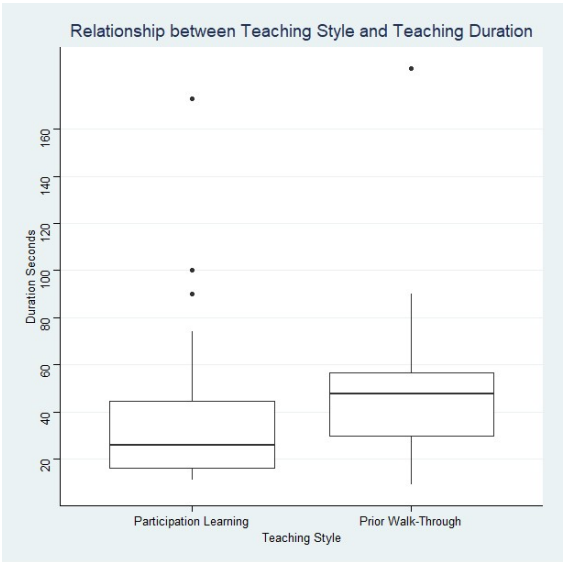
*Only one child checked in with their partner.











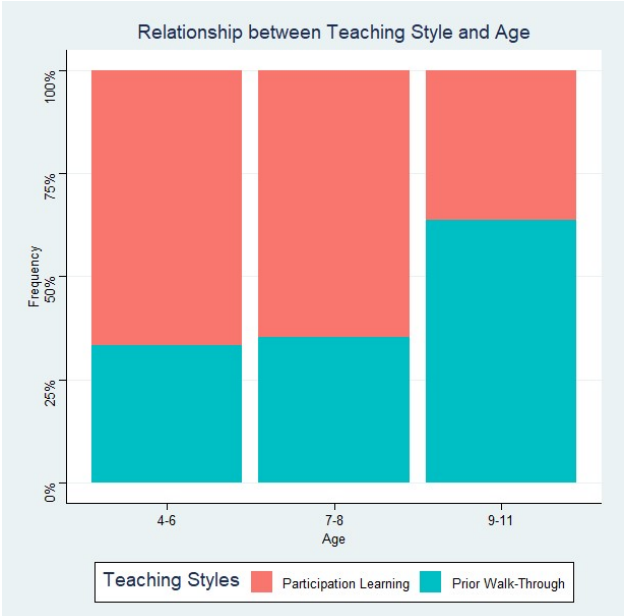


Fig. 4.4: Teaching Styles and Strategies.

4.3.2 Teaching Strategies (Game Task Play Phase)

No distinct teaching styles were evident during the play phase. Most children used verbal commands (98.1%) and move commentary (83.0%), but only few made use of abstract elaborations (22.6%) (see also Table 4.13). Only one child used rule reminders (1.9%), by quizzing their partner after playing with them. As to age trends, the age effect for children's use of abstract elaborations was close to 0, indicating that age trends were negligible for this teaching strategy (see Table 4.10). Children's use of move commentary declined with age, but this effect was small to medium-sized, with a steep decline evident by age 9 but not in younger children (see Table 4.10). Across all ages, children used a strikingly high number of verbal commands, often directing their partner every step of the way (e.g., 'now you! push the truck, now take the dice! shake it! shake it again! you again! take the flower and put the flower on your box!', translating to eight commands for a single game move) (see Table 4.10). The number of verbal commands declined with age (see Table 4.10), but 9-11-year-olds still used this teaching strategy very often – 15 times on average, resulting in a medium-sized effect (see Table 4.10). Scatterplots revealed two outliers for this strategy (see Fig. 4.5). After removing these, the size of the age effect decreased slightly (see Table 4.10).

Table 4.10: Effect of Age on Teaching Strategies (Play Phase Only)

	Descriptive Statistics: mean (SD) – Age Cohorts			**Spearman Correlations**		
Outcome	**4-6**	**7-8**	**9-11**	**r_s**	**p**	**n**
Verbal Command (without outliers)	25.57 (17.49)	17.94 (9.26)	15.19 (8.39)	-0.31 (-0.25)	0.02 (0.07)	53 (51)
Move Comment.	8.29 (7.31)	8.11 (5.98)	4.33 (4.26)	-0.24	0.09	53
Rule Reminder	0.00	0.00	0.19 (0.87)	-	-	53
Abstract Elabor.	0.43 (0.76)	0.17 (0.38)	0.33 (0.66)	-0.08	0.57	53

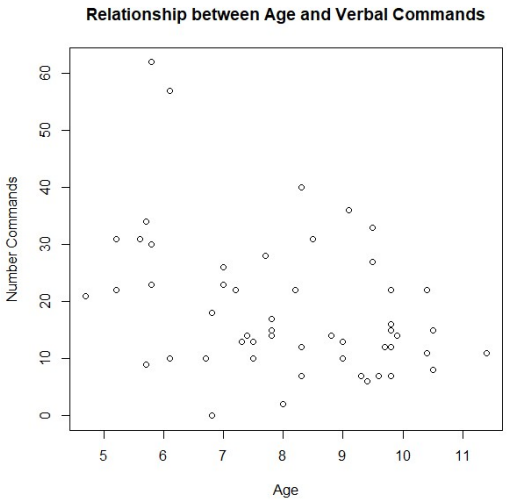


Fig. 4.5: Scatterplot of children's use of verbal commands.

4.3.3 Metacognitive Reflection on Teaching (Game Task Interview)

In the first Interview Question (How did you teach the game?), many children merely restated the rules of the game (34.5%), while play descriptions (18.2%) and references to their actual teaching with communication terms (20.0%) were less common (see also Table 4.13). Few children mentioned metacognitive reflections (10.9%), and slightly more gave unscorable responses (16.4%). Among the children with scorable responses, scores only increased very slightly with age, with a small effect (see Table 4.11) (the 4-year-old gave no scorable responses). Just under half of children in all age groups merely restated the rules of the game (see Table 4.11 and Fig. 4.6). Metacognitive reflection was uncommon in all age groups, and up to age 8, only few children used teaching references. Instead, up to age 8, many children used play references without communication terms. Teaching references with communication terms only become more common in 9-11-year-olds.

In the second Question (How do you know that your partner learnt the game?), most children referred to their own teaching or game playing (43.6%), with only few communicating about the learner's behaviour (25.5%) (see also Table 4.13). Nearly a third gave unscorable responses (30.9%). Among the participants with scorable responses, the odds of using the learner's behaviour as evidence that learning occurred increased slightly with age, but the confidence interval overlapped 1, indicating a negligible effect (see Table 4.11). Only a third of 5-6-year-olds and 7-8-year-olds mentioned the learner's behaviour, and this rose to just under half of 9-11-year-olds (see

Table 4.11 and Fig. 4.6). Against expectations, children who had used the more abstract teaching style were slightly *less likely* to use learner references in Question 2 and no clear trends were evident in the effect of children's performance in Interview Question 1 on Question 2; in both cases, confidence intervals overlapped 1 and were thus consistent with negligible effect sizes (see Table 4.12). There was a moderate-sized difference in Question 1 scores between children who had used the more abstract and those who used the more participatory teaching style, with participants who had used the more abstract style scoring slightly higher (see Table 4.12).

Table 4.11: Age Effects on Interview Questions (Scorable Responses)

Descriptive Statistics				**Tests**		
Interview Question 1	**Age Groups**			**Spearman Correlation**		
	5-6	**7-8**	**9-11**	**r_s**	**p**	**n**
Rule Description	45.5%	40.0%	40.0%	0.10	0.49	46
Play Reference	33.3%	36.4%	5.0%			
Teaching Reference	6.7%	18.2%	40.0%			
Metacognitive Refl.	0.0%	20.0%	15.0%			
Interview Question 2				**Logistic Regression**		
Teacher Reference	66.7%	68.7%	56.2%	**OR [95% CI]**	**p**	**n**
Learner Reference	33.3%	31.3%	43.8%	1.16 [0.75, 1.85]	0.50	38

Table 4.12: Relationship between Teaching Style and Interview Responses

Wilcoxon Rank-Sum Test						**Descriptive Statistics**
Predictor	**Outcome**	**W**	**r_w**	**p**	**n**	**mean (SD): PT / AWT**
Teaching Style (Abst.)	Question 1	154.5	0.30	0.052	43	1.73 (0.83) / 2.43 (1.21)
Logistic Regressions (df = 1)						
Predictor	**Outcome**	**OR [95% CI]**		**p**	**n**	**% Learner Ref.: PT / AWT**
Teaching Style (Abst.)	Question 2	0.46 [0.11, 1.80]		0.27	35	50.0% / 31.6%
						% Learner Ref.:IQ1 Scores
Question 1	Question 2	0.66 [0.31, 1.29]		0.24	34	38.5% (1) / 62.5% (2) / 33.3% (3) / 0.0% (4)

*PT = Participation-Teaching; AWT = Abstract Walk-Through

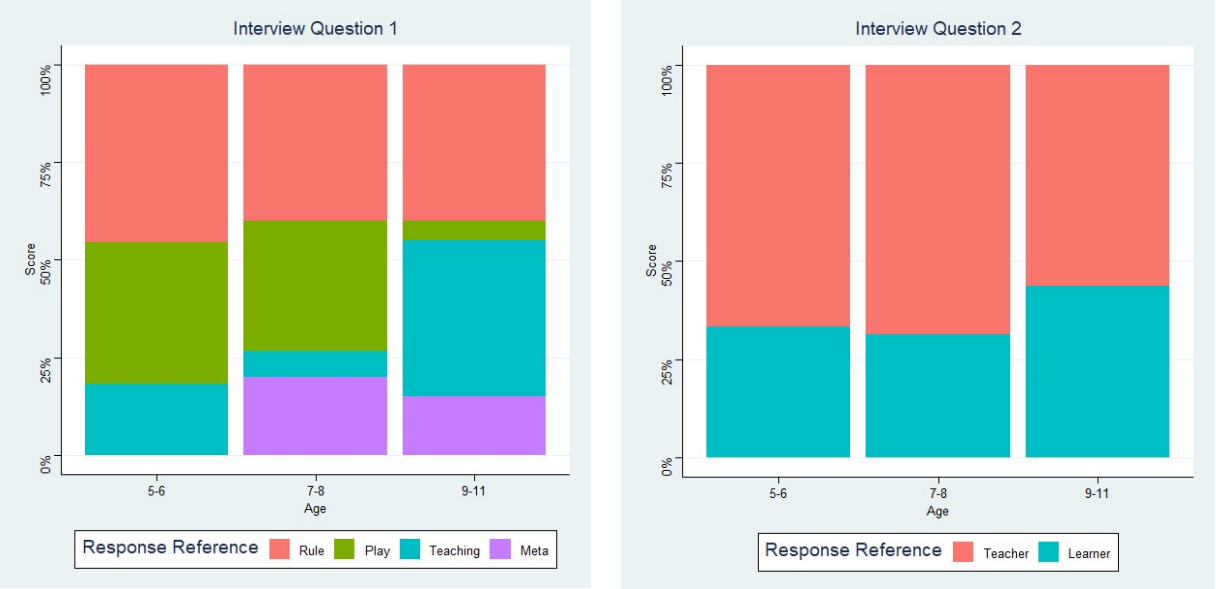


Fig. 4.6: Scorable Responses to Interview Questions.

Table 4.13: Descriptive Statistics for Presence of Teaching Outcomes (n = 55)			
Game Phase			
Teaching		Play	
Verbal Stat.	80.0%	Verbal Comm.	98.1%
Demonstration	85.5%	Move Comm.	83.0%
Combined	74.5%	Abstract Elab.	22.6%
Abstract Elab.	47.3%	Rule Reminder	1.9%
Checking In	1.8%		
Interviews			
Question 1		Question 2	
Rule Descript.	34.5%	Teacher Ref.	43.6%
Play Reference	18.2%	Learner Ref.	25.5%
Teaching Ref.	20.0%	Not Scorable	30.9%
Metacog. Refl.	10.9%		
Not Scorable	16.4%		

4.3.4 Theory of Mind and Mental State Talk

Overall, fewer than half of participants passed Location False Belief (42.5%) and Knowledge Access (41.3%), and even fewer passed Explicit (36.1%) and Contents False Belief (16.3%). Unlike North Efate, none of the tasks showed a consistent upward trajectory with age. For example, in Location False Belief, pass rates increased up to age 6, but then decreased again for older children (see Table 4.14). Fact Belief statements were rare (Location False Belief: 0.9%; Explicit False Belief: 11.8%), as were Previous Location Explanations (10.6%) (see Table 4.14). Perception Criterion statements were

only used by a minority (Contents False Belief: 25.2%; Knowledge Access: 30.6%), and so were External Characteristics (2.4%).

Table 4.14: Descriptive Statistics Theory of Mind and Mental State Talk Target Questions

	Age Group				Total	n (Controls passed)
Task	**3-4**	**5-6**	**7-8**	**9-11**		
LFB	42.9%	57.6%	33.3%	37.5%	42.5%	113
EFB	36.4%	37.1%	35.3%	35.9%	36.1%	119
CFB	9.1%	7.9%	32.4%	12.5%	16.3%	123
KA	45.5%	40.5%	48.5%	35.0%	41.3%	121
Justifications						
LFB - Fact Belief	0.0%	0.0%	3.0%	0.0%	0.9%	
LFB – Prev. Loc.	0.0%	9.1%	0.0%	22.5%	10.6%	
EFB – Fact Belief	0.0%	0.0%	11.8%	25.6%	11.8%	
CFB - Perception	0.0%	10.5%	41.2%	32.5%	25.2%	
CFB – External Ch.	0.0%	0.0%	2.9%	5.0%	2.4%	
KA - Perception	0.0%	18.9%	42.4%	40.0%	30.6%	

4.3.5 Relationship between Theory of Mind, Teaching, and Metacognition

Against expectations, higher Theory of Mind scores were associated with *lower* odds of using the more abstract teaching style (see Table 4.15). Accordingly, children with higher scores in Theory of Mind were *less likely* to verbally walk their partner through the rules of the game than peers with low scores in Theory of Mind (see Table 4.15 and Fig. 4.7). Post-hoc ANOVA model comparisons revealed that this was not reducible to age effects alone, as a combined model incorporating age (dated to the game task), Theory of Mind, and an interaction term substantially improved on an age-only baseline model (see Table 4.15). Sample size alone cannot account for this distribution either. While there were more children with a Target Question score of 0 or 1 (n = 13 and n = 16, respectively), the number of children who scored 2 or 3 was not much smaller (n = 12 and n = 8, respectively), although only very few answered all four Target Questions correctly (n = 2). This unexpected effect is likely due to the unusual patterns found in some of the Theory of Mind tasks such as Location False Belief, where pass rates initially increased with age but then decreased again in 9-11-year-olds, whereas the abstract verbal teaching style was only common in that same age group. For the relationship between children's use of mental state talk and use of the more abstract teaching style, confidence intervals were consistent with a null effect (see Table 4.15).

Higher scores in Theory of Mind were negatively correlated with children's scores

in the first Interview Question (How did you teach the game?), and this effect was fairly large (see Table 4.16). Accordingly, children with higher scores in Theory of Mind scored *lower* on average in the first Interview Question than peers with low scores in Theory of Mind (see Table 4.16 and Fig. 4.7). Again, this unexpected pattern is likely due to the unusual patterns found in some Theory of Mind tasks, where pass rates decreased again in 9-11-year-olds, whereas that same age group also scored higher than younger children in the first Interview Question. There was no clear trend in the relationship between children's Theory of Mind scores and performance in the second Interview Question (How do you know that your partner learnt the game?), and odds were consistent with a null effect (see Table 4.16). Children's use of mental state talk showed a slight negative correlation with their scores in the first Interview Question, although the size of this effect was small (see Table 4.16). There was no clear trend in the relationship between mental state talk and performance in the second Interview Question, and odds were consistent with a null effect (see Table 4.16).

Table 4.15: Relationship between Theory of Mind and Teaching Style

Descriptive Statistics

Predictor	**Use of Abstract Walk-Through**
Theory of Mind Score	
0	76.9%
1	56.3%
2	25.0%
3	25.0%
4	0.0%
Mental State Score	
0-2	69.2%
3-4	42.9%
5-6	33.3%
7-8	0.0%

Logistic Regressions

Predictor	**OR**	**95% CI**	**p**	**n**	**df**
Theory of Mind	0.39	[0.19, 0.70]	0.004	51	1
Mental State Talk	0.94	[0.71, 1.23]	0.65	51	1

ANOVA Model Comparisons

	AIC	**Res. Deviance**	**Deviance**	**n**	**df**
Age (Baseline)	68.40	64.40		51	
Age and Theory of Mind	61.94	53.94	10.463	51	2

Table 4.16: Relationship between Theory of Mind and Metacognition				
Descriptive Statistics: mean (SD) and Percentages				
Predictor	**Question 1 (Score)**		**Question 2 (% Learner Ref.)**	
Theory of Mind Score				
0	2.64 (1.21)		50.0%	
1	2.54 (1.05)		27.3%	
2	1.50 (0.71)		37.5%	
3	1.38 (0.52)		75.0%	
4	1.00 (-)		0.0%	
Mental State Score				
0-2	2.38 (1.26)		55.6%	
3-4	1.83 (1.17)		28.6%	
5-6	1.80 (1.10)		25.0%	
7-8	1.00 (-)		100.0%	
Interview Question 1 (Spearman Correlations)				
Predictor	**r_s**	**p**	**n**	
Theory of Mind	-0.49	<0.001	43	
Mental State Talk	-0.11	0.46	43	
Interview Question 2 (Logistic Regressions)				
	OR	**95% CI**	**p**	**n**
Theory of Mind	0.93	[0.51, 1.67]	0.81	35
Mental State Talk	0.99	[0.70, 1.37]	0.95	35

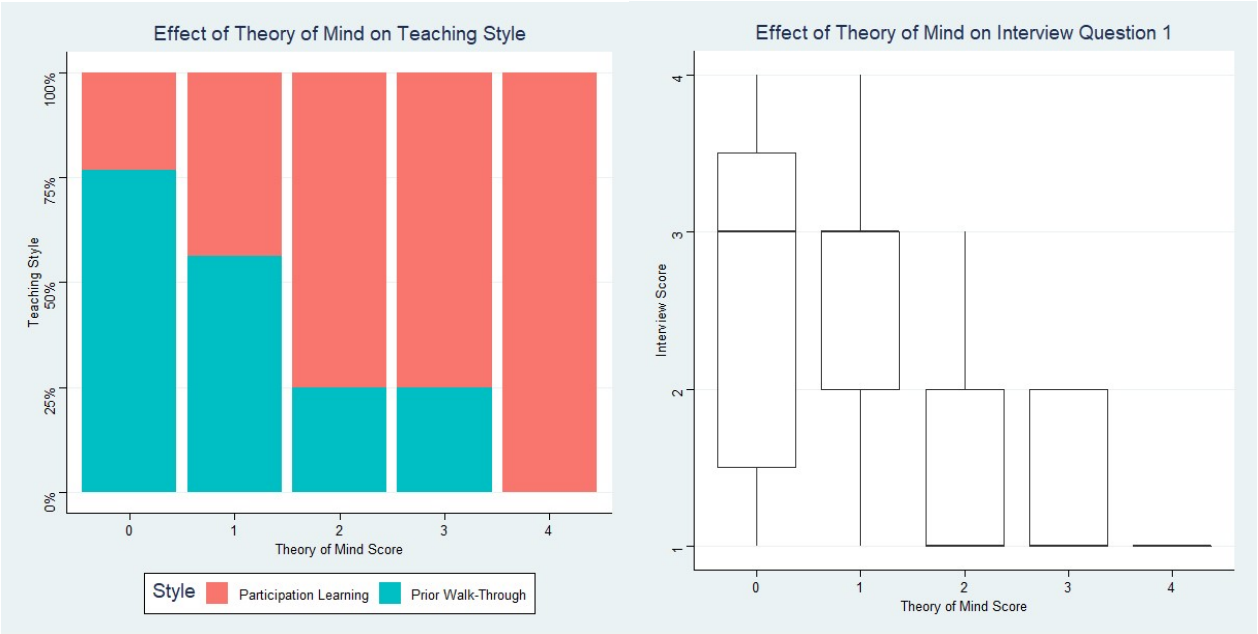


Fig. 4.7: Relationship between Theory of Mind, Teaching Style, and Interview Questions.

4.4 Discussion

4.4.1 Summary of Results

During the teaching phase, most children used a mixture of verbal statements, non-verbal demonstrations, and combined methods, but only half used abstract statements about conditional game rules (47.3%) and only one child checked in with their partner. Intriguingly, children showed distinct teaching styles, and participants were almost evenly split between those who used a participatory approach where they immediately involved their partner in the game (49.1%) and those who verbally walked their partner through the rules of the game before starting to play (43.6%), with the remainder playing a whole round by themselves and expecting the learner to learn from observation alone (7.3%). Children who walked their partner through the game taught longer, talked more, used more combined teaching, and more abstract elaborative statements. In contrast, children who emphasized participatory learning demonstrated more. Two-thirds of 4-6-year-olds used the less verbal, more gestural, and less explanatory participatory style, and this remained the same for 7-8-year-olds, where only a third used the more abstract style (35.3%), which only became common in 9-11-year-olds (63.6%). This finding is at odds with the developmental model underpinning the 'natural cognition' view of teaching (see Strauss, Ziv & Stein 2002; Strauss & Ziv 2012; Strauss, Ziv & Frye 2015), according to which children shift from teaching by demonstration to relying mostly on verbal communication, combined teaching, and abstract explanations by the age of 5.

Analyses of individual teaching strategies revealed that the most important shift occurred in children's use of abstract verbal communication. Children's use of abstract elaborations increased with age, from 1 in 4-6-year-olds (mean = 1.00, SD = 1.21) to around 2 in 9-11-year-olds (mean = 1.86, SD = 1.70). However, children's use of verbal statements and combined teaching more generally *decreased* slightly with age, although these effect sizes were generally small. This indicates that older children did not necessarily talk more, but they instead communicated at a higher conceptual level and were more likely to structure information in a 'pre-packaged' way. This is consistent with the idea that children's verbal teaching shifts from less complex forms such as verbal commands to more abstract statements such as rule explanations (see Ziv et al. 2016), although it also suggests that this continues to develop after age 5. During the play phase, most children taught with a mixture of short verbal commands and move descriptions, but only few used abstract elaborations (22.6%). Even in 9-11-year-olds commands

(mean = 15.19, SD = 8.39) and move descriptions (mean = 4.33, SD = 4.26) outweighed abstract explanations (mean = 0.33, SD = 0.66), suggesting that children's behaviour became more uniform after involving their partner in the game.

Unique trajectories were also seen in children's metacognitive reflection about teaching. This was evident in the first Interview Question (How did you teach the game to your partner?). Among the children with scorable responses, just under half in all age groups merely restated the rules of the game (40.0-45.5%). At age 4-6, none of the children used metacognitive reflection about the transmission process, very few used teaching references with communication terms (6.7%), and instead more commonly used play descriptions without communication terms (33.3%). Communication terms remained uncommon in 7-8-year-olds (18.2%), where again more children used play references (36.4%). Even in 9-11-year-olds, fewer than half mentioned communication terms (40.0%), and metacognitive references remained rare even in 7-11-year-olds (15.0-20.0%). These findings are at odds with the 'natural cognition' view of teaching (see Strauss, Ziv & Stein 2002; Strauss & Ziv 2012; Strauss, Ziv & Frye 2015), according to which children shift from merely restating the rules of the game or describing their play behaviour to describing how they communicated with their partner and reflecting on the transmission process by the age of 5. Divergent trends were also evident in the second Interview Question (How do you know that your partner learnt the game?). Among the children with scorable responses, most children of all ages referred to their own teaching or game playing as evidence that learning occurred. Only a third of 4-6-year-olds (33.3%) and 7-8-year-olds (31.3%) mentioned the learner's behaviour, and less than a half of 9-11-year-olds did (43.8%). Again, this is at odds with the 'natural cognition' view of teaching (see Strauss, Ziv & Stein 2002; Strauss & Ziv 2012; Strauss, Ziv & Frye 2015), according to which children shift from referring to their own teaching as evidence that learning occurred to describing the learner's behaviour as evidence that learning occurred by age 5.

Finally, effects between Theory of Mind and mental state talk on the one hand and children's teaching style and metacognitive reflection on the other did not point in the expected direction. For example, children with higher scores in Theory of Mind were *less likely* to verbally walk their partner through the rules of the game than peers with lower scores. Furthermore, children with higher scores in Theory of Mind scored *lower* on average in the first Interview Question (How did you teach the game?) than peers with low scores. Taken at face value, these findings are at odds with the 'mentalistic' account

of teaching (see Strauss, Ziv & Stein 2002; Strauss & Ziv 2012; Strauss, Ziv & Frye 2015), which predicts that children who perform better on Theory of Mind and mental state talk should use more abstract verbal teaching strategies and should express more metacognitive reflection about teaching. However, these surprising effects are likely due to unusual patterns in the Theory of Mind data (possible reasons for the different Theory of Mind results at the two field sites will be discussed in Chapter 5).

4.4.2 Comparison with Previous Findings

How does ni-Vanuatu children's behaviour compare to the exact values found in previous work? The most directly comparable study is Davis-Unger and Carlson (2008) due to its division into a teaching and play phase, the similarity of our respective coding schemes, and the complete table of means for each variable divided by age group provided in the paper. In the US, 3-year-olds taught for around half a minute on average before involving their partner in the game, whereas 4-year-olds and 5-year-olds taught for nearly a minute (see Table 4.17). After removing delays, ni-Vanuatu children of all ages taught for around half a minute on average and thus approximated the teaching duration of 3-year-olds in the US (see Table 4.17). Comparing strategies during the teaching phase reveals a mixed picture. Ni-Vanuatu children's lack of checking in with their partner is consistent with American children, who also rarely checked in with their partners (see Table 4.17). However, among American children, there was a steep increase in the frequency of combined strategies, from an average of one and a half instances in 3-year-olds to around 4 in 5-year-olds (see Table 4.17). On average, 4-6-year-olds from Vanuatu used combined teaching 5 times, i.e. slightly more often, than 5-year-olds from the US (see Table 4.17). However, 7-8-year-olds and 9-11-year-olds from Vanuatu had fewer instances of combined teaching and were within the range of 4-year-olds from the US (see Table 4.17). As Davis-Unger and Carlson (2008) treated verbal statements and combined teaching as mutually exclusive, I created a new column where I subtracted combined teaching from verbal statements to arrive at comparable figures for verbal-only teaching. The adjusted values reveal that 4-6-year-olds from Vanuatu (mean = 0.13, SD = 0.35) used verbal-only teaching less often than all ages in the American sample (see Table 4.17). 7-8-year-olds from Vanuatu (mean = 0.31, SD = 0.63) were similar to 3-year-olds from the US, and 9-11-year-olds from Vanuatu (mean = 0.48, SD = 0.75) were similar to 5-year-olds in the US (see Table 4.17). However, it should be noted that neither sample used verbal-only methods very often, and overall, these were rare in the American sample as well (see

Table 4.17).

Unfortunately, Davis-Unger and Carlson (2008) did not record instances of non-verbal demonstrations, and neither did they differentiate between levels of abstraction in verbal statements. In contrast, one Israeli study (Ziv et al. 206) coded for demonstrations and differentiated between direct instructions, move explanations, and rule explanations (the closest equivalents to verbal commands, move commentary, and abstract elaboration). Direct comparisons reveal that Israeli and ni-Vanuatu children's teaching behaviours diverged considerably. In Israel, 3-year-olds demonstrated 3 times, but this decreased considerably for 4- and 5-year-olds, who rarely gave non-verbal demonstrations (see Table 4.17). In contrast, ni-Vanuatu children of all ages demonstrated between 2 to 3 times during the teaching phase, similarly to 3-year-olds in Israel (see Table 4.17). In Israel, children's tendency to explain moves and rules increased considerably between the ages of 3 and 5, from 3 to 4 and 2 to 6 instances respectively (see Table 4.17). Conversely, in Vanuatu, 4-6-year-olds and even 7-8-year-olds only used one abstract elaboration on average during the teaching phase, and even 9-11-year-olds only used this strategy about as often as 3-year-olds in Israel (see Table 4.17). In Ziv et al. (2016), 'verbal instructions' served as the less abstract verbal teaching method compared to explanatory statements. To enable more direct comparison, I again created a new column where I subtracted abstract elaborations from verbal statements (for the teaching phase) to arrive at comparable figures for verbal teaching with lower levels of abstraction. The adjusted values reveal that 3- and 4-year-olds from Israel gave between 6 and 7 instructions, whereas 5-year-olds only gave 3, declining with age (see Table 4.17). 4-6-year-olds from Vanuatu made around 4 non-abstract verbal statements on average (mean = 4.25, SD = 2.49), and were thus slightly more likely to use this type of communication than same-aged peers from Israel. However, ni-Vanuatu children's tendency to make such statements also declined with age, to about 2 such statements in 7-8-year-olds (mean = 2.46, SD = 1.98) and 9-11-year-olds (mean = 2.29, SD = 1.76) (see Table 4.17).

I then examined whether differences in abstract communication were due to the fact that I divided my sample into a teaching and play phase. To this end, I created a new column where I added up the number of abstract elaborations made during the teaching and play phases for all children without excluding any participants (n = 55). In these combined results, 4-6-year-olds (mean = 1.29, SD = 1.14) and 7-8-year-olds (mean = 0.95, SD = 1.75) from Vanuatu used this method one time on average, compared to 2 in

9-11-year-olds (mean = 2.18, SD = 1.97). Accordingly, 9-11-year-olds from Vanuatu used this strategy about as frequently as 3-year-olds from Israel (see Table 4.17). This shows that incorporating the play phase values of ni-Vanuatu children does not alter the main conclusion for this teaching strategy. During the play phase, ni-Vanuatu children's use of verbal commands declined with age, but ni-Vanuatu children of all ages used considerably more verbal commands than Israeli children (see Table 4.17). Ni-Vanuatu children's use of move commentary showed a similar trend. While 9-11-year-olds from Vanuatu used this method 4 times on average, comparable to figures for Israeli 5-year-olds, younger children from Vanuatu used this strategy more frequently than all ages from Israel (see Table 4.17).

The most directly comparable study for the Interview Questions is again Davis-Unger and Carlson (2008). As Davis-Unger and Carlson (2008) included children who scored 0 in the Interview Questions, I recalculated my means to include 0 values for more direct comparison. In the first Interview Question (How did you teach?), 4-6-year-old children from Vanuatu (mean = 1.36, SD = 1.01) scored in between the levels of 4- and 5-year-olds from the US (see Table 4.17). Furthermore, even 7-8-year-olds from Vanuatu only scored slightly higher (mean = 1.63, SD = 1.34) than American 5-year-olds (see Table 4.17). However, children's scores continued to increase after that age, as 9-11-year-olds from Vanuatu (mean = 2.09, SD = 1.31) not only outperformed younger children from the same background, but also American 5-year-olds (see Table 4.17). In the second Interview Question (How do you know that they learnt?), 4-6-year-olds from Vanuatu (mean = 0.57, SD = 0.76) scored in between the levels of 3-year-olds and 4- and 5-year-olds from the US (see Table 4.17). 7-8-year-olds (mean = 1.11, SD = 0.66) and 9-11-year-olds (1.05, SD = 0.79) also scored similarly to 4-year-olds from the US (see Table 4.17).

Table 4.17: Comparison of Mean Values Across Studies

		Age Cohorts					
Source		**Previous Work**			**Current Study**		
		3	4	5	4-6	7-8	9-11
	Teaching Phase*						
Davis-Unger & Carlson (2008)	Duration (Seconds)	33	55	58	36	30	34
	Verbal Statements**	0.33	0.87	0.50	0.13	0.31	0.48
	Combined Teaching	1.67	3.73	4.31	5.13	3.31	3.57
	Checking In	0.00	0.20	0.06	0.00	0.00	0.00
Ziv et al. (2016)	Demonstrations	2.93	0.83	0.40	2.13	2.00	2.86
	Verbal Instruction***	6.64	6.50	3.10	4.25	2.46	2.29
	Move Explanation	2.57	3.00	4.00	-	-	-
	Rule Explanation****	1.93	3.50	6.40	1.00	1.15	1.76
	Play Phase***						
Ziv et al. (2016)	Verbal Instruction	6.64	6.50	3.10	25.57	17.94	15.19
	Move Explanation	2.57	3.00	4.00	8.29	8.11	4.33
	Rule Explanation	1.93	3.50	6.40	0.43	0.17	0.33
	Both Phases						
Ziv et al. (2016)	Rule Explanation	1.93	3.50	6.40	1.29	0.95	2.18
Davis-Unger & Carlson (2008)	**Interview******						
	Interview Question 1	0.60	1.23	1.50	1.36	1.63	2.09
	Interview Question 2	0.38	1.15	0.87	0.57	1.11	1.05

*Children with delays in this phase were removed. **Arrived at after subtracting instances of combined teaching from verbal statements more generally. ***Arrived at after subtracting abstract elaborations from verbal statements more generally. ****Treated as equivalent to abstract elaboration. *****Variables treated as equivalents of verbal command, move commentary, and abstract elaboration. ******Includes children who scored 0.

In sum: on average, ni-Vanuatu children taught for a shorter period of time before involving their partner than American children, even if the former were older. This was likely driven by many ni-Vanuatu children's preference for a learning-through-participation style instead of laying out the rules of the game in advance. Furthermore, 4-6-year-olds from Vanuatu used combined verbal and gestural teaching slightly more often than 5-year-olds from the US, although their tendency to use this method declined as they got older. Ni-Vanuatu children also demonstrated more often than Israeli children, even if they were older, and thus do not show the decline in non-verbal demonstrations (and thus purely gestural teaching) that has been observed in Israeli children. In contrast, 4-6-year-olds from Vanuatu used purely verbal teaching methods less frequently than both same-aged and younger children from the US, and even older children from Vanuatu were similar in this regard to 3- to 5-year-olds from the US, although overall neither sample used verbal-only methods very often. The starkest contrast was evident in the most abstract verbal teaching methods, namely explanatory statements and abstract elaborations. 4-6-year-olds from Vanuatu used fewer statements of this kind than both

same-aged and younger children from Israel, and even 9-11-year-olds used this strategy about as frequently as 3-year-olds in Israel. Again, this may have been driven by the learning-through-participation style that was popular in ni-Vanuatu children. This result remained the same regardless of whether only the teaching or both the teaching and play phases were considered.

Finally, there were also similarities. Ni-Vanuatu children's tendency to use the generally more abstract prior walk-through teaching style increased with age. Furthermore, the tendency to use less abstract forms of verbal communication declined with age in both Israeli and ni-Vanuatu children, although not at the same rate. 4-6-year-olds from Vanuatu were slightly more likely to use non-abstract statements than same-aged children from Israel and only fell below the level of Israeli 5-year-olds by the age of 7-8. The same broad trend was evident when considering children's behaviour during the play phase. Ni-Vanuatu children's use of verbal commands and move commentary declined slightly with age, but ni-Vanuatu children used these strategies more often than Israeli children, and their use of move commentary only fell to the level of Israeli 5-year-olds by the age of 9-11. The results indicate that teaching as such is developmentally reliable in the sense that most children taught, but also point to some broad cross-cultural differences in the ontogeny of teaching, especially regarding the role of verbal as opposed to gestural teaching and abstract communication as opposed to more straightforward commands. This is consistent with the idea that specific teaching styles and strategies are culturally learnt (Lancy 2015a; Heyes 2012; 2016b).

In the Interview Questions, 4-6-year-old children from Vanuatu scored lower than 5-year-olds but higher than 3-year-olds from the US. This indicates that ni-Vanuatu children were less likely to describe their teaching with communication terms or metacognitive reflections and less likely to use the learner's behaviour as evidence of learning than same-aged Americans. This is consistent with the idea that metacognitive reasoning about teaching is shaped by cultural learning (Heyes 2016d). However, in the first Interview Question, children's scores continued to increase after that age, and 9-11-year-olds from Vanuatu outperformed 5-year-olds from the US, indicating that this continues to increase as children get older.

4.4.3 Explanations for Teaching Behaviour

Intriguingly, many ni-Vanuatu children preferred a teaching-through-participation style over a more abstract 'pre-packaged' approach even though they had just been exposed to

structured teaching with detailed verbal explanations during the familiarization phase. This is consistent with observational work on teaching in small-scale societies. In many of these societies, caregivers teach by involving children in everyday activities through guided participation, often without much abstract communication (Paradise & Rogoff 2009; Gaskins & Paradise 2010). For example, in Hadza and BaYaka hunter-gatherers, adults provide tools to children, assign chores to them, and take them on foraging trips, which facilitates children's participation in subsistence activities (Lew-Levy et al. 2019). Verbal teaching often relies on commands, especially with small children, as was observed in Gusii mothers in Kenya (LeVine et al. 1994). The results are also consistent with a recent cross-cultural experiment where caregivers taught a puzzle game to their child (Clegg et al. 2021). While US caregivers used more direct active teaching and caregiver-led interaction, ni-Vanuatu caregivers relied more on collaborative learning (e.g., by dividing the task between them and the child) (Clegg et al. 2021).

The findings further fit with my personal observations in the field. For example, host families and friends would occasionally attempt to teach me local subsistence skills such as preparing *laplap*, a kind of pudding made from grated root vegetables or bananas mixed with coconut milk, which is wrapped in a parcel of banana leaves and then cooked in an earth oven (see Chapter 2 for ethnographic context). The process is labourious and complicated, as women must first cut the stalks of banana leaves, grate the vegetables or scrape out the flesh from bananas, open the coconut, scrape out the flesh, and mix the juice with the base of the dough before wrapping the pudding in banana leaves and burying it in the earth oven. People taught by involving me directly, inviting me to observe them, then encouraging me to have a go myself. People gave directions and feedback when I made mistakes and answered my questions, but they usually did not walk me through the activity beforehand or explained how the different aspects connect to each other. Furthermore, I often observed children being taught in the home, which usually involved giving commands and verbal feedback, assigning simple chores (a form of opportunity scaffolding), letting them participate in activities, and expecting them to observe adults (see Chapter 2 for ethnographic context).

Why, then, would children's tendency to use the more abstract approach increase with age, and why at age 9-11? While teaching style did not correlate with children's Theory of Mind on the individual level, this finding is consistent with the idea that in societies with a slower development of Theory of Mind, children should start to favour more abstract verbal teaching methods and shift to more metacognitive reflection at later

ages. Note that the more abstract method only came to be favoured by a majority of children by the age of 9-11. Similarly, communication terms, metacognitive references, and learner references only became more common in that age group, and even then they were not adopted by a majority of children. This coincides with some of the Theory of Mind findings from North Efate, where most children were found to pass the most reliable False Belief tasks by age 9-11 (see Chapter 3).

However, this is not the only possible explanation. Another possibility is that older children were more likely to emulate the teaching methods they had just observed in the experimenter. For example, older children may have assumed that the purpose of the task was to demonstrate that they had internalized the methods of instruction used by the experimenter, i.e., they assumed that the purpose of the task was to learn how to teach. In contrast, it might be that younger children merely taught the way they preferred, or they assumed that the purpose of the task was to just play the game. This idea is supported by children's behaviour in the walk-through group: these participants usually started with a verbal explanation of the game rules, often supported by combined teaching; this was followed by making a move, which also served as a demonstration for the learner; and finally, they invited the learner to join. This replicates closely the pattern of events during the familiarization phase, where the experimenter, too, always made the first move during practice play. This explanation is consistent with some findings from the imitation literature. Over-imitation -the detailed copying of arbitrary or unnecessary actions- emerges from 18 months of age and continues thereafter, and this has been documented in a range of different societies, including Western industrialized populations, South African Bushmen, and Australian Aborigines (Nielsen & Tomaselli 2010; Nielsen et al. 2014). Crucially, over-imitation increases with age (McGuigan, Makinson & Whiten 2011).

Another (though complementary) possibility is that older children were more responsive to the social context of the experimental setting itself, which took place at their primary school. In the village, children have many opportunities to experience teaching through participation when their caregivers and other adults teach them this way, but also when they observe such interactions between adults and older siblings. Furthermore, children have opportunities to enact this teaching style in child-led play groups, where they spend much of their time when not in school (see Chapter 2 for ethnographic context). However, children also experience other forms of teaching. In the classroom and at church, children have many opportunities to observe direct active teaching with a

strong reliance on abstract communication and advance verbal instruction. This is evident in frontal teaching by schoolteachers and preaching by pastors (for further ethnographic detail on differences between cultural transmission in church/school and village life see Chapter 2). Occasionally, children would spontaneously re-enact these teacher roles when playing with me, for example by pointing at objects and asking me to name or count them or to identify their colours. The children commented with 'good' when I gave the right answer or corrected me when they thought I was wrong. Accordingly, children were certainly capable of enacting a 'teacher script' during interactions outside the testing situation.

As a result, it might be that in addition to emulating the experimenter, older children enacted a set of behaviours associated with the more abstract verbal approach typical of formal education. This was evident in some children's communication during the teaching phase, who adopted a 'teacher posture' by pointing at objects with pencils or telling the learner to sit down properly (which the experimenter had also done). Older children may have been more likely to do so because they had more schooling experience than younger children, or because they were more inclined to draw a link between the teaching situation in the experiment and the teaching conventions of the place it was held at. Either way, the explanations I have advanced suggest that children rely on a range of different teaching mechanisms they have observed in their everyday lives and apply those during the testing situation. This is more attuned to the ethnographic context than the more 'mentalistic' alternative, which views different approaches to teaching as a direct reflection of Theory of Mind. Again, my interpretation is consistent with some findings from the imitation literature. Children's, but also adults', tendency to over-imitate is highly sensitive to the social context of the testing situation (Keupp et al. 2015; Kline et al. 2020; for a review of contextual factors influencing over-imitation see Rawlings et al. 2019). For example, children's tendency to over-imitate increases when they are observed by an adult (Stengelin, Hepach & Haun 2019). Furthermore, children's tendency to over-imitate varies between cultures, with children from age-egalitarian hunter-gatherer societies such as the Aka over-imitating less than others (Berl & Hewlett 2015). Intriguingly, previous studies have shown that ni-Vanuatu children show higher imitative fidelity than Western children (Clegg & Legare 2016). Furthermore, ni-Vanuatu adults associate conformity -expressed as high-fidelity copying- with intelligence and good behaviour (Clegg, Wen & Legare 2017). It might be that children's sensitivity to the social context of copying situations increases with age, and that ni-Vanuatu children's

interpretation of such scenarios shifts as they get older, favouring a more conformist approach in older children. Additionally, older children may have been more confident to assume this teacher role (and its associated authority) due to their better initial understanding of the game rules, as evident in the rule checks.

Another possibility is that the observed trajectory is simply typical of the ontogeny of teaching in small-scale societies. This idea is backed up by an older observational study with Maya children (Maynard 2002). When taking care of younger siblings, Maya children taught them how to perform everyday tasks (Maynard 2002). By age 4, children started to initiate teaching, and by the age of 8, children used verbal explanations and feedback combined with demonstrations, along with physically intervening in the learner's behaviour (Maynard 2002). Children aged 3-5 used some commands but did not use much combined teaching or verbal feedback, and no explanations (Maynard 2002). Conversely, 6-7-year-olds used all of these strategies at higher rates than younger children, and children's use of these strategies continued to increase in the 8-11 age group (Maynard 2002). Future work should investigate whether the observed trajectory in ni-Vanuatu and Mayan children also translates to other contexts.

The findings are also intriguing regarding children's use of language. The 'mentalistic' and 'natural cognition' model of teaching (see Strauss, Ziv & Stein 2002; Strauss & Ziv 2012; Strauss, Ziv & Frye 2015) treats the increasing involvement of language in teaching as a sign of developmental progression and has sometimes equated more verbal communication with higher teaching ability. Arguably, language-assisted teaching must increase during ontogeny, at least to the extent that language ability itself does – specifically lexical knowledge and verbal fluency, along with associated changes in brain lateralization (see review in Rosselli et al. 2014). Furthermore, language has certainly given our species an important tool for the transmission of complex cultural techniques (Laland 2017). However, it does not follow that more language use always equates to a more efficient transfer of information, especially when comparing different behaviours, skills, and techniques. Others have already criticized the assumption that abstract verbal teaching is the 'best' form of teaching, pointing out that humans flexibly use many different types of teaching (Kline, Shamsudheen & Broesch 2018). For example, the extent to which people use language when they teach depends not merely on their language ability or their capacity for teaching, but also on the characteristics of the behaviour being taught. Experimental studies have shown that verbal teaching is more effective in technically demanding and opaque tasks (Morgan et al. 2015; Caldwell,

Renner & Atkinson 2017; Lombao, Guardiola & Mosquera 2017). We should thus expect less verbal teaching in more simple, less demanding, and more causally transparent tasks. Furthermore, observational studies in BaYaka hunter-gatherers show that verbal teaching is more common for abstract cultural content such as social norms than for technical skills such as tool use and foraging (Salali et al. 2019). This is in line with theorists who have proposed that language has unique benefits for the exchange of *social* information through gossip, enabling a form of social 'grooming' that allowed early humans to maintain cohesion in larger and more complex groups (Dunbar 1996). Accordingly, we should expect more verbal teaching for information about people than for information about things.

Against this backdrop, it is intriguing that children's number of verbal statements, as well as instances of combined teaching, declined slightly with age. Some of the younger children talked a lot, but also repeated themselves or stated the obvious by merely narrating what they were doing. Their use of language therefore did not yield much additional information over and above what was already visible to the learner. In contrast, children's use of abstract elaborations increased with age. This result is consistent with Ziv et al. (2016), who found that the use of simpler verbal instructions declines, while the use of explanatory statements increases with age. Taken together, both studies suggest that it is the quality rather than the quantity of verbal communication that makes for effective teaching. In other words, it is not how much people talk, but what they say, and how they exploit language to structure information. In the context of this experiment, language is uniquely beneficial for elucidating its opaque aspects, i.e. the higher-level relationships between the various elements of the game that are captured in conditional rules (e.g. if red star -> roll dice again). Explicating these relationships reduces the number of inferences that the learner has to make and thus reduces uncertainty on the learner's part before starting the game. As children grow older, they not only develop a richer vocabulary, but presumably, they also become conscious of the unique benefits of language for making relationships that are not immediately discernible more concrete. This awareness is not only driven by Theory of Mind, but by children's growing insight into language itself, which in turn enables more strategic use of language in teaching situations, and this likely develops throughout childhood and into adolescence. For example, children's language development continues after age 5 and into adolescence and even adulthood, not only due to their growing vocabulary, but also their higher sensitivity to linguistic registers practiced in different social contexts, an increasing ability to

consciously shape their own verbal expression to accomplish specific goals, and increasing metalinguistic awareness, i.e. their ability to consciously reflect about language (see review in Berman 2007). This also relates to a more general problem, namely, how children learn to bring teaching under conscious reflection throughout development, and how they learn to structure information for greater learnability. This suggests that humans not only apply metacognitive reflection to their social learning when they seek information (Heyes 2016d), but also when they transmit information to others.

4.4.4 Explanations for Metacognitive Reflection

While cultural conventions of teaching may account for children's teaching behaviour, cultural discourses about knowledge, teaching, and authority may account for children's responses to the Interview Questions. Emic ni-Vanuatu ideas about the creation and transmission of knowledge have been documented by social anthropologists working on Tanna island. On Tanna, people can own knowledge like they own material possessions: "as is common throughout Melanesia, people sell to others medical and magical recipes, spells, dance steps, artistic motifs, ritual practices, and new songs. A person can possess knowledge, exchange it, and consume it" (Lindstrom 1990: 44). This means that, rather than being generated by the ingenuity of individuals, "[k]nowledge exists externally" (Lindstrom 1990: 43). In other words, "[k]nowledge is revealed, not individually created. It is passed down, not made up […] People do not explain the production of knowledge in terms of a knower's individual talent, genius, or creativity" (Lindstrom 1990: 43p). This ideology diminishes the role of the individual and their capacity to 'author' knowledge (Lindstrom 1990: 45). Instead, knowledge derives from external authorities that reveal themselves to individuals through inspiration (Lindstrom 1990:82p). Knowledge is created through "practices that promote the transmission of a knowledge statement from authority to spokesman" (Lindstrom 1990: 83). These authorities 'inspire' people through dreams and rituals: "[i]n dreams, for example, people may receive spontaneous communications from an ancestral voice. Other procedures consist of ritualized practices by which islanders purposely set out to learn new knowledge by inviting inspiration" (Lindstrom 1990: 83). This is based on a cultural model of dreaming that differs markedly from Western ideas. Westerners

> suppose that dreamed statements can be genuine only as a plan for a desired future, or as the disguised sign of some internal psychological state. In Melanesia, however, dreaming is a widespread means of inspiration that regulates the formulation of authentic knowledge […]. As people sleep, they pass over to the other side […] and enter into conversation with the dead. […] In dreams, people receive (that is, overhear of observe) knowledge form authoritative sources (Lindstrom 1990: 87).

Relevant authorities include recent ancestors, relatives (such as fathers), and nowadays also the Bible and Jesus Christ (Lindstrom 1990: 75). For example, ancestors 'reveal' songs to bards (Lindstrom 1990: 75). As a result, 'intelligence' means "to know where to find the right sources" (Lindstrom 1990: 73). This results in an 'ethno-theory' of culture learning that emphasizes the 'osmotic' absorption from authorities: "Learners watch and listen to teachers instead of actively questioning. […] Students learn, instead, by unquestioningly and repetitively imitating others" (Lindstrom 1990: 45). In this model, the learner's "processes of knowing are [presented as] sensual and passive, rather than reflective or interactive" (Lindstrom 1990: 45). Intriguingly, the same ethnographer goes on to state:

> This does not imply that people never learn by trial-and-error experimentation or are unable to plan and execute creatively in order to validate or falsify some idea. Nor does it suggest an exotic or undeveloped island cognitive psychology. This revelatory emphasis is, rather, a discursive condition (Lindstrom 1990: 72).

If attributing knowledge to external sources of authority is a 'discursive condition', it is largely a way of communicating about knowledge that imbues people's claims with legitimacy – legitimacy they would lack if they merely attributed it to their personal acuity. In other words, 'my ancestor said so' carries more weight than 'this was my idea'. This 'discursive condition' is a communicative convention, informed by normative ideals about teachers, learners, and knowledge itself. These ideals may stem from the 'communal', somewhat 'gerontocratic', and highly 'interdependent' model of sociality that is present in village life (see Chapter 2 for ethnographic context at my own field sites). In contrast, attributing knowledge production to internal mental processes and personal effort may be more salient in individualistic societies.

How might this 'folk model' of cultural evolution speak to the findings from the Interview Questions? In the first Interview Question (How did you teach the game?), children may have emphasized the game rules (rather than their communication strategies) to demonstrate that they had absorbed the knowledge content they were tasked

with transmitting. Children may have viewed this knowledge content as an external reality that people can possess, exchange, and circulate, and that exists independently of internal mental processes or communicative acts. In the second Interview Question (How do you know that they learnt the game?), children may have emphasized their own teaching (rather than the learner's behaviour) to emphasize their role as a source of authority in the transmission process, reflecting their expectation that knowledge circulates through osmosis. Accordingly, the fact that ni-Vanuatu children's responses diverged from those of children in Western countries is probably not caused by some deficit in metacognitive reflection. Rather, these metacognitive, metarepresentational reasoning abilities may be used to form different 'ethno-theories' of teaching in different cultural contexts.

4.4.5 Limitations

The experimental approach this study is based on (Strauss, Ziv & Stein 2002) has ecological limitations. At the field site, children have access to some Western toys and games, including football, some plastic or plush toys, and some mobile phone games, although this is limited (see Chapter 2 for ethnographic context). Furthermore, the objects used in the game, such as trucks and flowers, are present at the field site. Finally, school activities occasionally involve role play, such as playing shop when learning how to give change in Year 2. However, board games are not common. This means that in addition to memorizing and applying the rules of the game, participants must absorb the concept of playing a structured game by arbitrary rules, including conditional rules about collecting rewards. As a result, we would expect them to have more difficulty understanding the rules they are expected to teach than Western children, many of whom have encountered board games either in their homes or in a childcare setting. On the other hand, while the initial understanding of the task (as measured in the Rule Checks) was indeed lower in preschoolers, this cannot explain the whole pattern. Notably, 7-8-year-olds still preferred the participatory approach over the more abstract 'front-loaded' teaching style even though their performance in the Rule Checks was considerably better than that of younger children. While most primary schoolers answered all the Rule Checks correctly without repetitions, differences in exposure to structured games nevertheless point to a problem for research building on this paradigm. A related limitation concerns the modifications of the game rules (see Section 4.1.2, Study Design and Research Questions). Simplifying the game and reducing the number of rules may have made the game more accessible, but

also may have reduced the need for abstract elaborations and verbal communication. This may limit the comparability of results with previous tests conducted in other populations.

Furthermore, the participants in the current study were older on average than in previous studies. While primary schoolers were included deliberately due to the reported divergence in Theory of Mind among ni-Vanuatu children (Dixson 2016; Dixson et al. 2017; see also Chapter 3), all the children who were excluded because they refused to engage their partner or engaged in unstructured play were preschoolers. Furthermore, some preschoolers had to be excluded from the teaching role because they did not meet the conditions for the Theory of Mind task, i.e., they had failed Control Questions. Accordingly, age-matched comparisons with samples from earlier teaching studies (Davis-Unger & Carlson 2008; Ziv et al. 2016) were only possible for 5-year-olds, but not for 3-year-olds.

4.4.6 Outlook

Additional evidence is needed to clarify whether the teaching styles observed in this study are 'stable', habitual behaviour patterns or whether they are merely instances of flexible behaviour that are affected by a combination of various situational factors and cultural biases. For example, if a child keeps using the same participatory approach even when tested repeatedly on the same task, this would show that 'teaching styles' have test-retest reliability within the same individual, and are therefore indicative of habitual behaviours. Or if a child keeps using the same teaching approach even when tested on different tasks, this would show convergent validity, also indicative of repeatable, habitual behaviour patterns. Future studies should address this by using different activities in the peer teaching task. Of particular interest are activities that rely less on arbitrary rules, for example arts and crafts-related tasks that have been employed in previous social learning experiments, such as building spaghetti towers or paper planes (Caldwell & Millen 2008) and tying knots (Caldwell, Renner & Atkinson 2017). Alternatively, peer teaching tasks could integrate local skills and activities that children have observed in their home environment such as weaving or plaiting. While the specific pattern, fabric, or technique should be new to participants, the concept of weaving is not, making the task more accessible for children at this field site. More broadly, future work should examine whether the trajectory identified in ni-Vanuatu and Maya children (see Maynard 2002) translates to other small-scale societies where 'guided participation' and collaborative learning are common.

Furthermore, future work could manipulate the testing conditions of this paradigm (Strauss, Ziv & Stein 2002). While its creators have argued that teaching is a 'natural cognition' in humans, and that children's behaviour during the experiment shows this to be true (Strauss, Ziv & Stein 2002; Strauss & Ziv 2012; Strauss, Ziv & Frye 2015), this claim hinges on the notion that we are not taught to teach, yet we develop this ability 'naturally' during ontogeny (ibid.). However, as stated above, young children have already been exposed to many instances of teaching in the home and in the village, by caregivers such as parents, extended family, or older siblings. Furthermore, they have also experienced teaching in a classroom environment, by kindergarten instructors and primary school teachers. Finally, the participants have just experienced teaching during the familiarization phase of the experiment. Accordingly, any results are also consistent with the idea that children come to teach through social learning, and that older children are more likely and able to emulate the teaching behaviour of others. Future studies should attempt to distinguish between these possibilities. For example, the experimenter could vary the contents of the familiarization phase between participants, relying more on pre-packaged verbal information and abstract communication with some children, while emphasizing a more practical, participatory approach with others. Researchers could then examine whether this influences children's own teaching, and whether this influence increases with age. If children's teaching styles are highly variable depending on the content of the task or the method of instruction, and especially if the same individuals express different teaching strategies in response to such factors, this would indicate that teaching is as contextual, situational, and variable as other high-fidelity methods of cultural transmission, such as imitation.

Additionally, future work should examine teaching in older children and how it relates to their ongoing cognitive development, especially their growing insight about language, their metacognitive reflection on teaching and learning, and their ability to structure information. This work could explore the ontogeny of flexible teaching, or children's ability to flexibly adjust their teaching to the needs and abilities of the learner. For example, a previous study found that 5-6-year-olds flexibly adjusted their demonstrations to the knowledge level of the learner (Gweon, Shafto & Schulz 2018). It may be that this flexibility is at the core of human teaching, and that therefore the ability to teach flexibly should emerge more reliably during ontogeny than the application of specific teaching styles. Finally, future work should also examine younger children to determine when trajectories in specific teaching behaviours diverge between cultures.

5. Socioeconomic Transitions and Theory of Mind

5.1 Introduction

5.1.1 Background

In this chapter, I assess whether aspects of the family environment and 'modernization' affect the development of Theory of Mind, and specifically, False Beliefs, in ni-Vanuatu children. Theory of Mind refers to 'mind-reading', or the ability to represent what others think, know, want, and feel. False Beliefs refer to an agent's understanding that others can hold subjective beliefs that conflict with external reality. Children's developing Theory of Mind is largely determined by age and disability status, with children suffering from Autism Spectrum Disorder (ASD) showing delayed development compared to normally developing children (see Baron-Cohen, Leslie & Frith 1985). Normally developing children from Western societies understand False Beliefs by the age of 4-5 (Wellman, Cross & Watson 2001). The same age-dependent developmental trajectory has been identified in children from India, Peru, and Thailand (Callaghan et al. 2005) as well as Yap and Fais islanders in Micronesia and Baka hunter-gatherers in Cameroon (Avis & Harris 1991; Oberle 2009). These age trajectories differ somewhat between populations from different cultural backgrounds. For example, the timing of False Belief understanding appears to be later in Filipino (de Gracia, Peterson & de Rosnay 2016), Japanese (Naito & Koyama 2006), Samoan (Mayer & Träuble 2012; Mayer & Träuble 2015), and ni-Vanuatu children (Dixson 2016; Dixson et al. 2017; see also Chapter 3).

In addition to age and culture, children's developing Theory of Mind is also affected by multiple demographic variables. Twin studies show that most of the variance in Theory of Mind performance between children can be attributed to environmental factors (Hughes et al. 2005). Some findings suggest that children's Theory of Mind performance is delayed if their guardians have low educational attainment and socio-economic status, but the results are inconclusive. For example, children from low-income African American families showed improvement in False Belief understanding from age 3 to 5 but performance at age 5 was lower than that reported in most other populations (Holmes, Black & Miller 1996). Socio-economic status was also found to affect children's understanding of deception, even after controlling for age (Cole & Mitchell 1998). In other studies, parent's occupational class and mothers' education affected children's understanding of False Belief but not emotion (Cutting & Dunn 1999). Pears

and Moses (2003) found that mothers' education predicts children's understanding of perception, desire, and emotion, and that socio-economic status predicts children's understanding of perception and emotion. Education effects on perception understanding held after controlling for age, but income effects did not (Pears & Moses 2003). However, demographic effects on desire and emotion understanding disappeared after controlling for age (Pears & Moses 2003). Others found that socio-economic status affects children's ability to differentiate between fantasy and reality, but not False Belief (Garner, Curenton & Taylor 2005). Yet others found that socio-economic status had no direct effect on Theory of Mind (Lucariello, Durand & Yarnell 2007).

Others have proposed that family structure impacts children's understanding of Theory of Mind, the most important environmental factors being household size, number of siblings, and the mother's marital status. But again, results have been inconclusive. Children from larger families have been shown to have accelerated False Belief development, and this effect held after controlling for age (Jenkins & Astington 1996). Furthermore, family size showed a stronger association with False Belief understanding in children with lower language ability, which might suggest that the presence of siblings compensates for lower language ability in children's developing social cognition (Jenkins & Astington 1996). Some found that children from larger families showed better False Belief understanding than children from smaller families, with no difference in the effect of older and younger siblings (Perner, Ruffman & Leekam 1994). Others found that English and Japanese children with more older siblings showed improved False Belief understanding, but no effect for younger siblings (Ruffman et al. 1998). Others found that children with a sibling aged 12 months to 12 years outperformed only children, regardless of whether that sibling was older or younger (Peterson 2000). However, the presence of infants and adolescents had no effect, and neither did overall family size (Peterson 2000). In a Greek sample, the number of adult kin available, the number of adults children interacted with on a daily basis, the number of older siblings, and the number of older children the children interacted with on a daily basis all affected children's developing Theory of Mind (Lewis et al. 1996). In other studies, the number of siblings had no effect on children's Theory of Mind (Cutting & Dunn 1999). Pears and Moses also (2003) found that the number of siblings predicts children's understanding of desires, and that children with better emotion understanding were more likely to have two parents present in the home (Pears & Moses 2003). However, these effects disappeared after controlling for age (Pears & Moses 2003). Conversely, in a longitudinal design early sibling interaction did

act as a catalyst for Theory of Mind and for executive functioning more generally, with benefits accruing to children with more siblings (McAlister & Peterson 2013).

However, the above studies were all conducted in developed countries. As a result, it remains unclear whether these effects generalize to small-scale societies. So far, the literature offers little insight into how these variables affect variation in children's Theory of Mind development in those types of settings, as studies in those populations have mostly focused on whether developmental trajectories documented in Western societies replicate in other cultures (see also Chapter 3). This research focus may be partly due to a 'West vs the Rest' thinking which views small-scale societies as culturally homogenous and their members as interchangeable (see Amir & McAuliffe 2020; see also discussion in Chapter 1). There is a tendency to present small-scale societies as remote and removed from Westernizing influences. This is problematic because many small-scale societies have interacted with colonial powers for generations (Wolf 1997), have been visited by missionaries and anthropologists, and are participating in formal education and the market economy in increasing numbers (for an example with Hadza hunter-gatherers in Tanzania see Gibbons 2018). These shifts can produce considerable variation in educational attainment, socio-economic activities, and household structure within populations. These shifts can further affect people's value systems and child-rearing practices (Greenfield 2009; Lancy 2015a), which may in turn shape children's cognitive development to conform more closely to patterns observed in Western, industrialized countries (for an example on visual pattern representation see Greenfield, Maynard & Childs 2003). As a result, some have argued that, as traditional cultural practices are abandoned under the influence of globalization (Cox 2000), people's cognition will approximate patterns observed in Western societies (Rozin 2010).

Might this be the case for Theory of Mind? Cross-cultural comparative studies suggest that market integration and individualism affect the role of 'mentalizing' in the moral reasoning of adults (Barrett et al. 2016; Curtin et al. 2020). However, it remains unclear whether factors such as socio-economic status, formal education, market integration, and household structure affect children's Theory of Mind in non-Western societies. Where studies consider those variables, they show inconsistent results. For example, slower False Belief understanding has been documented in Brazilian children from low-income backgrounds (Dessen & Souza 2014). Socio-economic status also affects children's False Belief understanding in Puerto Rico (Shatz et al. 2003). However, False Belief development in Indonesian children from low-status trash picker (*pemulung*)

families did not differ from that of middle-class Jakartans, and neither group differed from middle-class Australians (Kuntoro et al. 2013). But unlike Australians and middle-class Indonesians, *pemulung* children showed slower development of Knowledge Access and Hidden Emotion (Kuntoro et al. 2013). In Vanuatu, the participants' number of siblings had no consistent effect on Theory of Mind performance, with significant effects in rural but not in urban samples (Dixson 2016; Dixson et al. 2017). Furthermore, these effects differed between different rural locations, with significant effects in some locations but not in others (Dixson 2016; Dixson et al. 2017). In that same study, urban children outperformed rural children, but children living in the most remote rural locations outperformed children living in less remote locations (Dixson 2016; Dixson et al. 2017). Dixson (2016) speculated that urban parents may have received more formal education than rural parents, and that this may contribute to differences in children's performance. However, Dixson (2016) did not assess guardians' educational status directly, and thus it remains unclear whether this was a factor. Other studies suggest that children's own exposure to schooling affects Theory of Mind. For example, Mofu children in Cameroon who attended school showed accelerated Theory of Mind development compared to children with no exposure to formal education (Vinden 2002). Pedagogical experiences during schooling may also be relevant. For example, children from Hong Kong who attend local schools (where drilling is common) perform worse on Theory of Mind than peers attending international schools with a British curriculum (Wang et al. 2016). Due to the limited data available, Dessen and Souza (2014) have argued that cross-cultural work should pay more attention to the characteristics of children's family environments.

5.1.2 Study Design and Research Questions

In this chapter, I take up Dessen and Souza's (2014) suggestion and examine the impact of children's family environments on ni-Vanuatu children's Theory of Mind. Vanuatu provides an interesting test case for these variables. Vanuatu has a higher birth rate than most Western countries, with 21.95 births per 1,000 residents per year (CIA World Factbook 2021). As a result, Vanuatu has a very young population: 33.65% are aged ≤14 years and a further 19.99% are 15-24 years old (CIA World Factbook 2021), i.e., 53.64% of the total population are under 25 years old, resulting in a median age of only 23 years (CIA World Factbook 2021). Net attendance ratios for primary school are lower than in developed countries (male: 80.2%; female: 81.6%), and only just under half of children

are enrolled in secondary school (male: 46.2%; female: 48.7%) (UNICEF 2013). Figures for actual attendance at secondary school are even lower (male: 37.5%; female: 35.9%) (UNICEF 2013). Most families live in rural areas, with only 25.5% of the total population living in the few towns (CIA World Factbook 2021). 65% of the population subsist on small-scale horticulture (CIA World Factbook 2021), with only $3,153 GDP generated annually per capita (CIA World Factbook 2021). The remaining 35% are active in industry (5%) and services (30%) (CIA World Factbook 2021). As a result, ni-Vanuatu children are more likely to live in larger households with more siblings than their Western counterparts. They are also more likely to live with guardians with limited exposure to formal education, long-term employment, and skilled labour, and in households with low annual incomes. Furthermore, as adoption is common in Oceania (Silk 1980), ni-Vanuatu children experience parental absence at high rates (see also Chapter 2 for ethnographic background). This constellation of traits is intriguing because some of these factors predict delayed, but others are associated with accelerated Theory of Mind development (see Section 6.1.1, Background).

At the same time, there is also considerable variation in educational attainment and labour force participation within in the country. In Vanuatu, households with only primary-level education or lower are more likely to live in poverty, especially in urban areas (UNICEF 2017: 175). Furthermore, female-headed households are more deprived. In many Pacific Island nations, women have less access to the labour market and cash income than men, and much of women's work is not remunerated (UNICEF 2017: 174, 179). On the other hand, participation in the labour market is not inherently protective against deprivation as salaries tend to be low (UNICEF 2017: 177). Furthermore, households with more than three dependents also experience higher rates of poverty (UNICEF 2017: 175). While some surveys have found that poverty rates are higher in urban areas, others have found that child poverty is highest in remote provinces that are further removed from the capital and rely exclusively on subsistence production (UNICEF 2017: 172p).

Vanuatu is also of interest because people's exposure to Western cultural norms and ideas varies considerably within the country, both between and within different islands and communities. The most urbanized settlement in the country is the capital, Port Vila, which has the highest exposure to resident and visiting foreigners such as tourists, NGO workers, diplomats, foreigners working in the tourism industry, and foreign advisers to the national government. Rural settlements in North Efate are only an hour's

drive away from the capital and villagers visit on a regular basis. Conversely, Espiritu Santo and other outer islands can only reach the capital by ferry or plane, which is prohibitively expensive for many villagers (see also Chapter 2 for ethnographic context). Additionally, some ni-Vanuatu have direct experience working in Western countries after participating in the RSE (Recognized Seasonal Employer) scheme, which enables Pacific Islanders to perform seasonal agricultural labour in Australia and New Zealand (New Zealand Immigration 2021). This is particularly intriguing because cultural background has been found to impact Theory of Mind development (see Chapter 3). As a result, it is possible that direct access to Western cultural influences could push children's developmental trajectories towards a most Western developmental pattern. However, to the best of my knowledge, this has not been examined systematically.

I therefore examine whether families' exposure to formal education, socio-economic status, proximity to urban environments, and direct exposure to Western cultural settings through overseas travel affect ni-Vanuatu children's development of Theory of Mind. I further examine whether household structure, and specifically household size, number of coresident minors, and co-residence with biological parents affects Theory of Mind. To this end, I conducted interviews with the caregivers of the children who participated in the Theory of Mind assessments presented in Chapters 3 and 4. I predict that children from homes with higher educational attainment and labour force participation and children from larger households with more coresident minors perform better on Theory of Mind. I also predict that children living closer to urban environments and children whose households had direct exposure to Western cultural settings should perform better on Theory of Mind. Conversely, I predict that children experiencing parental absence should perform worse. This is the first assessment of demographic influences on individual-level variation in Theory of Mind in Vanuatu. To the best of my knowledge, this is also the first systematic, combined assessment of all these variables in any non-Western country. If variables associated with 'modernization', such as more exposure to formal education, closer proximity to urban environments, more overseas travel, and higher participation in wage labour, are associated with improved Theory of Mind performance, this would support the idea that globalization 'homogenizes' psychological processing (see Rozin 2010).

5.2 Methods

5.2.1 Survey Design

As most previous work has focused on Western populations, I modified the most common measurements to adapt them to my field setting. For example, previous studies have often focused mostly on the mother's information (see Pears & Moses 2003), reflecting an assumption that the biological mother is the most important caregiver. Furthermore, socio-economic status is often assessed by scaling participants' gross annual income on a point scale (Pears & Moses 2003), reflecting researchers' expectation that people track their finances over long time periods. Finally, the number of siblings is often treated as a proxy for peer interaction in the household (see Perner, Ruffman & Leekam 1994), reflecting the Western family model where children usually reside with biological siblings in nuclear family households.

However, the residence arrangements of most ni-Vanuatu families differ drastically from Western countries. In ni-Vanuatu families, cousins, aunts and uncles, grand-parents, and even more distant relatives often share a home and thus take on important caregiving roles (see also Chapter 2 for ethnographic context). Due to widespread adoption and fostering, biological siblings may reside in separate households and many children are primarily cared for by extended family, not their biological parents (ibid.). As a result, the educational attainment and socio-economic status of the biological mother may not reflect the situation of the household as a whole and thus the range of influences that children are exposed to from their caregivers, or it may not be informative at all. In turn, many children live with other minors who are not their biological siblings, most often cousins, but also adopted siblings who are unrelated or distantly related to other residents in the household. Furthermore, due to higher birth rates and longer birthing careers, large age gaps between eldest and youngest siblings are not uncommon. It is therefore not uncommon for primary school-aged children to have older siblings who have already moved out to live with their domestic partner. As a result, children's number of biological siblings may not accurately reflect peer interaction within the household. Furthermore, the mother's marital status is not in itself informative about residence arrangements. It is not uncommon for couples to move in together and start reproducing before marriage arrangements are made, and before bride price is paid (see Chapter 2 for ethnographic background). As a result, being an unwed mother does not equate to being a single mother. Finally, due to lack of record keeping and variation in access to banking

services, many villagers do not have a record of their annual income.

Accordingly, I collected demographic information for all residents in a child's home, not just the mother. In addition to the number of biological siblings, I also collected data on total household size and the number of minors sharing a child's home. Instead of the mother's marital status, I used the child's coresidence with their biological parents as a measure of parental absence. Finally, I assessed socio-economic status through participants' occupations and reliance on wage labour.

5.2.2 Interviews

I conducted structured interviews with the guardians of children who had participated in the Theory of Mind assessments presented in Chapters 3 and 4. First, I asked respondents to name all the residents in the home (both adults and minors) and specify their kin relationship with them. I then enquired about the name, sex, date of birth, natal village and island, source of income, and educational attainment of all adults residing in the child's home. With regards to educational attainment, I asked participants to retrace their entire educational careers, with the names and locations of all schools attended, and the grade they finished at (e.g., Prenter Primary School at Hog Harbour village until Year 6, then New Site Secondary School near Hog Harbour village until Year 8, then no further). With regards to people's source of income, I also enquired explicitly whether anybody in the home had participated in the RSE scheme. I also asked participants to reconstruct their marriage histories, with the names, date of marriage, and place of post-marital residence of all current and previous marital partners.

Second, I asked the guardian how many children they had, and to name all the children they had in order of birth, starting with the firstborn. I enquired about the names, sex, date of birth, and current educational attainment of all children, namely the school grade they were currently attending and the name and location of their school. With each child, I also enquired specifically: whether the child was the respondent's biological child (*stret pikinini*), or whether they were adopted or a stepchild; whether they were living with the respondent or with someone else, and if they were living with someone else, who they were living with and where. If a child was the respondent's biological child, I also enquired about the name of the child's other biological parent, and whether their current marital or domestic partner was the child's biological parent. If a focal child had no biological parent present in the household, I asked about the names, dates of birth and natal village and island, educational careers, source of income, and current place of

residence of their biological parents. I also asked about the relationship status of the biological parents, the reason for transferring the child out of the natal home, and whether the child had any biological siblings living in other households, and if so, how many. I also enquired about the kin relationship between the focal child and its coresident caregivers. If a focal child had just one biological parent present in the household, I also asked about the background of the absent parent and the reason for their absence. At the end of each section of the interview, I reviewed the coresidents and children named by the respondent and asked whether anybody else was living with them, or whether they had any more children.

Respondents were sometimes not sure about the birth dates of their co-residents. In those cases, respondents were asked to estimate their ages. In some cases, it was revealed that either the focal child or another resident was dividing their time between multiple households. These cases were resolved by asking participants which household the relevant person spent most of their time in, and whether they slept in that household most nights, or whether they spent most nights in another home. They were recorded as living in the home where they spent most of their time, and in the case of focal children, the information of the home where they spent most of their time was recorded. If a resident was temporarily away under the RSE scheme, they were still counted in as a resident. The same procedure was followed for older children attending boarding school if they spent their term holidays at home. For one household on Santo and one on Efate, respondents reported that the child's natal household temporarily dissolves during seasonal labour. In those cases, I followed up with the household that was currently caring for them as the caregivers from the regular household were not present during my stay at the field site.

Interviews were conducted face-to-face in participants' homes. I set out to interview one respondent in the household to give information for the other residents, but most of the time the other residents were present as well and gave their information themselves. I conducted all interviews in Bislama. I wrote down participants' responses on questionnaire forms. The form is available on OSF: https://osf.io/pnqxy/ (Identifier: DOI 10.17605/OSF.IO/PNQXY). Depending on household size, one interview lasted ca. 15-20 minutes. Interview data were collected after all cognitive experiments presented in Chapters 3 and 4 had been completed. Interviewees provided verbal consent ahead of questioning and were informed that the demographic data collected from them would be used to predict children's performance in the assessments. On each island, I was

accompanied by two research assistants (working on separate days) who located the relevant households from a list of guardians identified in school records and clarified the meanings of questions if required. All research assistants were local residents who were fluent in Bislama, Ngunese / Wanohe, and English, and were parents or aunts and uncles of children who had participated in the assessment.

5.2.3 Scoring

From the gathered data, I extracted the following information for this chapter:

5.2.3.1 Household Structure

I recorded household size (the number of people residing in the home); the number of living biological siblings, including half-siblings, regardless of what household they lived in at the time; and the number of co-resident minors (residents aged <18 years) regardless of kin affiliation, which includes biological siblings, step siblings, adopted siblings, cousins, and other minors residing in the same home as the focal child. I further recorded whether children lived with both, one, or neither biological parent. I also assigned unique IDs to all households and mothers. 'Mothers' are the primary female caregivers of each child. For children living with their biological mothers, this was their biological mother. For children not residing with their biological mothers, this was their custodial allomother - a coresident stepmother for children living in stepfamilies, or for example a grandmother for children living with custodial grandparents. For two single-parent children living with their fathers, no stepmother was present. In those cases, I entered the information of the coresident paternal grandmother, the senior woman in the house. All data were entered from the perspective of each focal child individually. As a result, when children share a household with other children who also participated in the experiment, some of their data can differ. For example, one child might reside with both biological parents but their coresident cousin only has one parent present, which is the situation in homes where a single mother and her children reside with her married brother and his family. While all children in that home share the same Household ID, household size, and number of coresident minors, their Mother IDs and number of biological siblings differ.

5.2.3.2 Source of Income

I categorized households and mothers according to their source of income and participation in wage labour. I grouped people's sources of income into the following

categories: Horticulture (households and caregivers relying exclusively on slash-and-burn cultivation or fishing, where cash income is generated only through selling surplus crops and fish or copra, without participation in wage labour); Unskilled and Semi-Skilled Work (wage labour and enterprise not requiring specialist training, such as seasonal agricultural labour in Australia or New Zealand, selling mobile phone credits, *kava* or home-made bread and dresses, driving a minibus between villages, or maintaining a trade store for canned goods and household items); Skilled Work (trades such as carpentry and mechanics); and White-Collar or Professional Work (teachers, administrators, and nurses). I entered the mother's source of income and the highest level of employment present in the household. I further calculated additive figures for the number of people engaged in wage labour (all categories other than horticulture). Whenever a resident reported that they performed multiple types of wage labour, I selected the highest-ranking one.

5.2.3.3 Formal Education

I categorized households and mothers according to their level of education. I coded people's level of education on the following scale (1-8): No Schooling; Some Primary School (<6 years); Complete Primary School (6 years); Some Lower Secondary School (<4 years of secondary school, i.e., <10 years of education in total); Complete Lower Secondary (4 years of secondary, i.e., 10 years of education in total); Some Upper Secondary (1 year of upper secondary, i.e., 11 years of education in total); Complete Upper Secondary (2 or 3 years of upper secondary, i.e., 12 or 13 years of education in total); Tertiary (university-level courses or training at a professional college past year 12). I entered the mother's level of education and the highest level of education present among the adults in the household. I also calculated additive figures for the number of adults with exposure to any level of secondary school.

In the past, pupils sat an exam at the end of Year 6 to advance to secondary school, and another at the end of Year 10 to advance to upper secondary. The Year 6 exam has since been moved to the end of Year 8. However, primary school still terminates at the end of Year 6, which is why Year 6 was used as the cut-off point between primary and secondary school. I did not differentiate between government and faith schools. Bible colleges were rated as equivalent to secondary school because applicants do not have to complete year 12 beforehand. Pre-degree courses at the University of the South Pacific were treated as equivalent to the same number of years in upper secondary school. In

some cases, older people had attended a village school or been informally trained by missionaries before Vanuatu's national education system had been established, and thus did not attend a full six-year curriculum. This was treated as equivalent to some years of primary school.

5.2.3.4 Western Exposure

I also categorized households and caregivers according to their level of Western exposure. Specifically, I recorded that a caregiver had been exposed to a Western setting if they had ever lived, worked, or studied in a Western country such as Australia, New Zealand, or the United Kingdom, either through the RSE scheme or (more rarely) through secondary or higher education in one of those countries. I recorded that a household had been exposed to a Western setting if at least one resident had ever done so, which was coded as a binary (yes = 1, no = 0). I also calculated additive figures for the total number of adults in the home that had that experience.

5.2.3.5 Urban Proximity

I recorded what island each household was located on. This serves as a proxy for proximity to urban environments as rural communities in North Efate are geographically close to the national capital, whereas residents from Espiritu Santo can only reach the capital by ferry or plane (see also Chapter 2 for ethnographic background).

Information gathered on other topics (such as details about co-residence with kin and adoption backgrounds) were presented in Chapter 2.

5.2.4 Sample

Interview data are not available for n = 6 children on Efate and n = 10 on Santo. Complete Theory of Mind and household interview data are available for N = 282 children living in N = 213 separate households and with N = 224 distinct primary caregivers (see Table 5.1). On Santo, most children lived in the main village of Hog Harbour, with a smaller number living in the neighbouring settlements of Lokalee, Lonnoc, Towoc and New Site. On Efate, most children lived in the main village of Paunangisu, with others living in Emua, Marius, and Onesua, as well as in smaller settlements such as Launkarae, Suasu, Savaki, Manua, Napara, Samma, and Siviri and Undine Bay (see Table 5.2).

Table 5.1: Sample Size				
Availability of Data	**Set**	**Number of Children**	**Number of Households**	**Number of Caregivers**
Theory of Mind and Interviews	Efate	169	133	141
	Santo	113	80	83
	Total	282	213	224

Table 5.2: Sample Size: Distribution of Children's Home Villages			
Efate		**Santo**	
Village	**Number of Children**	**Village**	**Number of Children**
Paunangisu	51	Hog Harbour	95
Emua	43	Lokalee	7
Marius	36	Lonnoc	5
Onesua	10	Towoc	3
Launkarae	3	New Site	3
Suasu	3		
Savaki	3		
Manua	5		
Napara	6		
Samma	5		
Siviri	2		
Undine Bay	2		

The Vanuatu National Statistics Office lists a total of 692 households (1810 male, 1851 female residents) for North Efate (excluding offshore islands) based on recent census data (VNSO 2021). This suggests that 19.2% (133/692) of all households in North Efate were interviewed, although this designation probably includes settlements I did not visit and is therefore larger than my field area. The same authority lists a total of 1246 households (3199 male, 3000 female residents) for East Santo and 1076 households (2732 male, 2539 female residents) for North Santo (VNSO 2021). From the preliminary data release, it is unclear whether Hog Harbour was counted with the North or with the East, but either way, both figures represent a much larger area than the one covered in my research. In the case of Santo, a more fine-grained estimate may be provided by language figures; based on data from 2015, *Ethnologue* estimates that there are 4,000 speakers of Sakao, a linguistic classification that includes variants spoken in both Port Olry and Hog Harbour, thus comprising the entire North-Eastern coastline (Eberhard, Simons & Fennig 2021). Based on mean household size for the Santo sample (see Section 5.3.2, Relationships between Variables), this suggest that 12.0% ((5.99*80)/4000) of the population on the entire North-Eastern coastline was captured in my sample. I have not been able to access settlement-level census figures; accordingly, I cannot provide a more precise estimate of the proportion of residents captured.

5.2.5 Analysis

5.2.5.1 Information about the Field Sites (Descriptive Statistics)

I calculated descriptive statistics for children's household structure, caregivers' education and involvement in wage labour, and exposure to Western environments in R (R Core Team 2018). To this end, I grouped the data by Household and Mother ID and removed duplicates with *dplyr* (Wickham et al. 2020; *v.0.8.5*) to examine households and caregivers directly.

5.2.5.2 Relationships between Variables

I then examined whether the above variables were related to each other. Specifically, I assessed whether proximity to urban spaces (i.e. island location) and exposure to formal education affected the other variables. I first examined whether proximity to urban spaces impacts people's involvement in wage labour and formal education and their Western exposure, and whether it impacts household size and number of dependent minors. To this end, I conducted chi-square tests to compare households' and caregivers' Western exposure, educational attainment, and source of income across islands (predictor: island; outcomes: Western exposure, educational attainment, and source of income). I binned education data into three categories: Primary and Lower (1-3), Lower Secondary (4-5), and Upper Secondary and Higher (6-8). I then compared household size and number of coresident minors with Wilcoxon rank-sum tests (predictor: island; outcomes: household size and number of coresident minors). Second, I assessed whether exposure to formal education affected people's tendency to engage in wage labour and Western exposure, and whether it affected their household structure. I examined whether caregivers who had more formal education were also more likely to have Western exposure and to engage in wage labour. I also examined whether households with more formal education were more likely to engage in wage labour and Western exposure (predictors: educational attainment for households and caregivers; outcomes: Western exposure and source of income). To this end, I performed chi-square and Fisher's exact tests with binned education data. I also examined whether households' and caregivers' level of education affected household size and number of coresident minors. To this end, I performed Kruskal-Wallis tests with binned education data (predictors: educational attainment for households and caregivers; outcomes: household size and number of coresident minors**).**

5.2.5.3 Effects of Demographic Variables on Location False Belief

I then examined whether any of the above variables affected children's performance on False Belief. To this end, I ran mixed-effects logistic regressions models in *lme4* (Bates et al. 2015) on performance in Location False Belief, as this task appeared to be one of the more reliable False Belief tasks (see Chapter 3; due to the low pass rates in Explicit and Contents False Belief, those tasks also had low variance in outcome). I first ran a model with household- and location-level predictors (highest level of education, highest source of income, whether or not anyone had Western exposure, and urban proximity). I included child's age as a control variable as this had a significant impact on children's performance in Efate (see Chapter 3). I also added a random effect for children's Household ID as some children shared their household with another participant. I then used ANOVA model comparison to compare this model to a baseline that only included age. As in previous analyses (see Chapters 3 and 4), children who had failed the Control Questions in Location False Belief were excluded with *dplyr* (Wickham et al. 2020; *v.0.8.5*). I then ran another household-level model with household size, number of coresident minors, and parental absence as predictors, with the same control variable and random effects structure. Finally, I ran a caregiver-level model with maternal education, wage labour, and Western exposure, with the same control variable but Mother ID as the random effect. As Location False Belief increased significantly with age in Efate (see Chapter 3) but showed a different pattern in Santo (see Chapter 4), I also ran an alternative set of models without age effects (the null models only included random effects) to examine whether this affected the results.

I plotted the results in *ggplot2* (Wickham 2016), *ggthemes* (Arnold 2019; *v.4.2.0*), and *scales* (Wickham 2018; *v.1.0.0*). Given the limitations of null-hypothesis significance testing, the results of chi-square tests were interpreted with reference to phi coefficients for 2x2 tables (interpretation resembles other correlation coefficients, calculated using the *psych* package (Revelle 2021; *v.2.1.9*)) and Cramér's V for larger tables (calculated using the *rcompanion* package (Mangiafico 2021; *v. 2.4.1*)). Interpretation of Cramér's V depends on the degrees of freedom involved in a test; effects close to 0 are small, but for two degrees of freedom effect sizes of ca. 0.2 are already considered medium-sized, and the same is true for effect sizes of ca. 0.15 on five degrees of freedom. For pairwise comparisons and Wilcoxon rank-sum tests, Wilcoxon effect sizes were calculated (r_w is interpreted like correlation coefficients such as Spearman's rho but only takes positive

values, calculated with the package *rstatix* (Kassambara 2021; *v.0.7.0*)). For Kruskal-Wallis tests, I calculated eta squared. Effect size estimates for eta squared differ from those of more common correlation coefficients such as Spearman's rho; up to 0.06 is considered a small effect, while greater than 0.14 is considered a large effect. These analyses were run in a more recent version of R (*v. 4.1.1*.). P-values were nevertheless included in all results tables. No odds ratios were calculated for Fisher tests because these were run on tables larger than 2x2.

5.3 Results

5.3.1 Information about the Field Sites (Descriptive Statistics)

5.3.1.1 Household Structure

On average, households had six residents (see Table 5.3) and two dependent minors in addition to the focal child. On average, children had two biological siblings. Around 2 in 3 children lived with both biological parents (67.4%) and the remainder lived with either one (15.6%) or neither biological parent (17.0%).

5.3.1.2 Guardians' Education, Wage Labour, and Western Exposure

Around 2 in 3 mothers only relied on horticulture (68.3%), with the remainder pursuing unskilled (22.3%) or white-collar work (9.4%) (see Table 5.3). Only very few had no exposure to formal education (1.3%) or had not completed primary school (5.8%). Most had either finished their education after primary school (36.2%) or at some point during lower secondary school (not completed: 17.9%; completed: 21.4%). Only few had attended upper secondary school (not completed: 2.7%; completed: 4.0%) or some form of tertiary education (10.7%). Only few mothers had personal exposure to Western countries (8.5%).

However, trends among mothers did not necessarily reflect the situation of the households more generally. Overall, only few households relied on horticulture exclusively (22.1%), with most supplementing subsistence production with unskilled (40.4%) or skilled labour (16.9%) (see Table 5.3). A few households had access to white-collar work (20.7%). Just under half of households had one resident who was involved in wage labour (42.7%); having two (23.0%) or three or more (11.7%) residents involved in wage labour was less common. None of the households had no residents with exposure to formal education. Furthermore, only very few households had no residents who had

completed primary school (0.9%). In about half of households, the highest level of education was either six years of primary school (18.3%) or lower secondary school (not completed: 16.4%; completed: 20.2%). Intriguingly, households where the highest level of education attained was upper secondary (not completed: 5.2%; completed: 10.3%) or tertiary (28.6%) were fairly common (just under half, or 44.1%, combined). Around a third of households had one adult who was exposed to secondary education at any level (30.0%), and about half had either two (27.2%) or three or more (23.4%). Overall, around a third of households had direct exposure to Western countries (30.5%). Most of the time, households had one resident with personal experience in Western countries (24.9%), and only very few had two or more residents with that experience (5.6%).

Table 5.3: Descriptive Statistics for Demographic Variables		
Continuous Variables		
Household Structure	**mean (SD)**	
Household Size	6.18 (2.33)	
No. Biological Siblings	2.27 (1.59)	
No. Coresident Minors	2.03 (1.43)	
Categorical Variables		
Household Structure	**Percentages**	
Parental Presence		
Neither	17.0%	
One	15.6%	
Both	67.4%	
WEIRDness	**Caregiver**	**Household**
Source of Income		
Horticulture	68.3%	22.1%
Unskilled	22.3%	40.4%
Skilled	-	16.9%
Professional	9.4%	20.7%
No. Residents Wage Labour		
One	-	42.7%
Two	-	23.0%
Three or More	-	11.7%
Education (Highest)		
None	1.3%	-
Some Primary	5.8%	0.9%
Complete Primary	36.2%	18.3%
Some Lower Sec.	17.9%	16.4%
Complete Lower Sec.	21.4%	20.2%
Some Upper Sec.	2.7%	5.2%
Complete Upper Sec.	4.0%	10.3%
Tertiary	10.7%	28.6%
No. Residents Secondary		
One	-	30.0%
Two	-	27.2%
Three or More	-	23.4%
WEIRD Exposure	8.5%	30.5%
No. Residents WEIRD		
One	-	24.9%
Two or More	-	5.6%

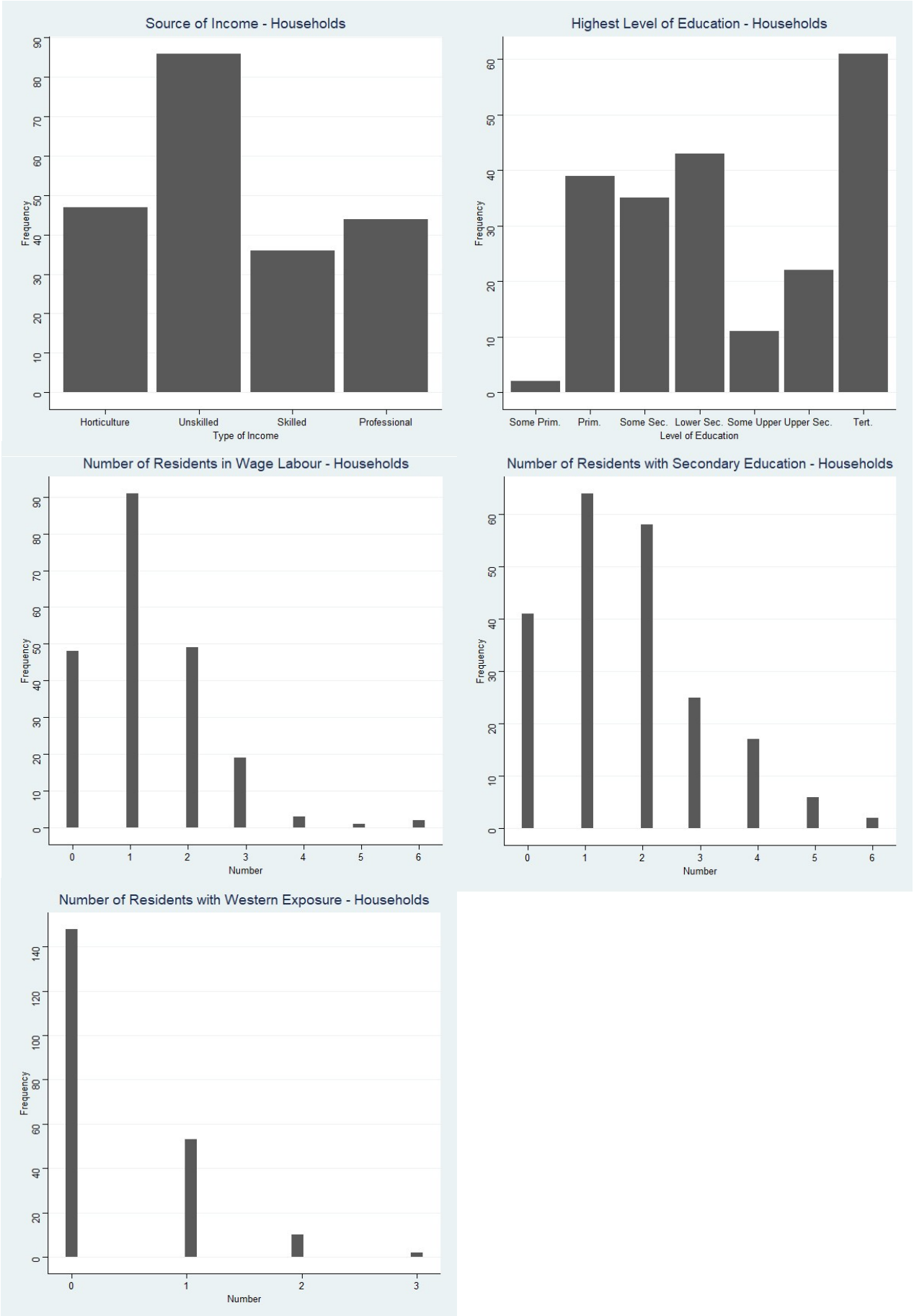


Fig. 5.1: Households' exposure to formal education, wage labour, and Western countries.

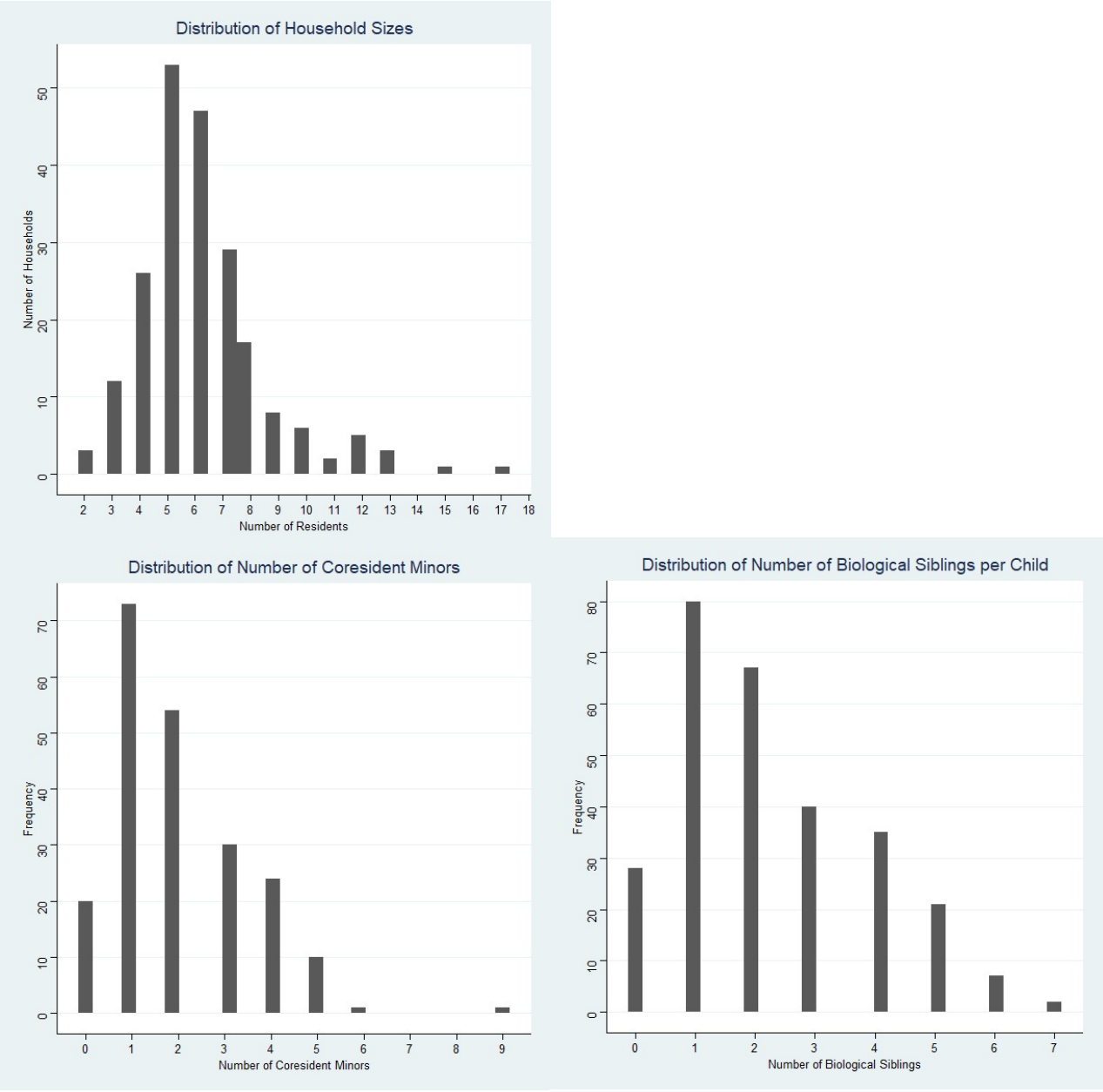


Fig. 5.2: Distribution of household size, number of coresident minors (in addition to the focal child), and number of biological siblings (for each focal child).

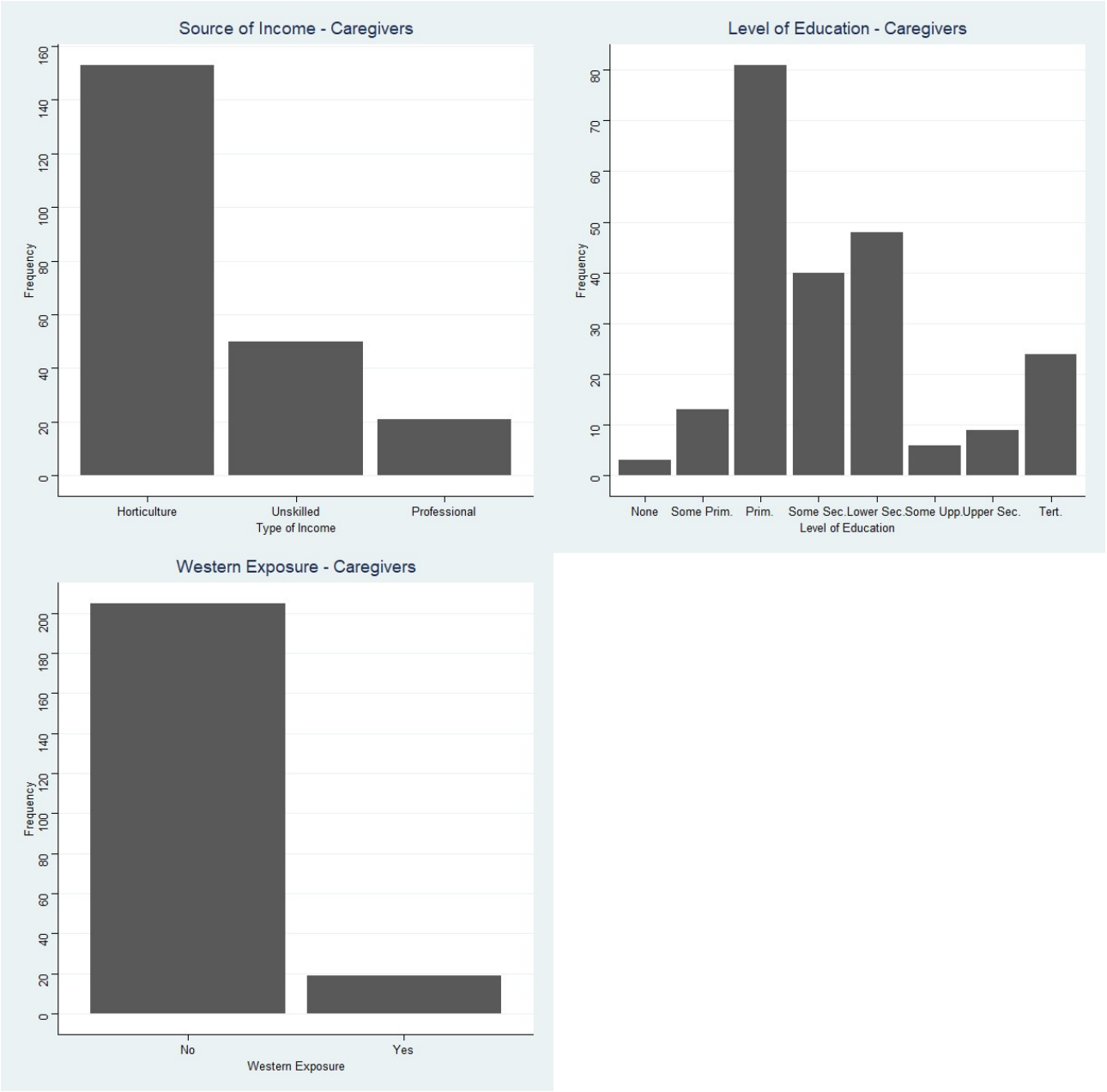


Fig. 5.3: Caregivers' exposure to formal education, wage labour, and Western countries.

5.3.2 Relationships between Variables

Household size and number of coresident minors did not differ between field sites, with nearly identical means across islands and effect sizes consistent with a null effect (see Table 5.4). Households' exposure to formal education, wage labour, and Western cultural settings did not differ much between the two field sites either, and the same was true of mothers' education and Western exposure (see Table 5.5). For example, while Santo households and caregivers were slightly less likely to have Western exposure than their Efate counterparts, this effect was only small (see Table 5.5). Other effect sizes for between-island comparisons hovered around 0 or were small (see Table 5.5). The largest effect was for mothers' involvement in wage labour, although even this effect was only small-to-moderate for the degrees of freedom involved in the test: in Efate, 63.1% of mothers were horticulturalists, compared to 77.1% on Espiritu Santo (see Fig. 5.4).

Table 5.4: Effect of Urban Proximity on Household Structure

	Wilcoxon Tests			**Descriptive Statistics**	
Outcome (n = 213)	**W**	**p**	**r_w**	**mean (SD) Efate**	**mean (SD) Santo**
Household Size	5485.5	0.70	0.03	6.30 (2.51)	5.99 (1.99)
Coresident Minors	5241.5	0.85	0.01	2.01 (1.43)	2.06 (1.44)

Table 5.5: Effect of Urban Proximity on Education, Wage Labour, and Western Exposure

	Caregivers (n = 224)					**Households (n = 213)**				
	% of Caregivers		**χ^2 – Tests**			**% Households**		**χ^2 – Tests**		
	Efate	**Santo**	**χ^2/phi or V**	**p**	**df**	**Efate**	**Santo**	**χ^2/phi or V**	**p**	**df**
Education			2.19 / 0.10	0.34	2			3.84 / 0.13	0.15	2
Primary or Less	39.7%	49.4%				16.5%	23.8%			
Lower Secondary	42.6%	33.7%				41.4%	28.8%			
Upper Sec., Above	17.7%	16.9%				42.1%	47.5%			
Source of Income			6.36 / 0.17	0.04	2			1.00 / 0.07	0.80	3
Horticulture	63.1%	77.1%				22.6%	21.3%			
Unskilled	-	-				40.6%	40.0%			
Skilled	27.7%	13.3%				15.0%	20.0%			
Professional	9.2%	9.6%				21.8%	18.8%			
WEIRD exposure	10.6%	4.8%	1.59 / -0.10	0.21	1	34.6%	23.8%	2.28 / -0.11	0.13	1

Household-level education was associated with a large effect on household size and a small effect on the number of coresident minors (see Table 5.6 and Fig. 5.4). Pairwise Wilcoxon-tests revealed that the differences in household size between primary- and lower secondary-educated households, and between primary- and upper secondary or higher-educated households were associated with medium-sized and medium-to-large effects; while the difference between lower- and upper secondary-educated households was associated with a smaller effect (see Table 5.7). However, the direction of this effect was opposite to the one usually found in Western countries. Namely, households with primary or lower had *fewer* residents than households with lower secondary or advanced education. Pairwise comparisons also revealed that the differences in the number of coresident minors between primary- and lower secondary-educated households, and between primary- and upper secondary or higher-educated households were associated with medium and small-to-medium effect sizes; but the difference between lower- and upper secondary-educated households was negligible (see Table 5.7). Again, the direction of the effect was opposite to the one usually found in Western countries; households with primary or lower had *fewer* coresident minors than households with lower secondary or advanced education. Accordingly, the trend that higher levels of formal education are associated with smaller households and fewer dependent minors is reversed in rural Vanuatu, at least when these variables are measured at the household level. The effect for mothers' education on household structure was negligible (see Table 5.6), with very similar household sizes and number of coresident minors across all educational categories. In other words, more educated mothers were not more likely to live in smaller homes with fewer dependent children than mothers with less formal education.

Table 5.6: Effect of Education on Household Structure

	Descriptive Statistics		Kruskal-Wallis Tests					
Households (n = 213)								
	mean (SD)		**Household Size**			**Coresident Minors**		
	Household Size	Coresident Minors	**χ^2 / η 2**	**df**	**p**	**χ^2 / η 2**	**df**	**p**
Education			32.90/	2	< 0.001	12.2/	2	0.002
Primary or Less	4.66 (1.28)	1.34 (0.96)	0.15			0.05		
Lower Secondary	6.08 (2.22)	2.33 (1.58)						
Upper Sec., Above	6.94 (2.44)	2.07 (1.38)						
Caregivers (n = 224)								
Education			2.58/	2	0.27	1.08/	2	0.58
Primary or Less	6.29 (2.92)	2.11 (1.82)	0.003			-0.004		
Lower Secondary	6.58 (2.42)	2.20 (1.38)						
Upper Sec., Above	6.59 (2.54)	2.18 (1.48)						

Table 5.7: Pairwise Comparisons for Household Education Effects on Household Structure

Household Size (n = 213)	**p-values / r_w**	
	Primary or Less	**Lower Secondary**
Lower Secondary	<0.001 / 0.35	-
Upper Secondary and Above	<0.001 / 0.48	0.02 / 0.19
Number of Coresident Minors (n = 213)		
	Primary or Less	**Lower Secondary**
Lower Secondary	0.002 / 0.31	-
Upper Secondary and Above	0.008 / 0.24	0.34 / 0.07

Households' level of formal education did not show much of a connection to their Western exposure, with only a small effect found (see Table 5.8). However, households' level of education affected their tendency to engage in wage labour, and this effect was fairly large given the degrees of freedom for this test (see Table 5.8 and Fig. 5.4). Specifically, households with higher levels of education were more likely to participate in the labour force and had more access to skilled and white-collar work. Among households with only primary education or less, half only practiced horticulture (48.8%) but exclusive food production was much less common in households that had lower secondary education (21.8%) or upper secondary and higher (10.6%).

Mother's education did not show a relationship with their Western exposure, with very similar rates of Western exposure for all educational categories (see Table 5.8). However, mothers' level of education also increased their tendency to participate in the labour force (see Table 5.8 and Fig. 5.4). However, this was only felt for mothers with a very high level of education. Exclusive food production was very common in mothers with primary education or less (75.3%) and lower secondary (73.9%), and this strategy only decreased substantially in mothers with upper secondary education or higher (38.5%). In sum, as soon as at least one resident in a home had been educated beyond primary school, that household's tendency to rely exclusively on food production declined by half. However, this trend was strongly gendered. Mothers' tendency to engage only in food production only dropped if they had advanced education.

Table 5.8: Effect of Education on Wage Labour and Western Exposure

Descriptive Statistics							
Caregivers (n = 224)							
	Source of Income				**WEIRD Exp.**		
	Horticult.	Unskilled	Skilled	Prof.			
Education							
Primary or Less	75.3%	24.7%	-	-	8.2%		
Lower Secondary	73.9%	18.2%	-	8.0%	9.1%		
Upper Sec., Above	38.5%	25.6%	-	35.9%	7.7%		
Households (n = 213)							
Education							
Primary or Less	48.8%	41.5%	9.8%	-	22.0%		
Lower Secondary	21.8%	41.0%	24.4%	12.8%	29.5%		
Upper Sec., Above	10.6%	39.4%	13.8%	36.2%	35.1%		
χ^2- and Fisher-Tests							
	χ^2/V	**p**	**df**		**χ^2/ V**	**p**	**df**
Education Caregiver	-	<0.001	-		-	1	-
Education Household	44.94 /0.32	<0.001	6		2.39 /0.11	0.30	2

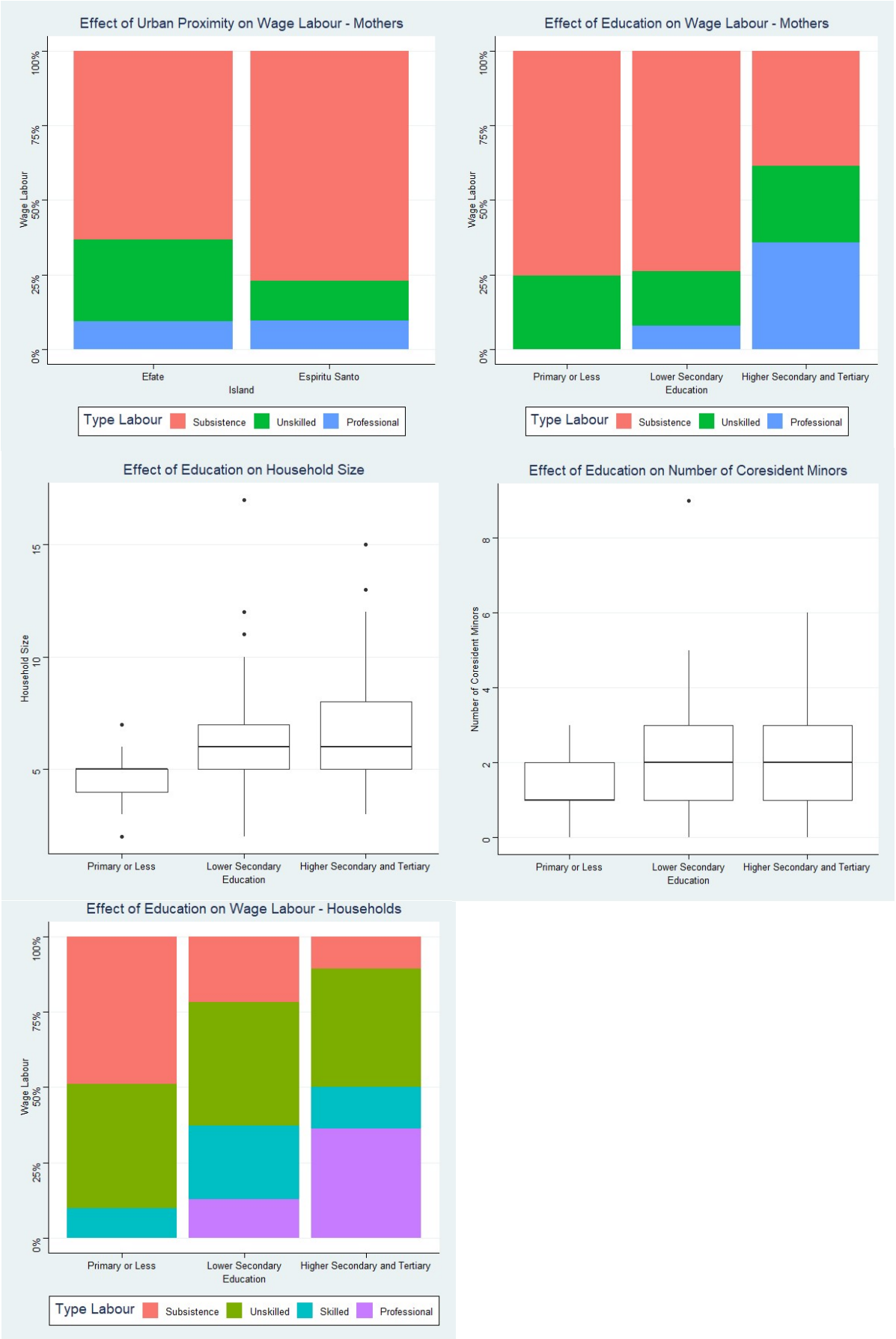


Fig. 5.4: Relationships between Demographic Variables.

5.3.3 Effects of Demographic Variables on False Belief Understanding

The model incorporating urban proximity and household-level education, wage labour, and Western exposure did not improve over the age-only baseline model; in fact, the AIC of the full model was *larger* than that of the baseline (see Table 5.9). The same was true of alternative models focusing on household structure (with household size, number of coresident minors, and parental absence as predictors) and caregiver data (mother's education, wage labour, and Western exposure) (see Tables 5.10 and 5.11). Running the models without age effects did not alter the results (see Tables 5.9, 5.10, and 5.11). Most variables showed no or only slight trends in the expected direction, and none of the measures pushed passing beyond the 50% mark (see Table 5.12).

Table 5.9: Effect of Urban Proximity and Household-Level Education, Wage Labour, and Western Exposure on Location False Belief (n = 250 Controls Passed)

Model	df	AIC	Log-Likelihood	Deviance	χ^2	p
Baseline = Age						
Age		346.15	-170.08	340.15		
Full	7	353.09	-166.54	333.09	7.06	0.42
Baseline = Null						
Null		344.81	-170.41	340.81		
Full	7	351.64	-166.82	333.64	7.17	0.41

Table 5.10: Effect of Household Size, Number of Coresident Minors, and Parental Absence on Location False Belief (n = 250 Controls Passed)

Model	df	AIC	Log-Likelihood	Deviance	χ^2	p
Baseline = Age						
Age		346.15	-170.08	340.15		
Full	3	348.05	-168.02	336.05	4.11	0.25
Baseline = Null						
Null		344.81	-170.41	340.81		
Full	3	347.26	-168.63	337.26	3.55	0.31

Table 5.11: Effect of Maternal Education, Wage Labour, and Western Exposure on Location False Belief (n = 250 Controls Passed)

Model	df	AIC	Log-Likelihood	Deviance	χ^2	p
Baseline = Age						
Age		346.33	-170.16	340.33		
Full	4	352.67	-169.33	338.67	1.66	0.80
Baseline = Null						
Null		345.02	-170.51	341.02		
Full	4	351.43	-169.71	339.43	1.59	0.81

Table 5.12: Location False Belief Pass Rates for Demographic Predictors	
	LFB Pass Rate
Island	
Efate	44.5%
Santo	40.4%
Household Predictors	
Household 'WEIRD'ness	
Education	
Primary or Less	50.0%
Lower Secondary	38.3%
Upper Sec., Above	44.0%
Source of Income	
Horticulture	36.0%
Unskilled	48.0%
Skilled	45.7%
Professional	37.0%
WEIRD Exposure	
No	39.4%
Yes	50.7%
Household Structure	
Household Size	
Up to 4	48.7%
5-7	42.7%
8 or More	39.7%
No. Coresident Minors	
Up to 2	46.3%
3 or More	35.1%
Parental Presence	
Neither	42.9%
One	40.0%
Both	43.4%
Caregiver Predictors	
Caregiver 'WEIRD'ness	
Education	
Primary or Less	45.5%
Lower Secondary	41.0%
Upper Sec., Above	41.3%
Source of Income	
Horticulture	41.6%
Unskilled	49.0%
Skilled	-
Professional	38.5%
WEIRD Exposure	
No	42.7%
Yes	44.4%

Due to the observed differences in age trajectories (see Chapters 3 and 4), I then performed a post-hoc analysis where I tested an island-age interaction model against an age-only baseline. This improved model fit, confirming that age trajectories differed substantially between the two locations (see Table 5.13).

Table 5.13: Effect of Urban Proximity on Location False Belief – Interaction Model (n = 250 Controls Passed)

Model	df	AIC	Log-Likelihood	Deviance	χ^2	p
Baseline = Age						
Age		346.15	-170.08	340.15		
Full	2	338.84	-164.42	328.84	11.32.	0.003

5.4 Discussion

5.4.1 Summary of Results

Both biological parents were present for only 2 in 3 children (67.4%), the remainder living with just one or neither biological parent. While all rural households are food producers, only few had no supplementary source of income (22.1%). In contrast, most female caregivers focused on child-rearing, housework, and horticulture (68.3%), suggesting that the tendency to participate in the labour force is strongly gendered. However, work that involves long-term contractual obligations to an employer (such as white-collar work) was relatively rare, both on the household level (20.7%) and for female caregivers (9.4%). Most female caregivers had between 6 and 10 years of education (completed primary: 36.2%; lower secondary: not completed: 17.9%; completed: 21.4%), and most homes housed at least one resident who had been educated beyond primary school (one: 30.0%; two: 27.2%; three or more: 23.4%). Only few mothers (8.5%) had personal exposure to Western cultural environments, but this was true for about a third of households (30.5%). Accordingly, when it comes to exposure to 'Westernizing' influences such as wage labour, formal education, and overseas travel, my results caution against research biases that view small-scale societies as homogenous and untouched by 'modernization' (for a discussion of the problem see Amir & McAuliffe 2020). At the same time, they reveal heterogeneity between households located in rural areas, with some having more exposure to these influences than others. The results are also indicative of heterogeneity within households, with different patterns for female caregivers, measured as individuals, and households when measured as aggregates of all residents.

Proximity to urban environments did not have a strong impact on household size, the number of dependent minors, and residents' level of formal education or exposure to Western cultural settings, with negligible or small effects found in all cases. However, mothers living closer to urban environments were slightly more likely to participate in the labour force. Furthermore, households with higher levels of formal education were more likely to participate in the labour force and were more likely to engage in white-collar labour involving long-term contractual obligations with employers. Mothers' tendency to engage in wage labour only increased if they were very highly educated. Taken together, these associations indicate that there is no linear trend of increasing 'Westernization' where proximity to urban environments, level of formal education, participation in wage labour, and direct exposure to Western cultural settings all reinforce each other. Nor do these factors necessarily all go together with 'Western' demographic trends such as smaller households with fewer dependent minors. In fact, more educated households were larger on average than less educated ones. This suggests that 'modernization' in rural Vanuatu has a heterogenous, 'mosaic' character.

Children's False Belief performance was not related to their families' exposure to formal education and wage labour and experience in Western cultural environments. This was true regardless of whether these variables were measured at the level of the household or that of the individual caregiver. The same was true of variables capturing household structure such as household size, number of coresident minors, and parental absence. Null effects remained regardless of whether age was included as a predictor or not. While I noted differences in Theory of Mind trajectories between Efate and Espiritu Santo (see Chapters 3 and 4), these did not reach statistical significance in the main model, which may have been due to the fact that overall pass rates were similar (see Chapters 3 and 4). However, post-hoc analyses revealed that age trajectories differed between the two locations. Accordingly, aside from the island effect, my findings do not support the idea that children's cognitive development shifts in response to socio-economic transformations (Greenfield 2009). They also conflict with the idea that exposure to 'Westernizing' cultural influences homogenizes people's cognition or shifts their psychological processes in a more 'Western' direction (Rozin 2010) – or in a milder formulation, they conflict with the idea that this exposure changes how people respond to and interpret cognitive tasks.

5.4.2 Comparison with Previous Findings and Explanations

My findings contrast with older studies that found effects for socio-economic status, level of education, and family structure (Perner, Ruffman & Leekam 1994; Holmes, Black & Miller 1996; Jenkins & Astington 1996; Lewis et al. 1996; Cole & Mitchell 1998; Ruffman et al. 1998; Cutting & Dunn 1999; Peterson 2000; Shatz et al. 2003; Dessen & Souza 2014; Kuntoro et al. 2013). However, my findings are consistent with studies finding null results for these predictors (Garner, Curenton & Taylor 2005; Lucariello, Durand & Yarnell 2007), or that found that demographic effects disappeared after controlling for age (Pears & Moses 2003).

Why have different studies produced such contrasting results? One possibility is that previously documented effects are statistical artefacts produced by small sample sizes. A cursory review reveals that most relevant publications have smaller samples than the current study, with the exception of Ruffman et al. (1998) (see Table 5.14).

Table 5.14: Sample Size Comparison with Previous Studies

Study	Sample Size
Jenkins & Astington (1995)	68
Holmes, Black & Miller (1996)	90
Lewis et al. (1996)	157
Cole & Mitchell (1998)	57
Ruffman et al. (1998)	444
Cutting & Dunn (1999)	128
Peterson (2000)	265
Vinden (2002)	154
Pears & Moses (2003)	142
Kuntoro et al. (2013)	129
McAlister & Peterson (2013)	157
Current Study	282 (n = 250 passed controls)

Another possibility is that these variables affect children's Theory of Mind in one socio-cultural setting but not another. For example, some findings indicate that demographic factors such as socio-economic status and education do not affect Theory of Mind directly. Instead, these effects (where they are found) are indirectly produced by class differences in parent discipline and parent-child communication (see also discussion on mental state talk in Chapter 3). For example, some have found that children's verbal ability and parents' discipline strategies mediate the relationship between socio-economic status and False Belief understanding (Tompkins et al. 2017). Parenting strategies based on power assertion (yelling, corporal punishment, asserting parental authority) are associated with lower False Belief understanding in children (Pears & Moses 2003). The

same is true of parents habitually giving the silent treatment (Shahaeian et al. 2014). Conversely, parenting strategies that respond to disciplinary situations by communicating about other people's feelings and encouraging perspective-taking and discussion are associated with improved Theory of Mind understanding (Ruffman, Perner & Parkin 1999; Farrant et al. 2012; Shahaeian et al. 2014). Low-income parents tend to use power assertion at higher levels than middle-class parents, and the reverse is true of alternative parenting strategies such as general instruction and communication about people's feelings, which in turn affects their children's developing social cognition (Tompkins et al. 2017). Furthermore, children from middle-class families tend to have a richer vocabulary than children from low-income backgrounds, which also affects their Theory of Mind (Tompkins et al. 2017). These factors all interact when producing developmental outcomes. In Western settings, harsh parenting, Theory of Mind deficits, and low verbal ability are all associated with child behavioural problems, and harsh parenting and Theory of Mind have been found to interact in this process (Hughes & Ensor 2006).

However, in contrast to Western societies, rural Vanuatu does not have a class system equivalent to that in developed economies. As a result, there is no middle class in the sense of a coherent social group marked by distinct tastes, mannerisms, and values. Households maintain vegetable gardens and fruit trees for their subsistence and mainly use other sources of income in a supplementary way. Furthermore, clerical work is a common destination for ni-Vanuatu citizens with tertiary education as the labour market does not sustain many high-level, highly paid professional jobs outside of the diplomatic service. Residents have told me that there is a shortage of well-paid work, even in Port Vila. Positions in Vanuatu's civil service are often for life, meaning that applicants must wait until a senior official's retirement for vacancies to open. Seasonal labour can be a more profitable option than waiting for opportunities for white-collar work, even for villagers with A-level education. This also echoes qualitative observations from my field work (see Chapter 2 for ethnographic context). While some voices encourage young people to enroll in formal education, the financial payoffs are uncertain, and agricultural work (both in the village and abroad) remains a source of resilience against these uncertainties. As a result of these factors, there is no upper middle class outside of the few towns, and no discernible 'middle class culture' or consciousness. Finally, in rural areas social status is not intrinsically tied to income: positions of respect such as chief or chief's adviser are not salaried positions but come with considerable prestige in the community (see also Chapter 2 for ethnographic context). Due to the absence of a

cohesive middle class, formal education and other demographic variables may not be associated with different parenting and communicative styles, and correlations found in developed countries may not hold in this context.

Accordingly, traits associated with a middle-class lifestyle in developed countries can look very different in rural Vanuatu; this may also explain some of the counter-intuitive correlations in the demographic data, such as the fact that more educated households tended to be larger than less educated ones. One possibility is that the more residents are present in a household, the higher its chance of having at least one person with advanced education. Alternatively, this may be related to fostering practices specific to more educated white-collar families. While young children are often transferred out of their natal homes due to issues associated with labour migration or parental separation (see ethnographic background in Chapter 2), adolescents and young adults are also sometimes sent to live with other households. Women in white collar professions such as teaching often rely on help from 'house girls' (live-in domestic staff), usually unmarried nieces or other young female relatives. For example, at Onesua, where a Presbyterian college is located, a teacher household lived with younger relatives who assisted with housework but also took advantage of the educational opportunities afforded to them by this placement. The teacher I lived with on Santo also had a house girl, who called her 'mother' (for ethnographic detail on kin terminologies and their use see Chapter 2). As a result of this practice, households with higher levels of formal education may expand by taking in additional residents, rather than following the small nuclear family model typical of Western societies.

Furthermore, while rural ni-Vanuatu are 'Westernizing' in some ways (for example, by attending formal education), this does not necessarily translate into a wholesale adoption of 'Western' views about human behaviour, the mind, and childrearing. Despite the considerable transformations that Vanuatu has undergone since the colonial period, both of my field sites remain 'kinship intensive', meaning that kin groups play a prominent role in the social structure and most people live either with or close to extended kin (see Chapter 2 for ethnographic context). Cross-cultural studies have found that people from individualistic societies with weak kin ties focus prominently on a transgressor's mental states (such as their intentions) when making moral judgments (Barrett et al. 2016; Curtin et al. 2020). In contrast, kinship-intensive cultures place less emphasis on mental states and focus more on social norms and obligations (Curtin et al. 2020). Additionally, my experiences in the field suggest that childrearing styles based on

power assertion, which are associated with slower Theory of Mind development, are common at my field sites. This was evident in people's support for corporal punishment and the widespread endorsement of 'gerontocratic' ideas about the family, and these ideas were also present among people with high levels of educational attainment such as teachers (see Chapter 2 for ethnographic context). However, as many ni-Vanuatu conceive of prosociality in terms of community harmony, consensus, respect for chiefly authority, and meeting obligations to kin, their socialization styles should not be viewed as promoting anti-social behaviour or other behavioural problems. Instead, they are better understood as producing behaviour in line with their own cultural model of proper conduct. Finally, drilling, which was associated with slower Theory of Mind development in Hong Kong (Wang et al. 2016), is common at rural schools in Vanuatu (see Chapter 2 for ethnographic context).

In this context, overseas travel may not translate into deeper cross-cultural exchanges that change people's ethnopsychology. I have been told that when overseas, ni-Vanuatu workers spend much of their time on farms and mostly socialize with other Pacific Islanders, with only superficial interactions with the population of the host country. Where conversations do happen, they may focus on obvious differences in lifestyles, climate, or diet, not abstract concepts such as folk models of the mind. The idea that cultural contact does not necessarily result in fundamental psychological changes also mirrors recent findings from the cognitive science of religion. Like people from other small-scale societies, Fijians were found to emphasize the outcomes of transgressions, rather than the transgressor's mental state, when making moral judgments (Barrett et al. 2016). When asked about supernatural agents, indigenous Fijians hold that the Christian god *also* punishes the outcome of an action, rather than the intentions of the perpetrator, mirroring local values (McNamara et al. 2021). Fijians make these judgments despite being aware that, unlike local ancestor spirits, the Christian god knows and cares about what's in people's hearts (McNamara et al. 2021). Accordingly, Fijians have maintained local biases in (non-)'mentalizing' despite prolonged culture contact (McNamara et al. 2021).

Urban proximity was not significant in the main models, but age trajectories did diverge between Efate and Espiritu Santo (see also Chapters 3 and 4). On the one hand, villagers from North Efate frequently travel to Port Vila to process documents for overseas work, sell produce at the market, or visit friends and relatives. However, these trips may not necessarily involve much personal conversation or in-depth interactions

with resident foreigners. Differences in performance may have been due to other factors, such as differences in children's relationship with the experimenter. The experimenters were a young mother in Efate (see Chapter 3) and a teaching assistant in Santo (see Chapter 4). As the latter was more of an authority figure for the children, this may have induced children to give more 'prescriptive' (as opposed to predictive) responses (see also discussion in Chapter 3). Another possibility may be differences in dialect. In my experience, the pronunciation of various words in Bislama can differ slightly depending on where someone is from. The same may be true of the way future tense is used in casual conversation (see discussion in Chapter 3 for further detail on the relationship between future tense and imperative). If this is the case, Santo children may have been more inclined to interpret the purpose of Location False Belief in a prescriptive way. However, this suggestion remains speculative at this point and should be investigated systematically in the future (see also discussion in Chapter 3).

5.4.3 Limitations

This study has some limitations due to its focus on household-bound data. At the field site, households are more fluid than in most Western settings. As many opportunities for secondary education and wage labour are only available away from the village, some residents move in and out of rural households on a regular basis. In the case of parents who engage in seasonal labour overseas, children may be separated from one or both parents for months at a time on an annual basis. As a result, the number of children who live with both biological parents continuously and without interruption is overestimated in the current data set. Furthermore, some participants split their time between multiple households staying with one set of relatives some days of the week and with another set of relatives on the remaining days. In a few cases, the natal home temporarily dissolves due to seasonal labour. Finally, some of the children who lived away from their biological parents had transferred multiple times between different households. This fluid situation produced some telling encounters during data collection. For example, in one household on Efate and one on Santo, different residents expressed different views about who did and did not live with them, which surfaced when I asked them to list their co-residents. On Efate, one child was claimed by two separate households after he had recently transferred from one to the other. As a result, determining who is and is not included as a resident in a given household is subject to the criteria used to define residence, and this

process is less straightforward than in most Western settings.

Further, the range of people that children interact with and are influenced by transcends the household. In my experience, children at both field sites spend much of their time away from their adult guardians, roaming the village and environs with other children from both their own and other homes. Accordingly, the number of coresident children may not reflect children's frequency of peer interaction nor the size of their social networks. Furthermore, most children live in close proximity to relatives residing in the same village and may thus access a wide range of alloparents outside their home. Finally, even if neither biological parent resides in the same household as the child, this does not necessarily mean that there is no contact as they may still visit or divide their time between the child's natal village and another location. Accordingly, household-level data cannot fully account for the range of influences a child is exposed to. This echoes findings from Black Caribbean populations. Alloparenting behaviours documented in Black Caribbean families demonstrate that alloparenting transcends the household (Nelson 2020). Fathers are expected to provide material and emotional support to their children regardless of whether they reside with the mothers (Nelson 2020). Furthermore, children receive support from extended kin, usually maternal relatives. Arrangements that involve transferring children from the natal household to another also "interrupt the concept of a physically bounded household consisting of unchanging members. In effect, fostered children belong to more than one household and are the responsibility of many adults" (Nelson 2020: 363).

It should also be noted that the demographic data presented in here and in Chapter 2 are not full census data. Households were approached and caregivers interviewed because their children had participated in the cognitive assessments presented in Chapters 3 and 4, which was done after experiments had already been completed. Accordingly, this does not constitute a fully random sample of the local population. As the children who participated in the assessments were of kindergarten and primary school age (3-11 years old, see Chapters 3 and 4), my sample may have been biased towards millennials and middle-aged adults, with less data collected on elderly people. Grandparents and great-grandparents were only included if they shared a home with a child that had participated in the assessment, meaning that older people living on their own (or with adolescents but not younger children) are not represented in the survey. As a result, it may be that my sample is slightly more 'Westernized' than the population as a whole. The same type of bias may have been introduced by the fact that children were recruited and tested at

schools (the act of enrolling children in formal education already being indicative of support for it), although I was informed that only few children do not attend school at all. At the same time, the youngest adults (young couples who just had their first baby but no school-age children) may have been under-sampled as well, at least if living independently or not sharing a home with a relative's primary school-aged children. However, as extended family households (and therefore co-residence across generations) are common, I believe that these biases are moderate.

Due to the 'mosaic' character of 'modernization' in rural Vanuatu and the complexities involved in this process, the null findings reported here should be interpreted as preliminary rather than conclusive. For example, it may be that rural areas of Vanuatu are simply not far along enough in the socioeconomic and demographic transformations that accompany 'modernization' to observe an effect on children's cognitive development. Specifically, it may be that, while declining, rural women's fertility is still at a relatively high level, at least when compared to women from (post-)industrial societies. As a result, childrearing practices associated with 'intensive parenting' (which require high levels of investment in a shrinking number of offspring) are not favoured at the moment, but caregivers may become more receptive to them (and to 'neontocratic', 'mind-minded' parenting strategies more specifically) in the future.

5.4.4 Outlook

Future work on Theory of Mind should focus on cross-cultural differences in parenting styles and discipline strategies, and whether these are affected by socio-economic transitions. This could be done by applying a range of methods, such as self-report questionnaires where guardians are invited to reflect about how they have responded to disciplinary challenges in the past (Pears & Moses 2003). Alternatively, guardians could be asked to give their opinion about vignettes presenting a range of disciplinary challenges (Ruffman, Perner & Parkin 1999; Tompinks et al. 2017). Finally, behavioural observations could be used to assess parenting behaviours directly (Hughes & Ensor 2006). In addition, future work should systematically assess guardians' attitudes towards the moral importance accorded to mental states. This could be done with self-report measures and vignettes used in previous studies (Barrett et al. 2016; Curtin et al. 2020).

Specifically, future work should examine whether (1) intra-cultural variation in those attitudes is linked to socio-economic transitions and demographic changes (such as exposure to formal education and the kinship intensity of people's personal networks, or

alternatively the number of children in the family). For example, it has been found that market integration reduces the kin density in people's social networks in rural Poland (Colleran 2020). Future work should further try to (2) link intra-cultural variability in those attitudes to children's Theory of Mind. For example, in an Indonesian study many mothers rejected power-assertive parenting in favour of more discussion-oriented approaches (Kuntoro, Peterson & Slaughter 2017). Mothers' endorsement of authoritarian parenting had a negative impact on children's Theory of Mind in that population (Kuntoro, Peterson & Slaughter 2017). This line of work could be applied productively to rural Vanuatu. As variables that are closely correlated in industrialized populations (such as educational attainment, labour force participation, and number of dependent children) may not come in tandem in rural areas and small-scale societies, and as the latter can show considerable heterogeneity both within and between households, future work should explore these complexities directly (for community- and individual-level correlations between wealth, formal education, market integration, and demographic change in various populations, see Colleran et al. 2014; Colleran et al. 2015; Snopkowski et al. 2016).

6. General Discussion

In this dissertation, I investigated the impact of culture on social cognition and social learning among children on the islands of Efate and Espiritu Santo, Vanuatu. To this end, I conducted cognitive experiments with children, demographic surveys with their caregivers, and ethnographic investigations on rural lifeways. In Chapter 2, I provided an ethnographic account of village culture at my field sites, with a treatment of kinship, childrearing practices, and ideology, based largely on my own primary data from the field. In Chapter 3, I examined the ontogeny of Theory of Mind and mental state talk. In Chapter 4, I examined the ontogeny of teaching and children's reasoning about teaching. In Chapter 5, I explored socioeconomic transitions in rural Vanuatu and their effect on children's developing Theory of Mind. In this chapter, I summarize my findings and provide an outlook for future research on these topics.

6.1 Summary of Results

In Chapter 2, I examined the ethnographic context at my field sites, based on qualitative observations and unstructured interviews. These data showed that North Efate and East Santo could be described as 'kinship intensive' – social life is characterized by interlinked extended families who are so closely related that genealogical connections can be reconstructed from living memory for the families of nearly all children in a village. Relatedness is structured through matrilineal descent groups (clans in Efate, moieties in Santo) that determine marriage rules, but patrilateral principles can influence inheritance and community leadership, although decision-making is flexible in practice. Ties between families are established through intermarriage and affirmed through ceremonial exchange. Children share a home with extended family or at least have them close by, the extended family is thought to be responsible for each other's children, and children may transfer from one relative to another through adoption and fostering arrangements. Children experience two primary forms of cultural transmission: a participatory one that is embedded 'organically' in everyday life, where caregivers include children in subsistence activities through task assignment and guided participation, children have many opportunities to observe such activities, and children practice skills such as fishing in independent play groups. At the same time, children attend primary school and increasingly also preschool, attend Christian services with their families, and are thus also exposed to the classroom-style, frontal teaching typical of Western countries. Moral

ideology emphasizes children's respect for and obedience to elders, and this is reflected in discipline strategies, which promote corporal punishment. Local values further stress 'interdependent' ideals such as consensus and social harmony, respect for tradition and chiefly authority, and assistance between kin. Finally, local spiritual beliefs such as witchcraft and love magic, which are present alongside Christianity, indicate that, under some circumstances, the mind is seen as 'porous' – open to spiritual influences that originate outside itself. This might imply that the origins of people's thoughts can be sought in the actions of other people, and that mental states are not necessarily just a collection of internal psychological processes. Taken together, these characteristics place North Efate and East Santo within the 'holistic' or 'interdependent' model of childrearing and the 'gerontocratic' family model as described in the anthropology of childhood. They further place my field sites with 'kinship intensive' societies and with those embracing the 'porosity' model of the mind, as described in cross-cultural research on ethnopsychology and social structure (see Chapter 1 for theoretical background).

In Chapter 3, I examined the ontogeny of Theory of Mind and mental state talk among children in North Efate. I tested the proposition that Theory of Mind is culturally learnt, which predicts that its development can vary across cultures (Heyes & Frith 2014). To this end, I replicated an earlier study which had found extreme delays in mental state reasoning among ni-Vanuatu children from rural areas, where even teenagers did not advance much beyond chance levels (Dixson et al. 2017). I supplemented the design employed in that study with additional controls to assess children's use of mental state talk and understanding of the tasks (Blijd-Hoogewys et al. 2008). Unlike what had been found with Western children (see Wellman, Cross & Watson 2001), I found no increase in children's False Belief understanding around the ages of 4 and 5. However, developmental trajectories varied considerably across different False Belief tasks – while some tasks showed no age-related increases, others did, with majorities passing False Belief, Appearance-Reality and Belief-Emotion at 9-11 years old. These results are broadly consistent with the view that Theory of Mind is culturally learnt (Heyes & Frith 2014). However, the most extreme findings in Dixson et al. (2017) were not supported. Furthermore, some of the results are consistent with some big-picture patterns that have been found in many different languages and cultures. For example, just like elsewhere, children in my sample passed desire-based tasks before they passed tasks assessing their understanding of beliefs – and they were also more likely to talk about desires and preferences than about beliefs. This pattern is consistent with the notion of belief-desire

psychology (Wellman & Woolley 1990), where desires predate beliefs, and where children communicate about desires before their talk about beliefs (Kristen et al. 2014). Intriguingly, I found that the children in my sample seemed to bypass references to mental states, and especially references to beliefs, when possible, by focusing on some general aspect of the situation in the story, or by communicating about the story in a non-mentalizing way. While children's use of belief statements increased with age in some tasks, even in the task with the most 'mentalistic' responses only half 9-11-year-olds used belief statements, and there was no substantial increase in children's use of belief statements under the age of 6. This runs counter to patterns found in other societies, where children's use of belief statements increases substantially throughout the preschool years (Ruffman, Slade & Crowe 2002; Suzuki & Nomura 2019). Finally, I concluded that False Belief tasks with very low pass rates probably do not reflect ni-Vanuatu children's real mindreading skills – many children failed in low-performance tasks, but then not only passed other False Belief tasks, but also communicated directly about beliefs in those.

In Chapter 4, I examined the ontogeny of teaching among children in East Santo. I tested the proposition that mechanisms of cultural transmission, such as teaching, are themselves culturally learnt, which predicts that the ontogeny of teaching can vary across cultures (Heyes 2012; Lancy 2015a). To this end, I implemented a peer teaching assessment that had previously been performed only with children from industrialized societies and examined whether ni-Vanuatu children's trajectory matched that found in earlier studies. While most children used verbal statements mixed with demonstrations as well as combined teaching, only half of them used abstract communication. Children expressed distinct teaching styles – about half employed a participatory style (where they simply invited their partner to play), and the other half employed a more abstract style (where they verbally walked their partner through the game before playing). Up until age 8, most children used the participatory style, and the abstract style only become common in 9-11-year-olds. This trajectory is unlike the one found in Western, industrialized populations, where children shift from mostly relying on demonstrations to relying more on abstract verbal explanations around the age of 5 (Strauss, Ziv & Stein 2002; Strauss & Ziv 2012; Ziv et al. 2016). The most substantial increases were found in children's use of abstract conditional statements about game rules: older children did not necessarily talk more, but they were more likely to 'pre-package' the verbal information they were giving to their partner and were more likely to communicate at a higher conceptual level. While this shift does not reflect the age structure found in Western societies, it is broadly

consistent with a general pattern where children start their verbal teaching with short commands and then 'graduate' to more abstract explanatory statements (Ziv et al. 2016). The results suggest that teaching as such is developmentally reliable, but specific teaching strategies may be shaped by cultural learning (Heyes 2012; Lancy 2015a). Furthermore, when reflecting on their own teaching, the children in my sample tended to describe their own teaching by restating the game rules; few described their teaching in communication terms or metacognitive references. Additionally, when reflecting on whether the learner had learnt the game, the children in my sample tended to use the fact that they taught as evidence that learning occurred, not the learner's actual behaviour. Again, these findings differ from the trajectories found in Western, industrialized populations, where children shift from redescribing the rules to describing their communicative strategies, and from using their own teaching as evidence that learning occurred to referring to the learner's behaviour as evidence that learning occurred by age 5 (Strauss, Ziv & Stein 2002; Strauss & Ziv 2012). This suggests that metacognitive reasoning about teaching is shaped by cultural factors (Heyes 2012; 2015b; 2016a), although I also argued that these responses may reflect local discourses about knowledge production rather than a failure to understand how teaching occurs.

In Chapter 5, I examined the effect of socioeconomic transitions on children's Theory of Mind in Efate and Santo. I tested the proposition that, as small-scale societies adopt and participate in 'Western' norms and institutions, their cognition becomes WEIRDer in the process (see Rozin 2010). To this end, I conducted structured interviews with the caregivers of the children who had participated in the Theory of Mind assessments. I found that, rather than being thoroughly 'remote' or 'pristine', many households actively participate in socioeconomic transitions. While all households engage in subsistence horticulture to meet their basic needs, most also had supplementary sources of income. Households' participation in wage labour revealed heterogeneity within households: while most women with dependent children focused on horticulture, childrearing, and household duties, only few households did not participate in the market economy at all. Heterogeneity was also evident in households' participation in labour migration. While only very few women with dependent children had participated in seasonal labour in Australia or New Zealand, the number was higher on the household level. Furthermore, participation in formal education was widespread, and most households had at least one adult resident who had been educated beyond primary school. Additionally, the various aspects of 'Westernization' did not necessarily go together or

reinforce each other in a linear fashion. Many 'Westernizing' variables, such as proximity to urban environments, formal education, and labour migration, were not related to each other and did not affect demographic variables such as household size or the number of dependent children in a home. On the other hand, mothers' participation in wage labour increased when they were living closer to urban environments and participation in wage labour also increased when residents had had more exposure to formal education, although this occurred at different thresholds for households and individual female caregivers. Finally, I found that exposure to most of these 'WEIRD' norms and institutions had no discernible impact on children's ontogeny of Theory of Mind, counter to expectations that the world's cognition is becoming 'WEIRDer'; these results may come down to the fact that the associated 'modernization' processes are not far along enough to show such an effect. However, I also noted some differences in performance between Santo and Efate, the precise reasons for which are in need of further investigation.

6.2 Reflections

6.2.1 Theory of Mind

In Chapter 1, I noted that the WEIRD bias in cognitive research is problematic because it encourages researchers to generalize findings from Western populations to humanity as a whole without examining whether the documented patterns or associations translate to other cultural settings. However, there may be an opposite, essentialist bias with research conducted in small-scale societies. Namely, that receiving a response that differs from those received in industrialized societies is directly indicative of a deep cognitive difference when other explanations are possible. A particular problem with cross-cultural research is that the worldviews of researcher and participant are not only different, but the researcher 'doesn't know what they don't know' about their participants' perceptions, even with prior experience at the field site. Even when children pass control questions, there is no guarantee that they took the scenarios at face value or that they interpreted the story as intended. Cross-cultural work aims to measure whether some cognitive process differs across cultures but must always consider the possibility that the premise of the task was interpreted differently. Ecological validity is therefore not limited to the objects and concepts used in task scenarios and the presentation of appropriate social relationships, but also concerns the participants' intuitions about the purpose of the test.

Accordingly, cross-cultural psychologists should not merely do an assessment once and then accept the result at face value but need to examine alternative explanations and run replications designed to distinguish between them in the same ethnolinguistic context.

Future work should therefore examine whether cultural evolutionist accounts of mindreading hold up to the challenges of critics. For example, some social anthropologists have argued that we should not use folk models of the mind to make assumptions about variation in Theory of Mind ability (Astuti 2015). We may rephrase this to say that the more elaborate aspects of folk psychology (such as whether the mind can detach from the body or act on supernatural forces) may not be informative about the more fundamental components of Theory of Mind (such as False Belief understanding), which should vary less across cultures. Furthermore, some evolutionary psychologists have argued that Theory of Mind, along with other abilities that appear to be important in culture learning, may be partially specified but then become more elaborate during development by way of domain-specific learning processes (see Roige & Carruthers 2019). In this view, rather than just being a collection of domain-general learning mechanisms and affective biases, the 'starting state' of cognitive development also comprises some 'pre-specified' learning systems that are domain-specific, and that have evolved to accommodate domain-specific experiential input during development (Roige & Carruthers 2019). This starting state may include some 'priors' or 'pre-packaged' concepts such as 'think', 'want', and 'see', which are elaborated in increasingly sophisticated ways throughout ontogeny (Roige & Carruthers 2019). They have argued that this view is compatible with the evidence that input from the socio-cultural environment can impact the developmental trajectory of key cognitive mechanisms (Roige & Carruthers 2019). Specifically, they have argued that their view is consistent with evidence that children's exposure to mental state communication affects their performance in verbal Theory of Mind problems, with associated cross-cultural variation, and with the existence of culturally specific ethnopsychologies (Roige & Carruthers 2019). This argument rests on the notion that verbal communication about mental states is a key input that this partially specified learning system has evolved to accommodate (Roige & Carruthers 2019). In other words, a basic, domain-specific core of Theory of Mind may be present from infancy, but this more fundamental component interacts with other cognitive systems during development, which enables learning without radically altering the core mindreading system (Carruthers 2013). Researchers in this line of reasoning have argued that Theory of Mind may have co-evolved with other cognitive

specializations (Barrett, Cosmides & Tooby 2010; Kurzban & Barrett 2012). According to these critics, the dichotomy between cognitive gadgets (which only rely on domain-general learning and are culturally evolved) and fully innately specified cognitive instincts is a fallacy (Roige & Carruthers 2019).

It is therefore somewhat unclear how to distinguish between the cognitive gadgets model and this 'intermediate strength' hypothesis, and where they make different predictions. One clue for future work may be in assumptions about the role of teaching in mental state attribution. Heyes' critics have argued that children spontaneously attribute mental states to other people without being instructed to do so, and that neither formal nor informal teaching is involved (see Roige & Carruthers 2019). If there is no teaching of mental state concepts, they argue, then it remains unclear how a domain-general learning apparatus should ever come to accommodate mentalistic interpretations of behaviour (Roige & Carruthers 2019). Specifically, they ask how the developing brain should, merely by overhearing conversations about mental states and employing associative learning, learn to map the relevant *sounds* to the correct mental state *concepts* (Roige & Carruthers 2019). This is much less of a problem if mapping is taught. For example, a naughty child might tease their sibling, take their toys, and make them cry, then a caregiver intervenes and says: 'look, she is crying, now she feels bad because of you! You have to apologize!'. Interactions such as these may provide children with teaching moments where they learn to map the mental state concepts of their culture to observable behaviours. This could be investigated in naturalistic studies on child training across cultures, with a focus on how caregivers connect mental state concepts and other features of ethnopsychology to emotional expressions when small children are present. If, say, caregivers in some cultures frequently use emotion references (feel bad, sad, etc) but place less emphasis on cognition terms (think, believe), and this affects the ontogeny of different aspects of Theory of Mind, the culture learning account is supported. In contrast, other aspects of social cognition may be more precocious and less variable. For example, 6-month-olds can already distinguish between animate and inanimate objects, recognizing that animate beings are self-propelled, whereas inanimate ones need to be acted upon to move (see review in Premarck 2007). This may suggest that our ability to recognize intent (or the absence thereof) and goal-directed behaviour is more deep-seated (Premarck 2007) and may therefore predate mature Theory of Mind.

In general, mixed-methods approaches that combine participant observation, systematic observations of child training, and experiments are well-placed to determine

how plastic various components of social cognition really are. Social anthropologists have already argued that cross-cultural developmental research should pay more attention to children's behaviour in daily life, including their responses to relevant experiences such as deception (Astuti 2015). Reflecting on my experiences interacting with ni-Vanuatu children in daily life, I "do not find that they suffer from glaring mental deficits or psychiatric abnormalities" (LeVine et al 1994: 273), just as LeVine and colleagues did with Gusii children. Furthermore, even if caregivers avoid deep speculation about the inner lives of others, everyday life and casual conversation still offer many opportunities to make children aware of their own misconceptions and those of others. For example, in Paunangisu, a friend reported on a false rumour that had been circulating about another relative. Some people falsely assumed that this relative's father had passed away, and people started coming to his house to give their condolences until the misunderstanding was eventually cleared up. In Hog Harbour, I witnessed an incident where a mother corrected her child when she expressed a false belief about another person's intentions. A teacher had mistakenly claimed that another person had not boarded a bus into town, when she had in fact done so. The child then opined: 'I guess she just lied then' (*hemi giaman nomo*). She was immediately corrected by her mother: 'No, the teacher just didn't see her get on the bus' (*no, hemi no luk hem jam lo bas*). I also had some encounters where children laughed at amusing misunderstandings. Future work could capitalize on events such as these and investigate how children make sense of them. This may help developmental researchers to determine whether children's responses to such incidents are shaped by cultural idiosyncrasies and ethnopsychologies, or whether children understand the False Belief element of such misunderstandings regardless of the specific folk models and communicative conventions they are exposed to. This may be done by turning such real-life events into stories and asking children to reflect on them retroactively, by asking them why the people behaved the way they did (see also Chapter 1 for another possible 'retrospective' design).

Future work could also attempt to distinguish between the cultural evolutionist account of mindreading and more radical constructivist accounts. As I hinted at in Chapter 3, the most radical 'particularistic' interpretation of cross-cultural differences in Theory of Mind tasks may be that these tasks do not establish or measure a shared baseline of human cognition, but merely proximity to a particular (Western) model of human behaviour. This interpretation resembles what some theorists have called the radical socio-cultural constructivist model of mindreading (Fenici & Zawidzki 2020). In this

view, the primary function of mental state ascriptions is not to describe 'true' mental states that cause behaviour (Fenici & Zawidzki 2020). This means that mental states do not exist independently of the communicative conventions we use to ascribe them (Fenici & Zawidzki 2020). In the most radical formulation, cultural conventions of mental state communication do not merely 'read' pre-existing, culturally neutral mental states, but help to create and regulate them in the first place (Fenici & Zawidzki 2020). In this view, mentalizing is not an independently selected cognitive mechanism for tracking people's inner worlds, but a way of communicating practical commitments in relation to our social environment (Fenici & Zawidzki 2020). For example, when planning a joint outing, non-mentalistic statements like 'The restaurant is closed' or 'It's raining tonight' sound very definitive and thus incur obligations for the speaker – namely, that what they are saying is true (Fenici & Zawidzki 2020). Being proven wrong may then come with reputational costs (Fenici & Zawidzki 2020). In contrast, mentalistic statements like 'I think the restaurant is closed' does not commit the speaker to the veracity of their statements and incurs lower reputational damages if proven false (Fenici & Zawidzki 2020). This allows the speaker to share their goals and shift group action while adjusting their statements to varying levels of uncertainty about the world (Fenici & Zawidzki 2020). Proponents of this view argue that it is precisely these aspects of 'Theory of Mind' that enable humans to coordinate joint hunting and foraging activities (Fenici & Zawidzki 2020).

This view lines up with some proposals from emotion research. For example, Feldman Barrett (2006) has argued that emotions (such as anger or disgust) are not 'natural kinds' – meaning that they are not objectively identifiable aspects of nature that exist independently of our perceptions of them, with distinct observable properties and causal mechanisms behind them. Instead, 'emotions' are abstract constructs that 'bundle' emergent phenomena such as arousal and valence (feeling good or not) into linguistic concepts (Feldman Barrett 2006). Cross-culturally recurrent emotion terms such as 'happy' or 'sad' are frequent because of their functional role in human communication, not because 'happiness' or 'sadness' are 'things' (Feldman Barrett 2006). The constructivist model also resembles some aspects of simulation theory (see the classic formulation in Gordon 1986). Simulation theorists argue that when we make predictions about other people's behaviour, we engage in practical reasoning based on salient facts, norms, and values (Gordon 1986). We then 'simulate', projecting ourselves into the other person's situation (not their mind) and imagining what we would do if we were in their shoes, taking into account observable regularities about human behaviour, the other

person's spatiotemporal position, and what we know about their goals, social roles, and life experiences (Gordon 1986). According to this account, discourse about other people's mental states is not 'mindreading' but a form of pretend play (Gordon 1986).

Again, developmental researchers may examine these proposals by conducting longitudinal, mixed-methods research with children from various 'opacity of mind' societies. This may help them to document how children acquire the mental state concepts that are used in their environment, how they learn to relate them to the observable behaviour of other people, and how they learn to apply these concepts to their own experiences. This perspective may also benefit from cross-cultural data on how children's caregivers formulate practical commitments and express degrees of uncertainty when they communicate with their children, and children's tendency to engage in pretend play.

6.2.2 Teaching

Some have argued that the human life-history reflects the adaptive benefits of culture (Richerson & Boyd 2020). In this view, humans had become dependent on culture as a primary vehicle of adaptation by the late Pleistocene, and this shift enabled the extended juvenile period coupled with long post-reproductive survival that characterize our species (Richerson & Boyd 2020). The former increased youngsters' opportunities to engage in social learning, while the latter enabled elders to pass on their many years of experience (Richerson & Boyd 2020). As a result, behavioural ecologists have focused on older people to investigate teaching. In subsistence societies, hunting is often taught by older males (Gurven, Davison & Kraft 2020). Furthermore, Tsimane elders use stories to transmit ecological knowledge to the young (Schniter et al. 2018). But how does teaching get off the ground? This question is best answered by drawing on the 'helical curriculum' or 'apprenticeship' model of social learning. Whiten et al. (2009) have proposed that both apes and humans pursue a variety of social learning strategies that are applied differently depending on the situation. In the wild, both chimps and humans transmit technologies that are acquired over many years of apprenticeship. This transmission process is not condensed into a single episode or sequence. Instead, learners start by mimicking some basic steps and then gradually progress towards the fully functional operational chain, copying various models, experimenting on their own, and updating their knowledge as they go along. Learning of tool-use behaviours is an extended social, cognitive, and embodied process, not an isolated copying event. This is particularly true of complex skills that need years to master. Rather, they start off with incomplete mimicking of adult

behaviours, then gradually approach the adult pattern over the years by approximating the finished sequence.

This point is borne out by detailed investigations into the learning process of captive apes. Synchrony and motor mimicking are involved in the observational learning of nutcracking techniques (Fuhrmann et al. 2014). Accordingly, young 'apprentices' not only emulate goals, but also copy motor processes, albeit imperfectly. Hirata, Morimura and Houki (2009) trained a naïve chimp in nut-cracking, who was subsequently observed by his peers. The participants acquired the technique step-by-step, first recognizing that they had to apply pressure to the nut, then gradually learning how nut, anvil, and hammer had to be combined with hitting actions (Hirata, Morimura & Houki 2009). In the initial stages of the learning process, they often used non-functional combinations of objects or attempted to crack the nut with their hands (Hirata, Morimura & Houki 2009). The subjects learned about the individual components of nut-cracking separately and gradually combined them into a functional sequence (Hirata, Morimura & Houki 2009). Field experiments with young chimps in Bossou, Guinea, have revealed that nut-cracking skills develop from a single action on a single object to multiple actions on multiple objects, gradually increasing in complexity and adequacy over time (Inoue-Nakamura & Matsuzawa 1997). During apprenticeship learning, learners often start off with attempting to copy some action they have observed or implement a technique that has been taught to them, failing, evaluating the result, and then engaging in exploration and deliberate practice to achieve mastery (Hecht & Stout 2017). Learners must relate the details involved in executing these skills to the goals they are trying to accomplish, and thus apply executive control and motor planning during this process (Hecht & Stout 2017).

Building on this work, Whiten (2015) proposed a 'helical curriculum' model of social learning. In this view, learners alternate between observation, practice, play and exploration, updating their knowledge as they go along (Whiten 2015). This results in a stepwise improvement of technological proficiency in which social and individual learning interact and reinforce each other (ibid.). According to Whiten (2015), complex technical skills are transmitted by a combination of "individual learning, exploration and practice, intertwined with social learning" (Whiten 2015:10). In this model, the key to transmitting complex technical skills is sustained practice coupled with various social learning mechanisms (Whiten 2015).

A similarly 'synthetic' process may be involved in the ontogeny of teaching. Children probably learn to teach in the first instance through experiencing communicative

acts that are embedded in everyday life. In 'intensive' parenting environments such as many families in industrialized populations, adult caregivers use eye contact, pointing, and infant-directed speech, whereas in rural subsistence populations, caregivers may orient the child's body towards interactions between other people. Children's attentional bias towards other people and their prosocial emotions motivate them to join in these events and participate. As children grow and participate more and more in communication with parents, peers, and relatives, they are increasingly exposed to teaching events. In rural Vanuatu and many other small-scale societies, this occurs when caregivers allow them to interact with objects they are using in some activity, give them commands, or assign simple chores to them. The words and gestures involved in this kind of teaching are not qualitatively different from 'generic' communication – such as asking someone to fetch a tool, showing them a toy, or commenting on the colour of a fruit. The tasks that children participate in may get more complex with age, which may necessitate more intensive teaching such as abstract communication and detailed demonstrations.

As children experience this process, they start to emulate what they see and hear, and as they start to communicate with their peers, they also start to implement simple teaching episodes (without necessarily viewing themselves as 'teachers'). These emerging 'teachers' are on some level simply emerging communicators, who in turn integrate their emerging social cognition (which they pick up from the communicative conventions of their cultural environment), but also their growing causal understanding of the skills they observe and participate in, which they have picked up during the 'apprenticeship' curriculum described above. The simplest forms of teaching -such as pointing out an object for another to bring- may 'bootstrap' from these more generic forms of communication and may not be in need of more mentalizing than non-teaching interactions – in fact, they may get off the ground on the basis of 'submentalizing' or implicit mindreading. During this process, children might also receive situational feedback that helps them refine their own teaching – for example, they try to engage a younger sibling in nut-cracking but are informed by another that the sibling is too small to hold the hammer. Through repeated interactions with both older and younger children in play groups, they learn to adjust their own behaviour to the abilities of their peers. Teaching may thus rely on a genetically inherited 'starter kit' made up of other-centred attentional biases, prosocial psychological mechanisms, and the capacity for perspective-taking and joint attention, but also needs regular interactions with caregivers and peers, along with domain knowledge, to get off the ground. In this manner, teaching might

resemble language, in that the capacity for language is anchored in our genetic heritage, but children nevertheless only develop language if they have language-based interactions with other people during critical phases of their early development.

Over time, children gain the ability to perform more cognitively demanding forms of teaching, along with the ability to make abstract information learnable. As children grow, they also become receptive to cultural models of the mind (the ethnopsychology endorsed in their socio-cultural environment) and learning, along with normative ideas about knowledge and authority. During that time, children also become receptive to cultural 'schemas' or models of teaching - by receiving particular teaching styles and using similar styles when teaching others. As I have discussed, there is 'teaching through life' or participatory learning (see Chapters 1 and 2): 'teaching-to-go' that is embedded in everyday life, where children learn from being included in activities. On the other hand, there are teaching approaches that favour abstract communication. Children exposed to more face-to-face stimulation and visual cuing may engage in more of the same, children exposed to more abstract communication may themselves teach in a more abstract manner, and children exposed to a more participatory approach may themselves teach using participation. Children's own teaching then reproduces these interactions with reversed roles, applied to new social situations. Others have already recognized that animal teaching is often limited to key aspects of food acquisition, such as stalking and handling prey, the presence of edible foods, and locating food sources in the environment, with a single target behaviour taught in each species (see review in Premack 2007). In contrast, humans teach skills in many different domains with numerous cross-cultural differences in the behaviours targeted for teaching (Premack 2007). To this we can add that humans show cross-cultural differences in the way they go about cultural transmission.

These deliberations are consistent with theoretical arguments from education research. Some education researchers have proposed that both humans and non-human animals engage in 'spinal cord teaching', where the teacher reflexively adjusts their behaviour in response to learner cues (Rodriguez 2013). This type of teaching is 'instinctual' in the sense that no higher-level processing of the student's learning capacities occurs; it is often involved in the transmission of basic survival skills (Rodriguez 2013). For example, a parent may notice that their child is reaching for a hot stove and quickly pats their hand and says 'no!' (Rodriguez 2013). However, they further argue that adult humans also engage in 'teaching brain' teaching, which involves higher-

order cognitive functions (Rodriguez 2013). Here, the teacher constructs a mental model of the learner's 'learning brain', modelling what they might know and remember, what their abilities may be, and how they might respond to different teaching approaches – in other words, here the teacher employs Theory of Mind, along with a Theory of Cognition (Rodriguez 2013). In addition, human teachers form mental models of their own knowledge and memories, which they in turn relate to their mental models of the learner (Rodriguez 2013). These complex inferences enable mature human teachers to customize instruction to the needs of individual learners in a dynamic process where the teacher continuously adjusts their assumptions in response to new learner input (Rodriguez 2013). According to this line of thinking, this iterative feedback loop enables the synchronous, interactive nature of human teaching, which makes it more efficient (Rodriguez 2013).

Another important distinction between humans and other animals may be that adult humans can teach by communicating concepts to a learner. Some cognitive archaeologists have argued that this ability is deeply rooted in human phylogeny and may go back to the cultural transmission of Acheulian hand axes, which is evident from 1.8 million years ago (Chazan 2012). According to this line of thinking, hand axe production requires people (and their *Homo erectus* predecessors) to impose strategic goals on the stone they work with, which are modified with a design or mental template in mind (Chazan 2012). Learning these skills may have involved the communication of concepts, not just techniques, between a teacher and a learner (Chazan 2012). In contrast, the kind of nut-cracking that chimpanzees (*Pan troglodytes*) engage in only requires the learner to categorize objects, implement action sequences, and practice dexterity – no mental image of a finished tool-product is required (Chazan 2012). Accordingly, teaching through communication of concepts may have evolved after the split with *Pan* but predates the emergence of *Homo sapiens* and symbolic culture (Chazan 2012). This process may have involved what some have called mutual attention within a community of practice, where active helping was iterated with long periods of individual practice, in a dynamic interaction between knowledgeable and naïve individuals (Chazan 2012).

Our ability to communicate concepts may be among the most important differences between human and animal teaching. As critics of teaching research in behavioural ecology have argued, human teaching does more than just directing a learner's attention or providing access to stimuli (Hernik & Gergely 2015). Mature human teaching can cope with (1) teleological opacity, by explicating the goals of knowledgeable individuals; (2) with causal opacity, by illuminating the causal relationships between

different aspects of a task; (3) and with uncertainty about the generic or shared aspects of observed behaviour, i.e. whether a certain technique applies to contexts other than the one the learner is experiencing in that moment, and whether it is shared with a broader a socio-cultural group or specific to the model (Hernik & Gergely 2015). Teaching then shifts not just the stimuli that the learner is accessing, but how they interpret what they see, allowing them to draw inferences beyond the specific situation they are participating in (Hernik & Gergely 2015). In fact, some have argued that the evolution of language introduced such a radical shift in human cognition that human and animal teaching are barely comparable, giving humans the ability to introduce concepts through language-based definitions without the need for concrete examples to be present at all (Battro 2010).

Some neuroimaging studies have started to shed light on how some of these 'higher-order' forms of teaching operate in the brain. These studies suggest that adult human teachers engage in vicarious reinforcement learning (Apps, Lesage & Ramnani 2015). Regular reinforcement learning operates as we notice prediction errors or discrepancies between the predicted and actual outcomes of our actions, allowing us to correct our behaviour when we fail to achieve our goals (Apps, Lesage & Ramnani 2015). When we learn in this manner, prediction errors are signaled in neurons located in the anterior cingulate cortex (Apps, Lesage & Ramnani 2015). When teaching action-outcome associations (between coloured shapes on a screen and motor responses on a keypad) to a learner, experiment participants displayed activity in the anterior cingulate cortex that vicariously signaled the learner's prediction errors (Apps, Lesage & Ramnani 2015). This suggests that teaching is supported by vicarious processing of reinforcement learning mechanisms (Apps, Lesage & Ramnani 2015).

Note that the above -as of now, speculative- account of teaching does not rely on a suite of cognitive adaptations 'for' teaching like natural pedagogy. Instead, it merely assumes that teaching strategies are 'exapted' or 'spandreled out' from other caregiving behaviours and cognitive systems (for a definition of the spandrel concept see Gould & Lewontin 1979). In this view, cooperative breeding created a 'safe haven' for teaching where inclusive fitness interests (ultimate) promoted prosocial psychological traits (proximate) and made cooperation in culture learning stable. Some have argued that future research should implement wearable neuroimaging devices to better understand the teaching brain in action (Battro 2010). More broadly, comparative neural processing studies may reveal whether different species activate the same neural mechanisms when they teach, or whether teaching has evolved in different taxa by hijacking different neural

systems. The fact that human teaching is conducive to culturally variable normative interpretations and folk models (e.g. expectations about respectful conduct between children and their elders) demonstrates our level of cognitive control and behavioural flexibility over teaching, and therefore suggests that the latter is a plausible outcome. Furthermore, cross-cultural experimental work on younger children should seek to determine by what age teaching behaviours start to diverge between different socio-cultural environments, and how people's ability to flexibly adjust their teaching to the needs and abilities of learners comes about. This would help evaluate some claims made by Strauss, Ziv and Frye (2015), namely, that the 'proto-teaching' observed in infants emerges from shared cognitive prerequisites that are not inherently cultural (see also Chapter 1).

Another line of enquiry may be found in the social coordination of cultural transmission. While animal teaching is, by definition, also cooperative, social coordination may be another way in which human teaching differs markedly from animal teaching. For example, while neglected in the social learning literature, there is a phenomenon that we might call 'intensive' or dedicated teaching, which we can define as cultural transmission in a dedicated context that is separate from the everyday life of families. This latter form of cultural transmission is present in small-scale societies, where it is mostly practiced for ceremonial, ritual, and spiritual knowledge, such as the training of shamans and the initiation of pubertal boys in bush schools. For example, early ethnographies report male initiation rites practiced in Malekula, where novices were taught ceremonial knowledge, which involved the performance of hoaxes and the playing of musical instruments. In one such rite, the boys were circumcised. When it was time, the fathers planted a yam garden for their sons and appointed some trusted men -not necessarily relatives- to guide them through the rituals (Deacon & Wedgwood 1934: 250). They then constructed a ceremonial house (Deacon & Wedgwood 1934: 250). Upon its completion, the men would seize the boys and beat them before they walked them to the ceremonial house, where they had to remain secluded for 10 days (Deacon & Wedgwood 1934: 250). Once the 10 days were over, the novices' faces were painted black, and they were blindfolded, drugged, and circumcised (Deacon & Wedgwood 1934: 251). Upon their return to the hut, the novices were whipped again (Deacon & Wedgwood 1934: 252). The novices remained in seclusion for another 20 days, and during that time, they were instructed in ceremonial knowledge that was taboo for women and uncut boys (Deacon & Wedgwood 1934: 253). Specifically, they were "taught how to make and play the

panpipes […] This instruction is not a chance amusement to keep the lads occupied, but forms a definite part of the programme; the pipes are regarded as having a certain 'initiation value'" (Deacon & Wedgwood 1934: 253). Furthermore, "the novices are made to witness at night a number of remarkable performances, innumerable and ingenious 'hoaxes', which serve to some extent to test them and train them in self-control" (Deacon & Wedgwood 1934: 253). During these hoaxes, men dressed up as ghosts and spirits and frightened the boys (Deacon & Wedgwood 1934: 254p) – "[a]t the end of each exhibit, however, the secret of the deception is revealed to them; they are taught exactly how the 'hoax' was carried out, and in this way the mystery is dispelled, and they learn how to perform it themselves against the time when, as grown men, they will have to play their part in the incision ceremonies of other young boys" (Deacon & Wedgwood 1934: 255).

What occurs in these ceremonies fits the criteria for direct active teaching – abstract communication or demonstrations of specific techniques – but it is also more than that – by removing novices from their family environments, the male cults create a social sphere dedicated to experiencing a ritual which they will in turn transmit to the next generation. If there is anything distinctly human about cultural transmission (aside from its cognitive aspects), it might be found in the carving out of social spheres, separate from everyday life, where intensive teaching can take place. These may have been key to the emergence and transmission of 'thick' symbolic culture and ritual life. These spaces required the active coordination of cultural transmission between multiple teachers and learners at the same time. They also required the novices' families to plan their resource use and coordinate food transfers to feed them while they were away from their households, which is evident in the planting of dedicated yam gardens. In large-scale, complex societies, these dedicated transmission spaces are found in schools associated with modern formal education systems, but also in the studios and shops run by medieval craftsmen and in the scholarly establishments of Christian monastic life. In economies characterized by increasing professional specialization and a more and more fragmented division of labour, these spaces allowed people to accumulate specialist expertise. This was only possible because resource transfers, brokered by wealthy benefactors and political leaders, freed them from subsistence production. As the professions or domains of cultural transmission diversified in increasingly market-based, commercial economies, some aspects of cultural transmission became themselves subject to professional specialization, with the installation of full-time educators in scholarly institutions. Once

this was accomplished, knowledge about teaching could itself accumulate, as is evident in the existence of didactics.

6.3 Outlook

Cultural adaptations enable us to shift our behaviour to exploit different ecological conditions. In the context of this strategy, we can only benefit if the social learning strategies we use to circulate cultural skills are themselves plastic – adaptable to different domains and situations, enabling us to switch between different learning strategies depending on the demands of the task at hand and the needs and abilities of learners. Advanced social cognition, along with metacognitive reflection, enables us to relate our own to another person's knowledge, and then target and adjust teaching accordingly. In adults at least, much social learning is subject to conscious manipulation and intentional control, with people able to reflect on the fidelity of their own learning. At the same time, these 'meta' processing abilities open us up to normative expectations, cultural scripts, and discourse conventions that allow us to interpret teaching on a symbolic, aesthetic, and moral level. Finally, we employ cultural innovations to help us adjust our social learning processes to changing needs, in a deliberate act that is not only under executive control but is itself characterized by behavioural flexibility. This has become evident in programming tournaments, which have shown that cumulative change is mostly driven by flexible learners who combine copying with exploration and innovation in the right doses (Miu et al. 2020).

These observations lend themselves to a broader point about plasticity. Natural selection has favoured genetic traits that generate phenotypic plasticity because they enable us to flexibly adjust our behaviour (and our bodies) in response to input from the environment (for a discussion see Nettle & Bateson 2015). Based on such ideas, some have argued that in humans, developmental mechanisms have evolved to generate that behavioural plasticity (Kline, Shamsudheen & Broesch 2018). In other words, developmental systems are sensitive to input from the socio-ecological environment, which they then use to generate variability in developmental trajectories (Kline, Shamsudheen & Broesch 2018). Due to human's reliance on cultural niche construction for survival and subsistence, this capacity for 'responsiveness' is adaptive (Kline, Shamsudheen & Broesch 2018). This perspective broadens the scope of cognitive psychology –from a context-less, homogenous mind to one that is constituted by social processes and cultural systems of meaning, and one that generates flexible responses to

changing environments (Bender, Hutchins & Medin 2010; Bender 2019). Different cultural models of childrearing then create divergent pathways for children's development (LeVine et al. 1994: 274). These different ways of 'doing childhood' are functional in the socio-ecological environments that people find themselves in, preparing children for the socialization goals of their cultural context. Accordingly, the absence of 'Western' childrearing practices, which are designed to optimize performance in formal schooling, is not indicative of a failure to provide care (LeVine et al. 1994: 273p). Accordingly, we should refrain from assuming that milestones identified in research with industrialized populations are normative or that deviations from such patterns constitute a problem (Kline, Shamsudheen & Broesch 2018). This is particularly true of social cognition, where socialization goals differ starkly between cultures, with some emphasizing autonomy and others interdependence with kin (Kline, Shamsudheen & Broesch 2018). As a result, it has become increasingly clear that developmental psychology is not complete without cross-cultural evidence (Nielsen & Haun 2016).

This cross-cultural work would benefit from a 'slow science' approach (see Frith 2020) that prioritizes long-term projects over quantity of output. Short-term, one-off studies are scientifically problematic because they lack context from daily life in the culture the research is conducted in (Kline, Shamsudheen & Broesch 2018). Some cross-cultural developmental researchers have treated whole cultures as monoliths without considering environmental factors such as wealth and resource availability, and without taking into account variability within cultures (Kline, Shamsudheen & Broesch 2018). Yet others have failed to take int account that cultural factors may influence how participants interpret the purpose of experimental set-ups (Kline, Shamsudheen & Broesch 2018). Cross-cultural developmental research would therefore benefit from combining controlled experiments with naturalistic methods employed in behavioural ecology (demographic surveys and naturalistic observations) and with in-depth qualitative research as practiced in social anthropology (participant observation and in-depth interviews). This would enable developmental researchers to contextualize their findings within local lifeways and worldviews, including social structure, childrearing practices, and cultural models of the mind and human behaviour. Such an approach would also enable researchers to connect broader demographic trends (such as the transition from high to low fertility and its associated investment in a smaller number of children) with socio-economic shifts (such as the transition to a more commercial economy and the associated investment in formal education), but also to trace relationships between the

social structure (as reflected in residence patterns and household composition), cultural schemas of childrearing, and children's socio-cognitive development. This would also recover some of the 'holistic' approach that was present in early anthropology. Evolutionary psychology, biological anthropology and social and cultural anthropology are best placed to answer big questions about the evolution of the human mind and culture if they approach them together. In the long run, this research programme must also incorporate replications and follow-up studies designed to distinguish between cultural-cognitive and other, more circumstantial reasons for cross-cultural differences in children's performance.

Furthermore, through the recruitment of local research assistants, communities should have a chance to collaborate on the research design and give feedback before launching experiments. Others have already recommended that researchers adopt a community-centred approach, in which researchers seek out and respect the local community's feedback on research methods and the distribution of results (Broesch et al. 2020). Finally, researchers based in Western countries should make an effort to engage with relevant works produced by academics working in the Global South and other developing countries. These scholars' works are rarely published in the flagship journals of anthropological and psychological societies based in Europe and North America (see Dutra 2020). Others have already pointed out that the lack of collaboration across countries is hampering scientific progress in the attempt to create an accurate map of psychological variation in different socio-ecological contexts (Dutra 2020).

I hope that my thesis has made a small contribution to these efforts, with many more to come.

References

Maps

Fig. 2.1 Map of Vanuatu. University of Texas Libraries. Perry-Castañeda Library Map Collection. Retrieved from https://legacy.lib.utexas.edu/maps/australia/vanuatu_rel98.jpg [last accessed 20.04.2021]

Fig. 2.2 Map of Efate. Australian National University Open Research Library. Retrieved from https://openresearch-repository.anu.edu.au/handle/1885/123140 [last accessed 20.04.2021]

Fig. 2.3 Map of Espiritu Santo. IOCS. Retrieved from http://www.iocs.info/i/images/SantoMap.jpg [last accessed 20.04.2021]

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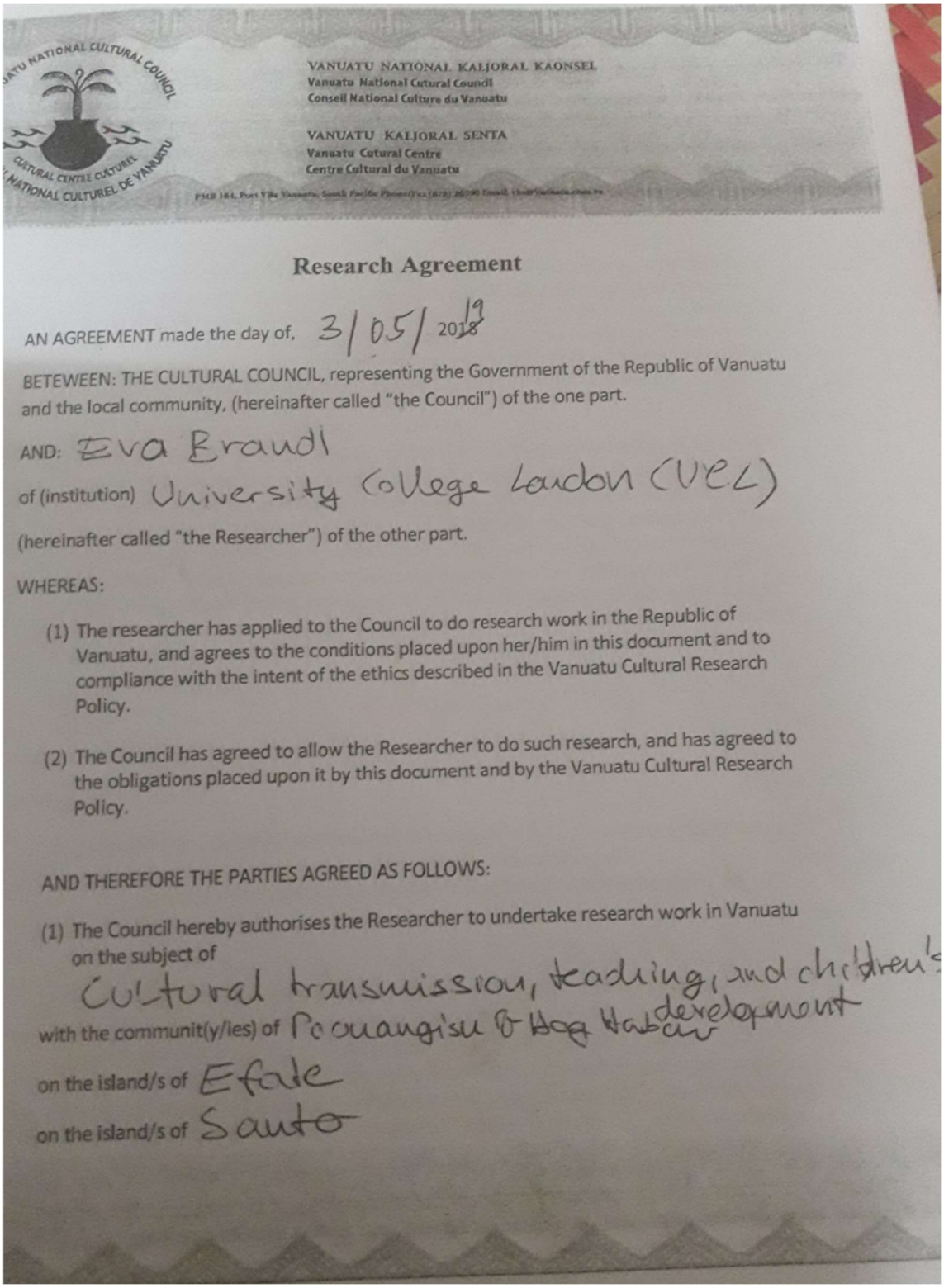
Appendix

Research Agreement with the Vanuatu Cultural Centre



VANUATU NATIONAL KALJORAL KAONSEL
Vanuatu National Cutural Council
Conseil National Culture du Vanuatu

VANUATU KALJORAL SENTA
Vanuatu Cutural Centre
Centre Cultural du Vanuatu

PMB 164, Port Vila Vanuatu, South Pacific Phone/Fax (678) 26590 Email: vkc@vanuatu.com.vu

Research Agreement

AN AGREEMENT made the day of, 3/05/2019

BETEWEEN: THE CULTURAL COUNCIL, representing the Government of the Republic of Vanuatu and the local community, (hereinafter called "the Council") of the one part.

AND: Eva Braudi

of (institution) University College London (UCL)

(hereinafter called "the Researcher") of the other part.

WHEREAS:

(1) The researcher has applied to the Council to do research work in the Republic of Vanuatu, and agrees to the conditions placed upon her/him in this document and to compliance with the intent of the ethics described in the Vanuatu Cultural Research Policy.

(2) The Council has agreed to allow the Researcher to do such research, and has agreed to the obligations placed upon it by this document and by the Vanuatu Cultural Research Policy.

AND THEREFORE THE PARTIES AGREED AS FOLLOWS:

(1) The Council hereby authorises the Researcher to undertake research work in Vanuatu on the subject of

Cultural transmission, teaching, and children's development

with the community(y/ies) of Pouangisu & Bog Habaw

on the island/s of Efate

on the island/s of Santo

in the capacity of (if more than one research is involved) 1

for the period up until (Specify if research will involve more than one visit) 31 Dec 2019

(2) The Research has paid an authorisation fee of 100,000 vatu to cover all administrative costs incurred in the setting up and implementation of the research venture, or this fee has been waived by the Council.

(3) The right to the products of research shall belong to the Researcher shall be entitled to reproduce them for educational, academic or scientific purposes, provided that traditional copyrights are not compromised and the permission to use material has been obtained, through the Traditional Copyright Agreement, from copyright holders. The products of research shall not be reproduced or offered for sale or otherwise used for commercial purposes, unless specified under section 12 of this agreement.

(4) Copies of all non-artefact products of research are to be deposited without charge with the Cultural Centre and, where feasible, with the local community. Two copies of films and videos are to be provided, one for public screening and the other for deposit in the archives. In the case of films, a copy on video is also required. Any artefacts collected become the property of the Cultural Centre unless traditional ownership has been established in the Traditional Copyright Agreement. The carrying of any artefacts or speciments outside the country is prohibited as stipulated under cap.39 of the Laws of Vanuatu. Artefacts and specimens may be taken out of the Country for overseas study and analysis under cap.39(7). The conditions for the return of the following materials are:

(Specify artefacts/specimens/other materials and conditions for return)

The Researcher has either

(a) provided a letter from the institution to which they are affiliated guaranteeing the researcher's compliance with the above conditions, or
(b) provided a retrievable deposit of 40,000 vatu to ensure their compliance with these conditions.

(5) The Researcher will be responsible for the translation of a publication in a language other than a vernacular language or one of the three national languages of Vanuatu into a vernacular or one of the national languages, preferably the one used in education in the local community. They will also make the information in all products of research, subject to copyright restrictions, accessible to the local community through such means as audio cassettes or copies of recorded information, preferably in the vernacular. The

Researcher will also submit an interim report of not less than 2000 words no later than 6 months after the research languages and in "layman's terms" so as to be of general use to all citizens.

(6) There will be maximum involvement of indigenous scholars, students and members of the community in research, full recognition of their collaboration, and training to enable their further contribution to country and community. The Council nominates the following individuals to be involved in research and/or trained, in the following capacities:

(7) A product of immediate benefit and use to the local community will be provided by the Researcher no later than 6 months after termination of the research period. This product is:

(8) In addition to their research work, the Researcher will, as a service to the nation of Vanuatu, undertake to: (section 3 (viii) of the Cultural Research Policy suggests possible services of benefit to the nation)

(9) In undertaking research the Researcher will:

a) recognise the rights of people being studied, including the right not to be studied, to privacy, to anonymity, and to confidentiality;

b) recognise the primary right of informants and suppliers of data and materials to the knowledge and use of that information and material, and respect traditional copyrights, which always remain with the local community;

c) assume a responsibility to make the subjects in research fully aware of their rights and the nature of the research and their involvement in it;

d) respect local customs and values and carry out research in a manner consistent with these;

e) contribute to the interests of the local community in whatever ways possible so as to maximise the return to the community for their cooperation in ther research work;

f) recognise their continuing obligations to the local community after the completion of field work, including returning materials as desired and providing support and continuing concern.

10) In all cases where information or material data is obtained by the Researcher, a Traditional Copyright Agreement will be completed by the Researcher and the supplier of data regarding this material. The Researcher has a responsibility to make such informants fully aware of their rights and obligations, and those of the Researcher, in the signing of the Traditional Copyright Agreement.

11) A breach of any part of this agreement by the Researcher or a decision by the local community that it no longer wishes to be involved in the researcher venture will result in the termination of the reseach project.

12) (Addition clauses/conditions) (This section will detail commercial ventures, extra costs incurred by the Vanuatu Cultural Centre, etc).

Signed:

[redacted]

.....

The Researcher

.....

On behalf of the National Cultural Council

CENTRE CULTURE
MUSEE MUSEUM
PORT-VILA-VANUATU