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Education then and now: making the case for *ecol-agogy*

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Abstract

The processes, settings and outcomes of human education have distinctive impact on the human and non-human world: this paper sets out to discuss what may have motivated the initiation of human education, how it has been maintained why the outcome has wide-ranging, and often negative, planetary impact. The analysis offers a multi-disciplinary account of education, from pre-history to the present, noting that humans, past and present are born into an ‘open world’ that requires world building or, niche construction. As a result, cultural and genetic evolution are out of synchronisation instigating an existential threat and the anxious experience of ‘adaptive-lag’ leading to the motive for continued niche construction. Education is presented as a particular type of niche construction requiring teachers and the use of symbolic verbal language to help learners move from simplistic ‘split’ thinking to the more mature position where the needs of self and others can be met.

Keywords:

Niche construction, adaptive-lag, genetic evolution, cultural evolution, verbal language, Melanie Klein, semantics

Viewing the horizon

This paper discusses the motivation for humans to engage in education, in its widest sense, taking place within a deliberately expansive landscape; covering time periods from an ancient pre-historical past, a multiplicity of environmental settings and a range of academic disciplines. The journey through such a panorama will necessarily take a little time to justify, and will need to provide suitable signposts to make sure that those who explore the scenery can maintain a sense of where they are, have come and hope to arrive. For myself, the journey reflects the twists and turns of my changing professional and academic horizons and has its origins in a childhood fascination for the ‘natural’ world that has remained a constant throughout my life. The landscape to be explored uses broad evolutionary and ecological perspectives, while never deviating far from considering the interaction between the human and ‘non-human’ world. Other lenses have been informed by a life working in education influenced by undergraduate studies in zoology and psychology, research guided by psychoanalytic concepts and practices and an academic life that seeks to resist laser-like reductionist interpretations of how or why humans learn. The terrain to be covered encounters the evolutionary motivation for humans to construct niches, such as educational settings, as a means to reduce anxiety that has its roots in a fear of immanent extinction. Paradoxically, these niches, while providing meaning, also induce unintended disruptive consequences leading to an interminable pursuit for ‘excellent’ education.

Context: A very human education

I am aware of potential accusations related to providing what may appear as an essentialist understanding of the human condition that may appear to seek, even in a superior way, to set humans apart, from other animals and a wider ecology. Therefore, at the outset of this discussion it is important to signal that my intention is the opposite. The objective is to provide an understanding of educational settings and human learning that is intimately connected and continuous with the pre-historic and current non-human world. Any sense of difference, including superiority, is largely reliant on the perception of current human activity within our own experience of history and the time frames that provide the architecture for our lived lives. This is an account of education that although experienced ‘in our time’, has its ontology in an ancient evolutionary past.

One feature that discriminates human learning from that of other animals is the particular outcome that has led to the construction of complex social and cultural systems: including that of formal education settings. It can be observed that human education involves a form of teaching that focuses on guiding the attention of novices towards referential symbols, more often than not, mediated by verbal language exchange, distinguishes the process of learning in humans from that of *most* other animal species (Laland, 2017; Tomasello, 2014). Although considerable human learning does result from simplistic conditioned and unconditioned behaviourist response mechanisms as well as social learning, such processes I argue are unlikely to support a more complex and holistic understanding of human learning. Particularly one that accounts for the individual desire towards meaning making that is associated with the continual construction of complex socio-cultural systems.

The contention that human learning is both complex and risky is well established. Psychoanalytic thinkers including Sigmund (1925) and Anna Freud (1930) and more recently others such as Bainbridge (2015), Britzman (2003) and Hinshelwood (2009) have recognised the difficult dialogical relationship between learning and human meaning making. Although not from a psychoanalytic background, philosopher Gert Biesta (2013) also acknowledges the complexity of human learning and notes how conceptions of causality fail to consider what he has contentiously (Lewis, 2014) termed the ‘beautiful risk’ to which human learners are exposed. Broadly, these authors argue that human learning is a psychosocial process where an individual encounters an external world at a conscious and unconscious level and that it involves the individual responding to an external ‘other’ (Biesta, 2013). Additionally, it is noted that the process that distinguishes human learning from that of non-human learning is the ubiquitous role of teaching (Laland, 2017; Tomasello, 2014). Therefore, to understand why and how humans learn requires the focus to move from simplistic notions of generalizable cause and effect, to one located more directly at the level of the existential meaning making individual in relationship with an ‘other’.

The work of Stephen Frosh (1989 and 1991/2016) provides a thoughtful analysis to begin to think about what may be involved in directing our attention towards the ‘meaning making individual’. Frosh (1989) asked a deceptively difficult question, initially of psychology, ‘Why did Jack hit Jill?’ For Frosh, using the syntactic rules of human behaviour, so often preferred by psychology, could not fully account for Jack’s (or indeed Jill’s) actions. A more complete analysis requires a semantic appreciation of a particular Jack, at a particular time in a particular relationship. Bainbridge and West (2012) subsequently reframed the question to become ‘Why did Jack learn?’ and in doing so, they highlight that an understanding of human learning must consider the

importance of semantics for a particular experienced life. This paper reframes Frosh's original deceptively difficult question yet again, but this time with more ambitious intentions, to ask 'Why do humans have formal education settings?'

As a result of this shift the particularities of human experience, including teaching and learning, that have initiated and maintained the construction of formal education settings shall be explored. Within this context, two lines of enquiry provide the structure for the analysis of what it may mean to be human and to learn. The first, linked to the educational significance of comparatively rapid social and cultural evolution that has given rise to education settings that support human learning. The second requires an examination of the mechanism(s) for the transmission of social and cultural practices that have led to these comparatively rapid changes.

The first line of enquiry consists of two sections. The initial suggestion is that the evolution of genetic traits, are no longer in synchronization with the products of a more rapid anthropologically influenced socio-cultural evolution, which leads in turn to the human propensity towards continued niche construction. The second section develops the hypothesis of an evolutionary asynchronous experience leading to an 'Adaptive-lag' (Laland and Brown, 2006) in which unconscious existential anxiety may have its origins, and provides the motivation for the construction of formal educational settings. The second line of enquiry focuses on the mechanism(s) for the transmission of the social and cultural practice of education. It begins by discussing the role of verbal language to reduce existential anxiety, as well as provide the creative mechanism for the transfer, via teaching, of social and culturally significant knowledge and skills within family and wider social groups. Lastly, I will address semantic particularities by providing a psychoanalytic interpretation of language development that discusses the role of the unconscious, anxiety reduction and individual meaning making.

The conclusion proposes an admittedly rather clumsy neologism - *ecological* – which is intended to situate *pedagogical* thinking within ancestral and current *ecologies*, providing an *ecological* model of education ultimately advocating the need for a semantic approach to current educational thinking.

The evolution of education settings

Human niche construction – the genetic and socio-cultural

This discussion on the evolution of education settings begins by providing a pre-historical evolutionary exploration to consider why and how *modern* humans are engaged in world building: in particular *modern* education settings on a magnitude, at least within current historical references and perceptions of time, not yet matched by other animals. The term *modern* does not sit easy, needs confronting early on, and is potentially loaded with essentialist representations of power, control and a myopic appreciation of what it means to be human in the present world. In this paper the term *modern* is used to distinguish the present post-industrial technologised world, from a distant evolutionary pre-history and does not allude to an existing worldwide ubiquity of the *modern*. This distinction of *modern* recognises that about 80% of the current population live in what the United Nations (2011, p1) refer to as ‘less or least developed countries’. As a point of departure, the focus on the 20% of *modern* humans, their proclivity to manage, control and often damage a wide range of environments at the expense of others, exposes their unrepresentative position therefore providing the stimulus to explore why *modern* humans are engaged with such wide ranging world building including educational settings.

Human engagement in physical world making exists on a planetary and extra-planetary scale and consequently humans are now able to survive extremes of hot/cold,

wet/dry as well as spend over 400 days in space. Indeed, such is the impact of human activity on geology and ecology, that Zalasiewicz et al. (2010) now contend that we are living in an epoch known as the Anthropocene, identified by the permanent impact of modern humans through the widespread destruction of habitats, increasing concretisation and climate change. To go some way towards initiating the discussion on this domination, Tomasello (2008) contends that evolutionary pressures have given rise to human nurturing, both in the familial groups and beyond, providing the social and cultural mechanisms that enable humans to control and survive in such diverse environments. For example, infants spend more time nurtured within family groups than any other animal species and almost one fifth of the modern lifespan is spent engaging in complex formal education settings.

It will be argued that modern formal education settings represent a very particular and influential type of world building, or ‘niche construction’, which has enabled an expansive socio-cultural and technological development of the modern world. Central to this debate is the premise that it is the very process of human learning that enables continuing niche construction including that of educational settings. Yet, despite millennia of human niche construction, the education settings of humans are continually debated and forever changing. The argument to be developed proposes that, despite what is often referred to as ‘progress’, this process is also inconveniently and inherently flawed, therefore leading to subsequent and continual niche re-construction.

Berger and Luckmann’s (1966) seminal text ‘The Social Construction of Reality’ proposes a framework around which the seemingly unquenchable desire to create multiple, and diverse niches including education settings, can be thought about. Central to their thesis is the concept that humans are born into *open* worlds, while other animals are born into *closed* worlds. They argue, that apart from humans, all animals

are born into established and relatively unchanging closed worlds that are environmentally specific and for which the process of evolution has adapted them. Consequently, learning in a ‘closed’ world involves acquiring the appropriate behaviours for this environment. In contrast, humans must become involved in world building or niche construction, as they are born ‘unfinished’ into an open world for which they are not yet adapted.

If the world inhabited by humans was a closed one: then the continual and increasingly complex niche construction, including education settings that characterise the Anthropocene would not be necessary. Berger and Luckmann regard this situation as a restless dialectic relationship where the human impulse for continual physical and psychological niche construction serves only to disrupt the niches already constructed. As a result (at least from an industrialised ‘modern’ world perspective), humans, unlike other animals who are able to live in equilibrium within their species-specific ecological niche, are destined to always be out of synchronization with their constructions and engaged in an interminable process of niche construction.

The inquiry into why human niche construction has evolved to so completely dominate the planet, for good or bad, cannot be answered by standard evolutionary theory linked to genetic causality and relatively stable adaptive environments. Standard evolutionary theory is unable to support both the comparatively rapid emergence of such complex ever changing niches and, associated socio-cultural practices, along with niche constructions that paradoxically harm planetary ecology. As an alternative ‘niche construction theory’ (Odling-Smee, Laland, and Feldman, 2003) suggests evolutionary drive is not limited to a genetic survival of the fittest but additionally to a more subtle involvement of social and cultural forces (see also and Flynn, Laland, Kendal and Kendal, 2013). Hence, socio/cultural practices are communicated and passed on

through generations far quicker than standard evolutionary genome modification (Howard-Jones, 2014). A process of trait-led evolution Fogarty, Strimling and Laland (2011) refer to as *cumulative culture*, in which advantageous behaviours set up positive feedback mechanisms, swiftly appropriated within populations.

Cumulative culture within Odling-Smee et al's., (2003) niche construction theory can better explain the dramatic and widespread influence of human social and cultural practices and offers additional insight into a dialogical evolution of the particular human niches that are formal education settings. Niche construction theory recognises that organisms and the genes they carry are influenced by the standard pressures of selection, but also that the organism can have a direct impact on the environment from which selection pressure can emanate. Laland et al., (2014) argue for an extended evolutionary synthesis (EES) that positions niches as causal influences on evolution and not simply an outcome of gene fitness. The evolutionary focus therefore shifts from glacial genetically influenced morphological change, to comparatively rapid social and cultural changes.

The construction of education settings will therefore influence human behaviour, including learning, while concomitantly human learning influences behaviour and further niche construction. This phenomenon leads towards a scrutiny of the function of educational settings, the subsequent role of teaching to support human learning and the impact of niche construction. Importantly there are many indications that the education setting and experience of learning are constitutive of and in a dynamic relationship between each other. It is within this context that the next section begins to employ a semantic lens to provide an understanding of the experience of living in and constructing an 'open-world' and to interrogate the impact this may have on human learning and therefore niche construction.

Adaptive-lag and separation anxiety

The motive for niche construction can be thought of as an attempt to ameliorate the impact of a hypothetical gap between evolutionary influenced genetics and socio-cultural practices, what Laland and Brown (2006) refer to as an adaptive-lag. Yet, paradoxically, the process of niche construction continually prevents humans from reducing the genetic-cultural gap, therefore augmenting the existing adaptive-lag. Although counterintuitive, the effect and significance of an adaptive-lag can more easily be thought about when considering the possibility that the gap between cultural and genetic evolution does not exist. Within an evolutionary context that assumes common ancestry and a continuous connection between closely related species, Howard-Jones (2014) observes the morphology of human brains are unremarkable and conveys many similarities to their closest relatives. Therefore, there is the expectation that human behaviour should match that of the great apes, leading to very little permanent impact on the wider physical environment or other species and that any rate of change, if it were to occur, would be equally as slow. Li & Kanazawa (2016) further claim that the human brain is adapted for ancestral environments and therefore, not well matched to deal with modern ‘entities’. This resulting adaptive-lag and the gap between evolutionary influenced genetic capacities and the psychological and physical products of socio-cultural constructions provides an uneasy setting for modern human functioning. An early paper by Niko Tinbergen (1972) referred to this unease as a problem of ‘adaptedness’ where the anthropogenic effect on the environment has increased the level of adjustability required for an organism to ‘fit’ their habitat (see figure 1 near here).

Many other ecological ‘gaps’ are represented in literature along with their associated effect on humans. Examples include The Savannah Principle (Kanazawa, 2004), Evolutionary Mis-match Hypothesis (Hagen and Hammerstein, 2006), an ‘evolutionary legacy’ (Burnham and Johnson, 2005) and the more evocative ‘untenable violation’ (Glendinning, 1995). Despite their different contexts, each of these ‘gaps’ provides another framework in which to consider the central motif of a disjuncture between the impact of evolution at a genetic and socio-cultural level, the outcome of which usually provides notions of deficit, or something missing.

There is therefore the potential that the source for human unhappiness and anxiety is rooted within the adaptive-lag caused by an evolutionary mis-match between ancestral genetic and modern cultural capacities. For Li and Kanazawa (2016) this modern/ancestral gap represents a ‘fitness failure’ that is the source of human unhappiness. Glendinning’s (1995) ‘untenable violation’ recognises how modern human living has become so divorced from ancestral savannah-esque experiences that deep psychological problems are routed in an unconscious desire of an existential search for a meaningful life. Along with Buss (2000) she suggests that the rise in anxiety and depression, increased reliance and addiction to alcohol and other drugs are all driven by an unconscious desire to annihilate existential angst rooted in the current lived experience of adaptive-lag. While Tinbergen (1972) argued that such a situation would ultimately threaten the survival of humans.

To return to niche construction, Laland and Brown (2006) reason that the motivation for human-world building is to buffer the impact of ‘adaptive-lag’. The proposal provided here is that educational niches can also be viewed as human constructions, contingent on and motivated by, reducing the existential anxiety rooted deep within the genetic/cultural gap. A further dilemma is offered by Berger (1967) by

acknowledging that the products of human world making possess their own internal logic that further confounds human functioning. He provides the example of a plough that will only work if human actions are now molded to the logic of the plough, hence the making of a plough has the impact of making humans into ‘ploughers’. Yet, the act of ploughing will have unintended consequences on farming activity, family life and the ecology of the soil. All of which upsets the existing equilibrium, if it existed, as in a closed world, and demands further adjustments (Tinbergen, 1972) and continued world making.

Hence, any attempt to finalise the ‘human project’ – an equivalent of a species adapted to a closed world - is fated by an evolutionary and culturally constructed adaptive-lag, in conjunction with the confounding internal logic of human made products, to fail. According to Tinbergen (1972) this phenomenon was initiated in the evolutionary past and has continued exponentially to the present day. This tension of the biological organism being in, but not in equilibrium with the environment is an ever-present manifestation of the anxiety associated with the lived experience of adaptive-lag. The next line of enquiry discusses the mechanism(s) for the transmission of the social and cultural practice that have led to the development of education settings and the role that language and subsequently teaching plays in reducing adaptive-lag anxiety.

Mechanism(s) for the transmission of the social and cultural practice of education

Managing adaptive-lag anxiety and the role of language

Up until about the age of one-year-old, human and great ape developmental cognitive processes proceed along similar trajectories, significant differences begin to emerge after this time (Tomasello, 2014). For example in gaze following, manipulative

communication, group action, and social learning: all of which ultimately lead to the development of a 'social cognition' providing the foundations for very complex social and cultural structures. A question still remains around the evolutionary pressures that may have occurred to provide the selective/fitness advantage for a distinctive form of human social cognition, which accompanies complex and continually changing socio-cultural systems. A number of authors (for example, Laland and Brown, 2006; Kendal, 2011 and Tomasello, 2008) suggest that environmental changes in food supplies and competition from other species provided the selective pressure that favoured the collaborative behaviours necessary for social cooperation and in particular, a 'shared intentionality'. This paper asserts that the development of verbal language has the potential to support communication of a shared intentionality, leading to the collaborative behaviours required between individuals, kinship groups, and beyond. In addition, while having at its roots the alleviation of potentially destructive adaptive-lag anxiety, that language is the precursor for the development of human educational niches and the practice of teaching (Laland, 2017).

Csibra and Gergely (2011) propose that humans are unique in providing a 'natural pedagogy' niche, enabling, from a very young age, the rapid transmission of cultural knowledge and behaviours. They argue that the ability of human infants, or ancestral hominins, to participate in cultural behaviours requires participation in collective cognitive representations supporting understanding the intentions of others. Natural pedagogy involves social learning *by* communication, distinguishing this from other non-human animal social learning that is independent of communication and was initially thought to be pre-verbal (Csibra and Gergely, 2011) relying on ostensive signals (eg eye gaze) and declarative gestures (eg pointing).

Whereas, Mattos and Hinzen (2015) suggest that ostensive signals and declarative gestures do rely on features of verbal language, therefore steering the discussion towards the role language may have in the functioning of natural pedagogy. They note that infants as young as ten months are able to assign first, second and third person roles setting up a shared deictic space, leading to the conclusion that natural pedagogy is an inherent feature of language and has provided a mechanism for very rapid cultural transmission, including niche construction. Laland (2017) further states that a particular type of teaching, which focuses on guiding the attention of novices towards referential symbols has co-evolved with language. Therefore the appropriation of language in teaching can be suggested to have evolved as it enhances the efficiency of cultural transmission and contributes towards a cumulative culture. Significantly, there are very few other examples of teaching in the animal kingdom (some ants, bees, meerkats and cats, see Fogarty et al., 2011) therefore the widespread impact of humans on the planet, can in part be accounted for by the evolution of a natural pedagogy supported by teachers using verbal language.

The discussion on the role of language in niche and, ultimately education setting construction, therefore has two elements; one linked to motivational origins (why) and the other to the evolutionary influenced cultural processes supporting niche construction (how). The why and how do not represent two opposing binaries but rather a dialectic relationship of continuous interaction, which recognise the tensions inherent in the relationship between self and external world, such as Maturana and Varela's (1987) conceptions of 'Structural Coupling' and 'Languaging'. Structural Coupling refers to the adaptive relationship through which living entities inhabit a certain medium, or system, that extends beyond traditional aspects of ecology by including the physical, biological, social and political. Living beings are motivated to maintain

‘sufficient levels of equilibrium in their own internal states to remain alive’ (Del Negro, 2017, p22), as a consequence living beings impact on structures and structures in turn impact on living beings (see also Berger and Luckmann, 1966). This defines what it means to be alive continuing up to the point of death, as a result of which the coupling ends. Languageing, for Maturana and Varela (1987), provides the mechanism for structured interaction between physical (living) syntactic, the symbolic (linguistic) semantic worlds, which can be more than verbal language, including music, dance or performance. The function for languageing is to facilitate communication and reciprocation, coordinating humans with themselves and one another and to make ‘it possible to say something about living, or rather about one’s relationship with living’ (Del Negro, 2017, p23). Therefore, adaptive-lag, language use and niche construction are intimately connected.

Stephen Frosh’s work distinguishing between syntactic and semantic understanding of human behaviour (1991/2016) positions the causality of language development within the experience of anxiety. What is original about Frosh’s exploration of the syntax/semantic nexus is his application of psychoanalytic theory alongside more established psychological theoretical constructs. The space here does not allow full justice to Frosh’s thesis but a summary is sufficient to highlight the main points of his argument. Frosh contrasts psychological and psychoanalytic explanations of language development and notes that psychology tends to provide an external/environmental rationale for acquisition and the learning of syntactic rules.

However, when considered from the position of a particular experiencing individual, psychoanalysis has a focus on emotion and unconscious defences. This approach represents the semantic and appreciates the role the unconscious and affective domains can play in providing a space for new meanings to emerge and be used by

individuals. What the acquisition of language made available for the ancient hominin ancestors, and still makes available for the child, is a system of symbols (words) and syntactic codes (grammar), used to bring to conscious awareness, unconscious emotions and desires. The function of language therefore, is not ‘a transparent vehicle for the articulation of rational consciousness’ (Frosh, 2016 p.8) from one human to another (parent/child, or teacher/pupil) but to allow the creation of new, individually validated, meanings to emerge.

The intricate link between language, meaning making and intentionality is also recognized by Flynn et al., (2013), Mattos and Hinzen (2015) and Tomasello (2008) and yet, beyond notions of evolutionary selection pressures, they offer no mechanism as to how shared intentionality: and consequently, language evolution and development is initiated. Tomasello makes his position clear:

... for reasons we do not know, at some point in human evolution individuals who could engage with one another collaboratively with joint intentions, joint attention, and cooperative motives were at an advantage. (2008, p8)

For Frosh, language is an experiential and constructionist epiphenomenon of meaning making, which he claims contrasts to more psychologically derived genetic, acquisitional, functional and social processes. While the causal anxieties for Tomasello and others were external evolutionary survival pressures, Frosh thought that anxiety, located in very early individual fearful experiences of survival, provided the conditions for language acquisition and development. There are connections to Maturana’s hypothesis that living things are in a continual internal/external ‘coupling’ to bring about sufficient internal equilibrium to support life. The focus on the individual struggle to achieve a sustainable internal equilibrium and manage the experience of adaptive-lag anxiety leads to a consideration of the role of psychoanalytic drives and defences in

educational niche construction. Importantly, the next section will draw on Frosh's work to argue that a semantic perspective supported by psychoanalytic assumptions of a dynamic unconsciousness enhances understandings of 'what it might mean to be human and learn'.

Anxiety, language and psychoanalysis

Just as embryology provides an insight into a distant evolutionary past, so it is argued here, that a study of very early infant behaviour may also provide an archive and understanding of ancient behaviours: particularly, those behaviours influenced by the experience of adaptive-lag. For although leaving no fossil record, the very early encounter between an infant and their external world, is likely to contain remnants of pre-historical experiences. The work of Melanie Klein is considered as she proposed the experiences in the first year of life to be influenced by anxiety associated with a fear of survival related to the death instinct. From Melanie Klein's (1931/1985) psychoanalytic perspective early anxieties and defences arise as a result of the death drive, leading to the infant experiencing hunger and frustration as a persecutory fear bound up in an external world that can threaten their survival. I offer the novel conjecture that this early unconscious primitive fear has its ontology in the uncomfortable anxiety inherent in the lived experience of adaptive-lag. Drawing on Maturana and Varela's (1987) notion of Structural Coupling, organisms are motivated to interact with an external world to maintain the equilibrium of their own internal state. In this context, I argue that Klein's description of early persecutory anxiety represents the existential fear inherent in the experience of not being able to exist in a safe 'Structurally Coupled' relationship with the external world. Indeed, this is the prevalent state for humans living in an open world.

Rather than trying to understand the complexity of their external world in an attempt to reduce anxiety, Klein argues that the young infant mind endeavors to order experience by separating the world into good and bad objects. This response is referred to as the paranoid-schizoid position, dominated by thinking split into destructive (aggressive) selfish impulses directed at threatening bad objects, alongside good objects that are experienced as loving and gratifying. The infants' individual selfish impulse represents a primitive attempt for survival and is at odds with the more mature need for a shared intentionality that will support complex social and cultural systems. I suggest that the paranoid-schizoid position experienced by very young infants can be considered similar to the pre-historical experience of early hominins encountering adaptive-lag. The experience for both is one of not being in equilibrium with their internal and external worlds

Fortunately, Klein also provides a more mature model of the mind: one that requires verbal language that facilitates the development of human meaning making and a mechanism to engage in social and cultural world-making activities. This state is the depressive position, which interestingly begins to emerge from six months old and may offer some insight as to why the developmental trajectory of great apes and humans begins to separate around the age of one year. The depressive position is characterized by a move away from 'split' thinking towards an acknowledgement of the complexity of 'reality', including the needs of others and the potential negative impact of their own envy and aggression. Thus, the largely unconscious response to the experience of existential threat is a developmental shift from; an omnipotent and selfish desire to control others, towards more complex thinking that can consider the needs of multiple others.

This developmental shift also reflects the evolutionary trend identified by Fogarty et al., (2011), Laland (2017) and Tomasello (2014) representing a move towards a social cognition associated with a shared intentionality that would allow for complex niche construction including educational settings. If we return to Frosh (1989, 1991/2016) the debate to be developed will show that the motive to move from paranoid-schizoid to the depressive position, equally, to move from pre-historic hominin behaviours to modern complex collaborative ones, is a particular response to experiencing a perceived threat to survival. Such a goal is achieved through the use of verbal language that facilitates both inter and intrapersonal communication.

The role of verbal language to support both intra and interpersonal communication can be seen from Hannah Segal's (1957) work which draws on Klein's (1930) clinical case study of Dick: a four-year old uncommunicative, possibly autistic boy and argues that the exchange of words between Klein and Dick helps him to negotiate the transition from paranoid-schizoid to depressive position and become more communicative. The success of the therapeutic encounter is provided as evidence confirming Klein's understanding that the function of symbol formation, typically towards an external object, is the result of experiencing anxiety is to make persecutory feelings and objects more accessible and therefore more tolerable. Significantly, Segal notes from her own clinical work and the case study of Dick, that the use of verbal symbols (words) has a powerful impact on transforming paranoid-schizoid thinking to the depressive position. The efficacy of verbal language is linked to the externally received spoken word that is provided as a symbolic representation of a particular individual experience. The receiver (Dick) now has a symbol through which their experience can be thought about in relation to the external world alongside his own internal experience. In Klein's example, Dick's moves from primitive paranoid-

schizoid thinking towards the mature depressive position, is correlated to increased communication and he begins to repeat and play with words.

To re-frame Segal and Klein: the uncomfortable and potentially life threatening external and internal experience of the lack of food can become manageable when it is represented symbolically by the word – hungry. When this example is considered from a paranoid-schizoid perspective it is possible (despite the obvious pre-lingual context) to imagine the infant ‘splitting’ the feeling of hunger by imagining that they are good and deserve to be fed, while the mother’s apparent withholding of food is bad and punishing. The use of the word ‘hungry’ by the mother provides a symbol that can communicate her understanding of the infant’s uncomfortable internal experience. Likewise, in the future the infant can use the word hunger to communicate their internal experience to the mother. Consequently, the use of language represents a teaching moment where the infant is guided towards a more realistic depressive position that can support thinking and meaning making, which serves to repair and maintain the relationship between the mother and the infant.

Segal regards the use of symbolism as a creative act that reduces anxiety and is of central importance when dealing with past and present conflicts as these can now be processed from within a more mature developmental position. For Frosh (1991/2016):

Language learning is not just a process of learning the names of external objects and for things that happen inside one’s head; it is also a process of giving and receiving, of discovering meaning and becoming powerful and safe. (p.10)

Therefore, in the context of the pre-historical hominin experiencing the anxiety associated with the threat of adaptive-lag, it can be argued that the evolution of language has enabled this threat to be thought about at an individual and socio-cultural level. It has made possible creative thinking that can act on an open world and has led

to modern human domination that we could argue is powerful and safe (although we could now contend that such is the effect of the internal logic of human world making, of ‘progress’, that humans are now at risk of extinction (Tinbergen, 1972)). Equally, I argue that the insight from early infant behaviour and its extrapolation into a distant past provides a novel hypothesis for the development of educational niches that involve teachers and learners. Maintaining this wide evolutionary and ecological stance Frosh’s claim, that language supports meaning making and becoming ‘powerful and safe’ allows further consideration of how parents/teachers influence the interaction of the learners with the external world, including the structures and processes of education.

Formal education therefore, has evolved as mechanism dealing with the anxiety caused by the adaptive-lag experience of not fitting in, or not being able to maintain sufficient Structural Coupling to support internal equilibrium. The ability of humans to survive in a threatening open world has been reliant on shared intentionality that has developed from the linguistic roots inherent within a natural pedagogy. Thus, leading to the social and cultural construction of physical and psychological life-supporting niches that include formal education settings. The principal role of which is to support the exploration of human learning spaces, as places where particular teachers interact powerfully and safely with particular learners to enable them to encounter and respond to a consistently threatening and risky open world.

Synthesis: Education as semantic communication

Psychology, sociology and politics have not been rejected, since both syntactic (psychological) and semantic psychoanalytic constructs are required to understand what motivates human meaning making and consequently, human behaviour. Theories of cognition, neuroscience or the motifs of social psychology will not be able to answer

Bainbridge and West's (2012) re-framing of Frosh's deceptively difficult question - 'Why a particular Jack, at a particular time, in a particular relationship did or did not learn?' Let alone the more expansive question 'Why do humans have formal education settings?' This paper presents a complex and wide-ranging novel synthesis of the relationship between the human mind, ecology, evolution, language and education, in its widest sense. Any synthesis will therefore be required to move between a number of theoretical domains. A logical starting point would be to delve back into an ancient past and to then travel forward to the present day while considering how human learning and educational processes may have emerged and been influenced by their relationship with the external world and unconscious anxieties.

A distinctive feature of modern human functioning is the prevalence of formal education settings supported by the use of symbolic verbal language, notably heightened in the role of the teacher, to promote shared intentionality and encourage continued construction of life supporting niches. Although these cannot be regarded as expansive ecological niches, it is fair to regard these as culturally and evolutionary important niches. Very few animal species engage in educative processes that could be regarded as 'teaching' (Fogarty et al., 2011; Laland, 2017; Tomasello, 2014) and most other higher animal learning that takes place in social groups is seldom beyond the level of observation and imitation of others (Boyd and Richerson, 2005). Formal human learning has the distinction of taking up almost one fifth of the lifespan, while informal learning can be regarded as lifelong – that is that it begins in the womb (Hepper, 1996) and continues until Structural Coupling fails at the end of life (Maturana and Varela, 1987). It is the impact of these more formal education niches that informs the final part of this debate.

That humans spend a disproportionate amount of their lifespan learning within informal family groups and, that they have developed highly structured and complex formal educational settings, can be considered as evidence from a distant pre-history to the present day for the distinctiveness of human learning and an observation of the impact of the adaptive-lag. Within this context it can be proposed that the dialogical relationship between human learning and the external environment is both the product and cause of the gap between the genetic and the cultural. Consequently, 'being human' is not static or fixed but is a product of learning from others – parents/teachers – in formal and informal educational settings while also, paradoxically being causal in the continuous production and development of educational settings (and other niches).

Therefore, the inexperienced infant/adolescent must first spend a prolonged period of time within the family learning to develop socially and culturally acceptable behaviours, before entering formal educational settings to learn how to be part of the interminable procession of human world making. Accordingly, when considering the role of educational settings and how these provide spaces to enhance human learning it will be necessary to reflect on the dilemma as to how such spaces provide opportunities for individual meaning making. It is also necessary to respond to the confounding internal logic of the products of human world-making and the associated anxiety of never really being adapted to the environment currently inhabited. When viewed through this lens, an understanding of the distinctive nature of human learning begins to become clear.

Just like the extant great apes, it is a fair assumption that the common ancestors of human beings lived in what Berger (1967) referred to as a closed-world, in which evolution had adapted the species to 'fit'. During these conditions learning would have involved simple syntactic rules, including basic stimulus-response and social imitation

mechanisms, now observable in a wide range of animal species. However, due to the occurrence of a significant ecological event(s) (Tomasello, 2008), along with the associated anxiety related to the lived experience of not being adapted; traits that favoured communication based on verbal language, led to selection pressures supporting humans adopting more complex and ultimately increasingly cooperative social structures. A transition that marks the beginning of humans dwelling within an open-world to be acted on and modified, made possible by the ‘newly’ acquired human ability of social cognition supporting shared intentionality. Subsequently, to facilitate the continued evolution of shared intentionality, the rich experiential and semantic detail inherent within verbal language, emerged co-determinedly, alongside the socially and culturally important role of teaching (Laland, 2017).

The hypothesis that within closely related kinship groups early structures of ‘education’ began to emerge alongside the vital role of language contributing to the communication of meaning between individuals. The shift from a syntactic to semantic foundation of human learning is therefore responsible for the rapid evolution and subsequent development of human social, cultural, psychological and physical structures. A repercussion of which was how, as the world being constructed became increasingly different from the ancestral experience, the evolution of genetically endowed neurological systems began to lag behind the escalation of complex human social and cultural structures. Therefore, leading to an ancestral-lag that, due to the confounding internal logic of products (Berger, 1967) is experienced as a continual cycle of world-making coupled with the unconscious existential anxiety associated with a search for meaning. It is within this context that humans have continued to developed complex formal educational settings to compensate for the ever-changing and

interminable process of human world making. Education is therefore both the result of and cause of anxiety.

The future: an *ecol-agogical* approach to education

I offer the neologism of an *ecol-agogy* of human education, where responses to ancestral and current *ecol-ogy* provide the origins of modern *ped-agogy*. It is here that genetically and culturally derived cumulative culture, grounded within relationships, use verbal language to support shared intentionality and the world building of education places, process and structures. Because of adaptive-lag, modern human learning is ruptured with anxiety, resulting in the continued hopeful construction of physical and psychological niches, including formal education settings. The internal logic of which will subsequently continue to confound human functioning. Thus resulting in seductive defenses that contribute to a micro and macro avoidance of the anxiety and risk that education represents (Bainbridge, Gaitanidis and Houlst, 2017). For example, learners can be reluctant to engage with intellectual challenge, while policy makers often seek to offer conceptions of the curriculum, pedagogy and assessment that avoid the complex nature of human teaching and learning.

Gaitanidis (2014) regards such a response as promoting *Halbbildung* – a half-education, a pseudo-education that distracts from the challenge supplied by education and instead supports conformity at the expense of transformation. Education emerges from the learners' motivation to manage anxiety while also causing the learner (and teacher) to be anxious. If this paper is to have recommendations then the first and most compelling one must be to encourage teachers and learners to accept anxiety as a vital constituent of the process of education. To do so is to accept the 'beautiful risk' that education offers (Biesta, 2013), as an education without risk and anxiety is not an

education at all. At best, anxiety free education reflects Frosh's (2016) contention that a psychological understanding of language is devoid of individual meaning: becoming 'a transparent vehicle for the articulation of rational consciousness' (p8) and not a niche where the individual can create new powerful and safe meanings.

It is recommended that teachers are encouraged to avoid the temptation of offering easily achieved risk-free goals, instead, noting how accepting anxiety in educational contexts can propitiate more satisfying educational experiences for learners and teachers. Just as learners need to be aware how, Shoshana Felman's (1987) reference to Lacan's 'passion for ignorance' and the desire to submit to the 'line of least resistance', will also lead to an unproductive education experience that promotes conformity and not transformation. I do not wish to promote education settings overwhelmed by anxiety but simply ask learners and teachers to reflect on the semantics of what their anxiety might be telling them. For example, a young child might be fearful of rejecting new ideas if these confront existing familial ways of understanding, adolescents may be cautious of displaying their superior intelligence fearful of envious attacks from their peers, while teachers and parents need to be mindful of responding to their own narcissism and not the needs of learners.

Viewed across the lifespan, early education involves the (m)other/infant dyad, where verbal language becomes the main communication conduit, providing anxiety containing creative symbols that can be utilized to construct meaning from individual experience. During infant development, symbolic language plays an increasingly important role in recruiting the individual into historically determined social and cultural contexts and roles. As the complexity of these contexts increases, so the complexity of the education setting must evolve to include experts – teachers – whose societal role is to bring into the presence of the learner new knowledge and skills.

Therefore, the consideration of human learning within the context of niche construction would recommend that the role of the teacher is to make professional ‘situated judgments’ about ‘what is educationally desirable’ (Biesta, 2012 p. 40).

Finally, it is noted that the construction of educational niches and their products are never completed, they will only serve to further confound human functioning, and continue to give rise to unconscious existential anxiety. The human world is therefore constantly open and therefore readily modified by continual human activity resulting in human learning, as a continual and ever-changing project and, an education that is never stable. Consequently, it is folly to promote notions of permanent and often sequential learning goals, rather than accepting that humans are involved in learning and non-learning and that education is sufficiently complex as to warrant models of understanding informed by semantic, as well as, syntactic knowledge. There is a sense of fantasy about being able to fully understand or control human teaching and learning, it is noted that Freud (1925) called education an ‘impossible profession’. His rationale was that it is impossible within education, with any confidence, to identify what ‘intervention’ leads to what outcome. If we end by returning to the deceptively difficult question, ‘Why Jack did or did not learn’? The answer can be surmised from the syntax of psychology or sociological structures but a more complete understanding is more likely to be found by considering the interaction between a *particular* teacher with a *particular* Jack, within a *particular* context. Education is not so much about adaptation but rather, life and a continual search for existential meaning.

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