

# How and Why Formal Education Originated in the Emergence of Civilization

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## Abstract

The purpose of this study is to argue that formal education had multiple, independent origins in the emergence of ancient civilizations, for universally the same reasons. It uses socio-biological literature to outline the nature of human societies; ethnographic literature to show that no systems of formal education existed in small-scale hunter-gatherer communities; and evolutionary psychological literature, specifically the cognitive niche theory of human evolution, and domain-specific brain module theories, to show how children learn. The second section details the organizational changes that occurred in the emergence of civilization and why this required the development of formal institutions of education. The study uses four ancient civilizations—Mesopotamia, Egypt, China, and Mesoamerica—to provide evidence for the paper’s argument. The study offers a theory for the relationship between the structural organization of human societies and the implications this has for social learning. Overall, it provides a working theory for how and why formal education first emerged in human societies, due to the administrative tools needed to keep a state-level society functioning.

**Keywords:** formal education, hunter-gatherers, societal organization, teaching, literacy, ancient civilizations, social learning

## 1. Introduction

For most of human history, people lived in small hunter-gatherer societies. The structure of these societies, and the environment they inhabited, had great implications for how children learned to become effective members of their society. Children in all societies have the ability to learn large amounts of skills and cultural knowledge through observation, imitation, socialization, and play. As the ethnographic literature used in this study will show, no systems of formal education, or even direct instructional guidance was necessary to transmit these important skills and knowledge to the next generation. Formal education had its origins in the emergence of state-societies starting more than 5000 years ago.

This paper will answer how and why formal education first emerged in state-societies. To do this, it will begin with an account of how children learn, and why formal education was not needed in small-scale communities such as hunter-gatherer societies. Next, this study will detail the structural and organizational changes that occurred in the transition from small-scale hunter-gatherer societies to large, complex state-societies. In addition, evidence from four ancient civilizations will serve as case studies for the emergence of formal education. The final section will review modern psychological evidence for why direct instructional guidance is necessary to learn literacy, numeracy, and scientific concepts. In the conclusion, some implications this study has for our modern understanding of formal education.

## 2. The Nature of Social Learning

Learning and development are a common feature of life, yet education is strictly a human phenomenon. Societies are rooted in human nature (Chapais, 2008; Moffett, 2013, 2019; Wilson, 2012), and it is impossible to conceive of an education that is not social in nature. The key stages of learning and development that humans progress through, from birth to mature adult, are dependent on development within a society. The society shapes all stages of human experience and education is a result of human’s social evolution and adaptation.

The concept of a niche in evolutionary models provides a coherent explanation of human’s complex specializations and adaptations. Tooby and DeVore (1987) have proposed the term “cognitive niche” as an

evolutionary model for human's "zoological distinctiveness." They explained that "humans are characterized by a remarkable expansion in intelligence, consciousness (however defined), complex learning, and culture transmission mechanisms—all interpenetrated by a sophisticated coevolved motivational system" (p. 235). The nature of education in human societies, and the reason it is strictly a human phenomenon, is rooted in these evolutionary distinctions.

Other animals show impressive capabilities for extended periods of learning and future planning (de Waal, 2016; Mulcahy & Call, 2006), but semantically, it is useful to have a concept that delineates the unique cognitive capacities of human beings. Education, therefore, is the process of social learning, and skills and knowledge attainment, that human children acquire to become competent members of their society. If education is strictly a human phenomenon, then education has its origins in the cognitive evolution of our species. The cognitive niche predicts that the success of anyone member in their society is dependent upon this education. Following evidence from the ethnographic literature, this study argues that not all societies use teaching or formal education. So, when did human societies first utilize formal education to transmit skills and knowledge?

For most of human history, people lived in small hunter-gatherer societies which consisted, on average, of twenty-five to thirty individuals of several nuclear kinships (Lee, 1968). A band of individuals was part of a larger band-society, which ranged from less than one-hundred, up to two-thousand individuals. Contemporary hunter-gatherer societies serve as a useful model for how our Paleolithic ancestors lived, though there are limitations to this comparison (Renfrew, 2007, p. 119). The usefulness in comparison lies in the size, organization, and dynamics of the group (Karl, 1989), and the similarities across culturally-distinct groups.

What is common across all human social organization is the phenomena of ingroup/outgroup distinctions, and fission-fusion patterns of movement. In addition to these social phenomena, hundreds of human universals have been identified (Brown, 2004), as well as little to no genetic diversity between different human populations (Cosmides, Tooby, & Kurzban, 2003, p. 173). It is in this common nature that human societies have been able to function, in various ecological settings, with as few members as a hunter-gatherer band, or scaled up to societies comprised of millions of individuals, all sharing a common identity. Individual recognition of each member is not necessary (Moffett, 2019, p. 79, 92), but the recognition of markers of identity, such as language, dress, gestures, storytelling, and permissible social behavior, is vital.

The society frames all human activity within the opportunities and limitations it provides. From birth, infants develop a strong sense of membership to their society, including clear distinctions from other groups, a social phenomenon labeled ingroup and outgroup. Human beings have innate needs for inclusion within their group, as well as clear distinctions from foreign groups (Leonardelli, Pickett, & Brewer, 2010; Brewer, 1991, 2007). All humans have a fundamental motivation to belong, form social attachments, resist losing these social attachments, and this desire shapes our cognition by producing positive and negative emotions according to changes in bonds (Baumeister & Leary, 1995, p. 520). "Subjective Well Being" has been shown to be connected, not just to personal need fulfillment, but also the fulfillment of societal needs (Tay & Diener, 2011, p. 363).

Brewer (2007), and her colleagues (Leonardelli et al., 2010) have developed the theory of "optimal distinctiveness" to explain social identity, social cognition, and intergroup relations. The optimal distinctiveness theory states that our sense of security is maximized from ingroup/outgroup distinctions (Brewer, 2007 p. 735). Others have found that these ingroup preferences develop early and are important for survival in social species (Dunham, Baron, & Banaji, 2008, p. 252). One of the strongest social markers for ingroup/outgroup distinctions is language. For example, a series of experiments provided evidence that infants develop an early social preference for members of one's native language (Kinzler, Dupoux, & Spelke, 2007). Ingroup/outgroup distinctions, whether they are language and dress in humans, or chemical scents in ants, are a common evolutionary survival strategy in many animal societies. The ingroup/outgroup phenomenon is further well-demonstrated in those hunter-gatherer societies whose name for their own group, roughly translates to "human" (i.e., Hadza, Yanomami, Ainu).

Hunter-gatherer bands are part of a larger band society dispersed across their territory. Members of one band were free to split with one group and join another in a pattern of movement called fission-fusion. Fission-fusion allows social animals the "benefit of living in larger communities whilst avoiding many of the associated costs," as well as "a means of ensuring that group size is optimal at any given time" (Grove, Pearce, & Dunbar, 2012, pp. 191–192). Individuals had the option to form temporary hunting or foraging groups, and the freedom to cultivate friendships or avoid conflicts within the band society. Fission-fusion is not a product of cooperation, rather cooperation is a feature of the ingroup/outgroup, fission-fusion nature of human societies. These characteristics are present in all contemporary hunter-gatherer societies, and they are the reasons why human societies can scale

up to millions of individuals. The scale of human societies has implications for how day-to-day social interactions occur. Much anthropological work has focused on the nature of equality within small-scale societies.

James Woodburn (1982) labeled small-scale societies that immediately consume resources as egalitarian. This he contrasted with the delayed-return systems common to agricultural and state-level societies. In small-scale societies, the fission-fusion pattern of movement allowed for a “Fluidity of local grouping and spatial mobility...reinforced by a set of distinctive egalitarian practices which disengage people from property, inhibit not only political change but any form of intensification of the economy” (Woodburn, 1982, p. 431, 447). Marlowe (2005) argued that the forager diet, gained from widely dispersed food sources, explains the egalitarian social organization of small-scale societies. Others have argued that the nature of small-scale social organization favors suppressing inclinations towards dominance-based hierarchies (von Rueden, 2020, p. 169) through the performance of counter measures (Erdal & Whiten, 1994, p. 177). The demand for fair distribution of resources and the suppression of political leadership common in chiefdoms and state-level societies, seems to be a social phenomenon of nomadic small-scale social organization.

In all human societies, people show the same basic aptitudes for communication, tool use, cooperation, processing food, protecting each other from predators, raising children, and learning. The variations in ecological conditions shape the nuances and cultural differences that emerge in each particular society’s history. Universally, children must learn the identity markers and relevant knowledge to become mature, contributive members of their society. This social learning is critical for survival and reproduction (Gray, 2011, p. 28). From a young age, children’s work and play among mixed-aged groups can affect their reputation within the society; a reputation which can persist into adulthood (Blurton-Jones, 2005, p. 108). Childhood is an important time in human lives, where the trajectory of skills and knowledge acquisition has great importance for their futures.

A unique feature of human growth and development is the length of childhood (Leigh, 2001, p. 223). Laird (1967) used a mathematical model to compare human growth to rhesus monkeys and chimpanzees, and found two stages of growth in the latter, while finding three in the former. This extended period of childhood dependency provides time for brain development, observing and developing technical skills such as tool making and food processing. It is also time for socialization, play, and learning complex social roles and cultural norms. In filling the cognitive niche, humans have developed intelligent ways of exploiting other plants and animal species, but these skills and knowledge take time to acquire. Adults must provide for children while they acquire these abilities. To explain the distinctive features of a long-life span and brain size, Kaplan and Robson (2002) created a model that considered the simultaneous action of natural selection on brain size and longevity. Their data shows that human calorie production is negative until the age of twenty, and does not peak until the age of forty-five, “reflecting the payoff of long dependency” (p. 10224). For an example of this, Walker, Hill, Kaplan, and McMillan (2002) studied Ache hunters of Eastern Paraguay, who rely on hunting for 80% of their diet, and found that successful hunting techniques required intelligence and a period of learning that peaked later in life. A recent meta-ethnic review found similar conclusions (Lew-Levy et al., 2017, p. 387).

Peter Gray (2011) has proposed a theory of “educative instincts” to explain how natural selection promoted children’s proclivities for learning social and technical skills. He surveyed the ethnographic literature and found that in every hunter-gatherer society, children had to learn an enormous amount, adults did not direct children’s learning, children acquired the skills of their culture by playing at culturally valued activities, and this play occurred in age-mixed groups (Gray, 2011, pp. 30–32). According to Gray’s theory, “educative instincts have much more to do with learning than with teaching (p. 29).” Much of the ethnographic literature observes that children acquire the skills and knowledge necessary for survival with limited or no teaching. Evolutionary psychology, specifically the domain-specific view of how dedicated mechanisms are involved in the acquisition of knowledge, has great explanatory theories for how children acquire such complex skills and knowledge through observation.

The cognitive niche theory predicts that humans use information and inference to gain access to and control of resources from other organisms (Tooby & DeVore, 1987). This theory fits well with concept of humans as hunters, trackers, and foragers (Whiten & Erdal, 2012). There is a growing literature which argues convincingly for a domain-specific modular organization of the brain, where each domain is primed to respond to information in the forms of social, biological, and physical ontology. Cognitive research suggests that our cognitive architecture develops expectations and principles about the world which distinguish between solid inanimate objects, living things, and intentional agency (Boyer & Barrett, 2005). The domains, which operate implicitly, correspond to areas called “intuitive,” “naïve,” or “folk” knowledge, and evidence exists for a folk psychology, folk biology, and folk physics.

Folk psychology is responsible for an awareness of the self, as well as inferring the beliefs and desires of other's behavior (Wellman & Gelman, 1992), also known as "theory of mind" (ToM). ToM is an ability found in all normally-developed humans across culture (Scholl & Leslie, 1999). Folk psychology allows humans to negotiate social relationships, infer people's mental states and intentions, and develop an awareness of the social ingroup/outgroup. Baron-Cohen et al. (1999) have made evidence-derived arguments that ToM is independent of measures of intelligence, executive functions, and reasoning about the physical world.

Folk physics is a domain for representing and navigating three-dimensional physical space. Baillargeon (2002) has provided a comprehensive review of the literature and how it has evolved since Piaget's studies in the 1950s. Evidence shows that an intuitive physics is responsible for explanations about: the trajectory of solid objects (Kaiser et al., 1986); expectations about the solidity and continuity of solid objects (Spelke, 1990); and that "a single conception of material bodies comprising, at least in part, the principles of cohesion, contact and continuity," help infants perceive and reason about solid objects (Spelke & Van de Valle, 1993, p. 156). Another separate domain exists to rank living things and distinguish them from man-made objects.

In every human society, plants and animals are intuitively understood to have a causal essence, and to be part of a species group; an ability known as folkbiology (Atran, 1998). These groups are hierarchically ranked and allow for expectations about the organism's physiology and behavior. In evolutionary terms, the ability to group different plants and animals allows for the correct behavioral response in discerning edible and inedible plants, predator and prey animals, and to make inferences about the properties of different organisms.

To distinguish between living things and man-made objects is dependent upon perceiving different aspects of objects. One study demonstrated that four-year-olds will use conceptual knowledge of function and shape to guide their word extensions to label same-appearance animals and same-function tools (Graham et al., 2010). Another found that children produce more generic noun-phrases about animals than tools where they had no prior knowledge (Brandone & Gelman, 2009). Studies on domain-specific modules of the brain organization continue to accumulate important evidence for how humans learn and develop explanations for the world. The flexibility to respond to variation in the environment is an important component to the cognitive niche theory of social evolution.

When a species has recurrent problems in the ecosystem over the course of evolutionary history, blueprints or algorithms for responding to these problems will evolve within the nervous system (Geary, 2007; Bugental, 2000, p. 187). Individual differences in these primary domains manifest themselves in varying abilities in the social and ecological context: be it hunting, tool making, or cultivating social relationships. These varying abilities are an important context for evolutionary selection in fitness. All humans have a motivation to gain and maintain a sense of control over themselves, their relationships, and the physical environment. This ability is essential for evolutionary survival (Shapiro, Schwartx, & Astin, 1996, p. 1231). The underlying attentional and perceptual mechanisms that deal with the social, biological, and physical world equip each individual with a cognitive system that processes information, and guides behavioral responses. As these different abilities manifest themselves at the social level, society provides its own sets of rules, norms, and limits for behavior. The benefits of conforming to societal regulation are cooperation, reduced competition, and an increased dependence on other members in the society. Children are biologically motivated to engage in activities such as social play, exploration of the environment, and observing and imitating others, because these activities have recreated fitness throughout human's evolutionary history. Analysis of learning in small-scale societies can provide an interesting window into the nature of education in all human societies.

There is disagreement in the ethnographic record as to how to understand the nature of social learning and cultural transmission in hunter-gatherer societies. Mead (1964) characterized hunter-gatherer band societies as 'learning cultures' because learners initiated the acquisition of skills and knowledge. This is contrasted with 'civilized' societies, which she characterized as 'teaching cultures.' In a recent review of the debate, Boyette and Hewlett (2017, p. 1) claimed that "teaching clearly exists among hunter-gatherers and appears in many forms," but clarify the statement by saying that "teaching tends to be less common" among these small-scale societies. An earlier study defined forms of teaching as observed among Aka hunter-gatherers: "Natural pedagogy, demonstration, task assignment, positive and negative feedback, and opportunity scaffolding" (Hewlett & Roulette, 2016, p. 10). This definition of teaching is too general and not easily differentiated from every day social interaction.

The biggest issue in the debate on teaching in hunter-gatherer societies concerns an agreed-upon definition of the concepts. If the term teaching is used in the context of a mathematics classroom, can it also be used to describe normal social interactions, as the ones listed in the above-paragraph, that are "brief and subtle, often lasting a

few seconds?” (Hewlett & Roulette, 2016, p. 10). This study finds a more suitable definition in Lancy (2010), that teaching is “student-centered, developmentally appropriate instruction by dedicated adults” (p. 97), though the last two words need not be the case.

This study offers an understanding of these concepts from a socio-biological perspective as follows: great cognitive abilities for learning are common throughout the animal kingdom (de Waal, 2016) and human education needs distinction from these abilities; education is the social learning and skills acquisition that occurs only in human societies; teaching is not necessary to facilitate social learning and the acquisition of skills, where observation and imitation suffice; formal education is direct instructional guidance to transmit evolutionarily novel skills, knowledge, and concepts. Examples of these include literacy, mathematics skills, and scientific conceptions of the world.

The learning Mead studied in hunter-gatherer societies is typical of small-scale societies. Children are innately curious, and learning through observation and imitation are common to all children in any society. Despite the on-going debate, the ethnographic literature overwhelmingly indicates that children in small-scale societies learn through imitation and observation, and this includes complex skills such as the production of tools, or the skills involved in effective hunting. These observations in the anthropological and ethnographic literature align with models of social evolution and adaptation in humans. Hunter-gatherer societies do not rely on direct instructional guidance in cultural and skills transmission because observation and imitation learning suffices.

Lancy (2008, 2010) has conducted a comprehensive review of the ethnographic record, which reviewed 1570 published and unpublished reports, comprehensive of geography and subsistence patterns. Lancy’s research (2010) of learning in hunter-gatherer societies concludes that teaching “is largely absent or of minor importance” in children developing into “competent adults” (p. 82). In subsequent work, Lancy (2016, p. 6) finds no connection between teaching and the acquisition of survival skills, which includes the lifelong development of hunting and tool-making skills (Lancy, 2017, p. 13). Hunting is potentially the most intensive and strength-demanding skill for children in hunter-gatherer societies to acquire (Walker et al., 2002). MacDonald (2007) reviewed the ethnographic literature to test predictions from evolutionary models of the costs and benefits of learning to hunt at different ages. She found “few descriptions in the literature of teaching or verbal instruction,” and that “teaching is unimportant relative to observation and practice” (p. 398). Among the Nayaka hunter-gatherers of southern India, caring for children as dependents ends at around three to four years of age, and by the age of six, children begin hunting and visiting relatives free of parental supervision (Bird-David, 2005, p. 96). Among the Nayaka, there is “no formal instruction and memorizing (here), no classes, no exams, no cultural sites in which packages of knowledge, abstracted from their context, are transmitted from one person to another” (Bird-David, 2005, p. 96). Similar results have been observed among the Martu children in the Western Desert, Australia (Bird & Bliege-Bird, 2005, p. 145). Diamond (2012), in his study on small-scale societies, found that education occurs from natural social interactions and that New Guinean Highlanders found it “bizarre” that “children need specified places, times, and instruction in order to learn how to meet and play with each other” (p. 206).

Indeed, children in small-scale societies, before the advent of civilization, had a great deal to learn as part of their social education, but no systems of teaching or formal education existed in their societies. This study argues that the emergence of civilization had major implications for the education of some members of society. In order to understand why formal institutions of education first emerged, it is pivotal to understand the changes in social organization that likewise occurred during the emergence of civilization.

### **3. The Emergence of Civilization and Formal Education**

This study will use four independently-emerging civilization case-studies to provide evidence for the development of institutions of formal education. The emergence of state-level societies scaled human social organization to a new complex dynamic, a phenomenon which happened independently in several parts of the world. In ancient Mesopotamia (Adams, 1981; Algaze, 2001, 2008), Egypt (Kemp, 1989), China (Trigger, 2003; Wang, 2014; Wang, 2015), and Mesoamerica (Houston, 2004; Law, 2015; Smith, 2002), establishing cities was the most discernible phase of the transition from small-scale societies and political chiefdoms to civilizations. In the ancient world, cities are only found in state-level societies (Smith, 2002, p. 4).

The transition to cities and civilization required several concurrent geographic, social, political, technological, and cultural aspects that began happening more than 5000 years ago; observed first in Ancient Mesopotamia and Ancient Egypt. Geographically, the most salient features in the early development of Mesopotamian and Egyptian civilizations was population growth, enhanced agricultural production, and the means to transport and distribute along rivers. This distribution, along with a sufficient army to acquire new territories and protect

trading, created dense city structures that over time attracted new members. These state-level societies also had agreed-upon definitions of symbols that played new roles in mediating behavior within society. For example, societies that developed standardized units of weight measurement, had innovated a system that symbolized and quantified new properties in the material and abstract world (Renfrew, 2007). These innovative ways of engaging with the material and abstract world created new valued skills and knowledge, which helped society function; chief among them literacy and numeracy.

The ruling elite developed new bureaucratic institutions to work out social problems, and manage the production and distribution of resources. Social stratification and the division of labor were new features of management, and with their establishment, societies were able to control and rule vast territories. This level of social organization created complex problems for which institutions had to find solutions, and this often meant a strong degree of state control. Administrations and bureaucracies oversaw and directed the production of textiles and agriculture, the transport and organization of troops, the sale of land or animals, the extraction of resources from the surrounding territory, as well as how to observe the rituals in religious ceremonies or showing proper respect to the king.

The development of state-level societies required the absorption of neighboring societies, but once established, cities became attractive places for work and protection, even though the downsides included greater risk for disease and, for many, an increased reliance on others. Increased density among a sedentary population created new social dynamics as well as increased opportunities for problems. Modern studies of city density have shown that “large size differentially affects the managerial, communicative, and professional and technical structure of social systems,” as well as “the relative proportion of other administrative personnel” (Kasarda, 1974, pp. 26–27). Overall, civilizations and their institutions created more complex social and economic relations.

Alan Fiske (1992) has argued that four models can describe the organizing principles of sociality: (1) Communal Sharing (2) Authority Ranking (3) Equality Matching and (4) Market Pricing. The first three are observed in all levels of social organization, but the fourth, market pricing, is a feature of the interactions that take place in state-societies. According to Fisk, market pricing interactions “are those that are oriented toward prices, wages, commissions, rents, interest rates, tithes, and taxes, and all other relationships organized in terms of cost-benefit ratios and *rational* calculations of efficiency or expected utility” (p. 692 *Italics* in original). While money is the “prototypical (p. 692)” example of market pricing relations, this study will show in the section on Ancient Egypt, a “rations administration” (Kemp, 1989, p. 171) can hold the same proportional distributive standards. The relational structuring of market pricing in civilizations was possible through administrative innovation in accountability.

Essential to the complexity of trade and distribution in a civilization is accounting, records, and bookkeeping. In ancient Mesopotamia, Egypt, China, and Mesoamerica, administrators used writing to record economic transactions, convey messages, record ritual texts, celebrate rulers, and preserve knowledge. Writing was a direct administrative response to increased social and political complexity (Cooper, 2004, p. 72). The invention, spread, and transmission of writing took enormous effort and energy on the part of the societies that developed these systems. To develop a system of writing required an agreed-upon set of standards and rules as to what the symbols represented (Schmandt-Besserat & Erard, 2008, p. 8). Bruce Trigger identified three different functions that early recording systems served: First, the commemorating of kings and their deeds. Second, administrative record-keeping associated with the receipt and ownership of goods, the sale of land, houses, slaves, and other property, loans and other commercial agreements, royal decrees and regulations relating to commerce, and legal proceedings concerning economic matters. Third, religious purposes such as the oracle bone inscriptions used for divination in Shang China. (Trigger, 2003, p. 587) For the case-studies examined in this study, all three of Trigger’s observations are relevant to the development of writing systems; the second particularly exemplified in the development of writing in ancient Mesopotamia.

#### 4. Case Studies

##### 4.1 Ancient Mesopotamia

In the period between 3500 B.C. and 3200 B.C., in Southern Mesopotamia, Uruk developed into the region’s largest city. This region benefited from the Tigris and Euphrates rivers and higher yields than the surrounding area in agricultural production (Algaze, 2008). Adams (1981, p. 85) found that by the Early Dynastic I times (2900 B.C.–2350 B.C.), the city had expanded to a population of forty to fifty thousand inhabitants. Uruk played an important role in the trade and manufacturing of the region because it had the ability to organize “the long-distance procurement of certain commodities like metals, wood for heavy construction, precious stones, and perhaps even ordinary flint and construction stones as well” (Adams, 1981, p. 80). As a regional center, raw

materials flowed into the city to sustain work for skilled craftsmen and laborers. The sustainable feature of Uruk's growth and economy was "that it brought a large and growing population within the compass of an urban way of life" (Adams, 1981, p. 81) Central to the administration of the city was the development of writing

Proto-cuneiform texts begin to appear in Mesopotamia in about 3400 B.C (Trigger, 2004, p. 47; Englund, 2004). By the Late Uruk period, around 3100 B.C., "real writing" appears, which according to Hans Nissen (1985) provides "the ultimate answer to the problems of controlling economic life" (p. 352). Systems of writing allowed institutions to store information and keep records of production and distribution. Cooper (2004) has argued that

"if we are looking for a common context for the invention of writing, a context which must also justify the social and economic investment required to propagate and maintain a writing system, we would do well to generalize from the Mesopotamian example and look to the administration of the kinds of organization and politics that emerged in increasingly complex societies" (p. 80).

Writing took several centuries to develop from crude markers into a system of symbols that represented speech. A consideration for further research is the degree to which this evolution relied on the development of formal education. What is clear is that, for new generations to learn the craft of writing, institutions of formal teaching emerged in Ancient Mesopotamia.

Those who undertook an education to become administrative scribes, attended schools known in Sumerian as "Edubba" (George, 2005). Scribal schools taught children literacy, mathematics, and bureaucratic skills necessary for work in the institutions of society. In addition to the thousands of administrative records that survive on clay tablets, archaeologists have also found scribal exercises used in schools. In these schools, young children learned sign-lists, lexical texts, and literary compositions. Literacy and mathematics were not just new and enhanced tools in human societies, they also transformed the nature of education as well. Sumerian society required schools to teach children, and teachers used discipline to keep children tasked on these new, evolutionarily novel goals. This is reflected in many of the tablets, which contain passages concerning discipline and strict authoritative guidance from instructors.

Samuel Noah Kramer (1956) found that towards the end of the fourth millennium B.C., "the Sumerians, as a result of their economic and administrative needs, came upon the idea of writing on clay" (p. xxi), and that the "school was the direct outgrowth of the invention and development of the cuneiform system of writing" (p. 3). Kramer translated texts that showed "as early as 3000 B.C., some scribes were already thinking in terms of teaching and learning" (p. 3). Texts from the first half of the second millennium B.C. show a widespread school system that became the center of culture and learning in Sumerian civilization. Other texts provide evidence for how difficult it was for children to learn literacy. Textual evidence shows scripts that range "from the sorry scratches of the first-grader to the elegantly written signs of the far-advanced student to become a graduate" (Kramer, 1956, p. 4).

In Kramer's "Schooldays" (1949) he translated texts that described the experiences of a school boy, and the behavior and attitude of his teacher and parents. His translation of the texts is informative for both the discipline involved in schools, as well as the importance of learning literacy in Ancient Sumeria:

"I spoke to my father of my hand copies, then  
Read the tablet to him, (and) my father was pleased;  
Truly I *found favor with* my father.  
"I am thirsty, give me drink,  
I am hungry, give me bread,  
Wash my feet set up the bed, I want to go to sleep;  
Wake me early in the morning,  
I must not be late, (or) my teacher will cane me. (*Italics in Original*, Lines 10–17; p. 205)"  
"I went to school.  
In the tablet-house, the monitor said to me: "Why are late?" I was  
afraid, my heart beat fast" (Line 21–22; p. 205).

According to Kramer's (1949) translation, any infraction such as talking out of turn, not keeping your head held high, standing, leaving, could all result in corporal punishment. Steve Tinney (1998) examined the nature of cuneiform teaching practices from tablets recovered in Nippur and Ur and found that a demanding schedule of

repetition drills was key to teaching literacy.

In ancient Sumeria, the evidence is clear that the social and political complexity of the state-level society led to the invention of writing for administrative purposes. The transmission and evolution of writing required the emergence of institutions of formal education. If the goal of this study was to find the first school in human history, perhaps it need not proceed further. However, civilizations emerged independently in several places around the world, and they can provide comparative samples to formulate a universal theory for the emergence of formal education. This study argues that formal education arose for the same reasons in all independently emerging civilizations. The evidence from Ancient Egypt helps to support this conclusion.

#### *4.2 Ancient Egypt*

Egypt's civilization developed along the last 1000 kilometer stretch of the Nile River. Nile Valley settlements grew in population over centuries of plentiful agricultural production. By the beginning of the 4th millennium B.C. the First Dynasty consolidated a vast territory of communities, each already on the path towards state-societies (Kemp, 1989, p. 98). The Naqada Predynastic culture that preceded the First Dynasty were already utilizing two types of writing scripts, one for administrative purposes, and the other for royal display (Trigger, 2004, p. 48). The first use of hieroglyphs was a part of the transition to the uniform material culture consolidated in the First Dynasty in 3100 B.C.

Writing in Ancient Egypt developed at a similar time to that of Ancient Mesopotamia, but in the Egyptian case, symbolic uses to celebrate the deeds of royalty seems to be just as important as administrative uses (Baines, 2005, p. 171). This is not to downplay the role writing served in administration, but rather to highlight the importance of symbolism and royalty in the Egyptian cultural context. Writing not only served an administrative purpose, but played a key role in establishing the legitimacy of rulers and a subordinate mass who believed in the leader's right to rule (Fukuyama, 2011, p. 42). The Egyptians utilized the written language to promote national identity and distinguish themselves from other societies, and textual evidence shows "they took pleasure in this kind of thinking" (Kemp, 1989, p. 21). Literary texts helped develop a sense of community, but they also helped maintain a highly-bureaucratized state-society.

The Egyptian civilization developed institutions for administrative control and distribution of resources. They devised a system of taxation, and complex ways of measuring, inspecting, and controlling people's activities. Though it remained a moneyless system, the distribution of "rations" in the form of wages required a level of abstract thinking in ways comparable to money (Kemp, 1989). Just as in the Mesopotamian civilization, this system of Egyptian institutions relied on scribes who could write, record, and perform calculations that involved ratios and fractions. The computing and recording of taxes, drawing up of census lists for military and labor, and the calculations required for massive building projects, all needed a large and well-trained bureaucracy. The training of scribes and administrators required formal education that was first attached to the royal court.

The king's sons and the sons of the elite officials attended scribal training from the ages of five to ten, and then continued for another decade as apprentices with allotted government officials. Pedagogical materials, recovered from the Middle Kingdom, show students undertaking a curriculum that began with learning to write words in the hieratic script, and progressing to simple stories and arithmetic calculations. By the Middle Kingdom, scribal schools were known as the "Houses of Life" (Trigger, 2003, pp. 607–608). In the Ancient Egyptian civilization, there was a clear understanding that learning literacy and mathematics would place you among members of the elite in society. A document from 1290 B.C. records a father giving advice to his son:

"I have put you to school with the children of high officials, to teach and instruct you in this office which will lead to power and authority" (James, 1984, p. 140).

"Be a scribe, it saves you from toil, it protects you from all manner of labor. Be a scribe. Your limbs will be sleek, your hands will grow soft. You will go forth in white clothes, honoured, with courtiers saluting you" (Kemp, 1989, p. 163).

Again, with Ancient Egypt, evidence shows a concurrent emergence of administrative record-keeping with state-level societies. Over time, both Egypt and Mesopotamia developed systems of writing that represented the spoken word, though this latter step need not happen. It appears that the Aztec, Inka, and West African civilizations had forms of record-keeping but not written speech (Trigger, 2004, p. 40). This evidence suggests that the structural organization of state-level societies, with hierarchies of administration and bureaucracy, is the driving impetus for the emergence of formal institutions of education. The final two examples used in this study offer less clear evidence for this crucial stage of development, but the descriptive power of the developing theory can offer logical explanations, in the absence of evidence, in the development of civilization in China and



Mesoamerica.

#### 4.3 Ancient China

The development of civilization in Ancient China is not as well documented as the records in Mesopotamia and Egypt, yet enough evidence exists to make some useful comparisons, which will serve to supplement the theory proposed in this study. As with Mesopotamia and Egypt, this section's review of the development of ancient cities in China is concerned with the advent of writing and state-society scales of organization.

The earliest evidence of writing used in Ancient China comes from the Shang Dynasty in the second millennium B.C. (Bagley, 2004; Wang, 2014; Wang, 2015), and this is where the archaeological record also shows evidence of an increased scale of urbanization. As this section will show, the historical record from the Shang Dynasty is lacking in administrative documents or pedagogical material. Yet, compiling the existing evidence, alongside comparisons of the rise of civilization in other parts of the world, can still provide enough clues to conclude that the Shang Dynasty utilized writing for administrative matters, and would have needed formal education to train scribes in these skills.

The origins of state formation in China come from two phases of development, in city-states known as Erlitou, and later Erligang. Erlitou was located on the Yiluo River tributary of the Yellow River, and according to the archaeological record, developed into an urban settlement around 1800 B.C. (Wang, 2014, p. 176). The city was large enough to have a division of labor working in bronze, turquoise, and pottery workshops, workers who would have needed to rely on others for agricultural production. It also seems likely that Erlitou was one of several city-states throughout the region. Evidence suggests that agriculture had a gradual development for thousands of years prior to the development of Erlitou (Jones & Liu, 2009).

The successor to Erlitou, Erligang, consolidated power in the territory around 1500 B.C., uniting city-states into an empire. From this period, the archaeological record shows sign of a uniform material culture, with casted bronze ritual vessels (Bagley, 1987, p. 16; Bagley, 1990, p. 9) and weapons found in several areas, and this was most likely due to "a rapid military expansion, one that built fortified strongholds at strategic points" (Wang, 2014, p. 179). A king in the 13th century B.C.E., Wu Ding, moved his capital to Anyang, where most of the earliest evidence for writing comes from.

From around 1200 B.C. Anyang, archaeologists have found writing on bronze vessels, and thousands of inscribed cattle scapulae used in divination rituals, more commonly known as oracle bones. A remaining gap in explaining the development of writing in Ancient China is due to the fact that, "the Anyang script has a repertory of several thousands characters, well standardized in graphic form, and it is full writing, able to record connected discourse" (Bagley, 2004, p. 190). To find evidence of a full writing system used for divination rituals, with a complete lack of earlier proto-writing samples, nor writing samples used in the administrative rise of the Erlitou and Erligang state-societies, leaves many unanswered questions. Did writing have a rapid onset? Was it unnecessary for the successful functioning of administrative duties? Or perhaps, were other perishable materials used for writing as well, materials such as bamboo and wood? There are many examples of writing on these materials from the Zhou Dynasty in fifth century B.C. (Bagley, 2004, p. 217), so it would not be a stretch to assume that the developing stages of Chinese civilization used them as well.

At this point, it is unreasonable to speculate further, however, it seems just as unreasonable to hypothesize that the lack of evidence means that writing did not have its origins in administration. If we draw on the development of writing in Egyptian civilization, with its dual functions in administration and royal decree, it provides a plausible working hypothesis for the functions writing served in Ancient China as well. Indeed, the oracle bone divination samples offer some promising clues that writing was not just the domain of diviners. As Keightley (1996) put it, "Diviners were required to read the cracks in bone, to read the sounds the cracks made, to read the portents in the world around them" (p. 72), a skill and practice that predated written literacy. In fact, the majority of divination bones are not inscribed. Looking at this evidence, Wang (2014) argued that:

It was not communication with the spirits that drove the elaboration of a writing system in China. We would be hard-pressed to explain how oracular responses conveyed by sets of cracks could call into existence an extensive Shang lexicon that distinguished many kinds of plants and animals and their numbers, ages, and colors, many personal names, and countless toponyms. As we have seen in other early states, its was in the sphere of administration—where the overriding motive was to exert control and the means of control was to make inventories and create accountability—that systematic exploration of the classification nature of recording systems was fostered" (p. 183).

There are also examples of oracle bone divinations that refer to administrative concerns and portents for the

future of the royal dynasty. Legitimacy in the Shang Dynasty was closely tied to a favorable spiritual connection with the ancestors, and examples of divinations that are concerned with royal decrees are comparable to the role writing played in the Egyptian Pharaoh's royal decrees.

Unlike the Mesopotamian and Egyptian rise of civilization, and the abundant surviving historical record, the rise of civilization in ancient China still needs more archaeological research before these important questions can be answered. The line of evidence presented in this paper, in support of the theory for how and why formal education arises amidst increased scale of social organization, is in no way denied by the Chinese case-study, and in fact provides solid theoretical ground to support the hypothesis that administrative writing and institutions of formal education would have arisen around the time of the development of the Erlitou and Erligang state-societies. This study draws similar conclusions from the evidence found in the rise of Maya civilization, a rise that occurred in a period that largely overlaps that of the rise of Ancient Chinese civilization.

#### 4.4 Ancient Maya

The ancient Maya civilization has its origins in the Preclassic period (4000 B.C.–250 C.E.). In the succeeding Classic period (250 CE–900 CE), a collage of city-states flourished and competed throughout the Maya region, an area covering the Yucatan Peninsula down to present-day El Salvador and Honduras. The Maya territory consisted of coastal plains, highlands, and lowland tropical forests. The cities that developed in these regions served as “specialized centers for administration, manufacturing, commerce, and religion, and therefore served the same purpose as other ancient cities” (Sharer, 1994, p. 71). As in the cases of Egypt and China, Maya cultural traditions of political legitimacy were closely tied to the economic, sociopolitical, and ideological frameworks that regulated the functioning of their state-societies (Sharer, 1994). Unlike other ancient state-societies, the Maya city-states did not politically unify under one central authority, but rather remained a “patchwork of more than 60 kingdoms” (Martin & Grube, 2008, p. 7).

Though scholars are developing excellent studies of the Preclassic and Classic polities; of their language and writing, agricultural practices, and even daily life; more years of study of this civilization are needed to fill in present gaps in knowledge (Houston & Garrison, 2015). The inclusion of Maya as an example in this study will be to show that all the features that led to the development of formal education in the above-stated societies, were also present in Ancient Maya civilization. Through comparative inference using the theory explained in this paper, all of the encompassing evidences in the Maya historical and archaeological record suggest that they would have needed formal institutions of education to maintain the cultural transmission of their complex, and ornate, writing system.

There is still on-going research into the origins and development of Maya Preclassic writing (Saturno, Stuart, & Beltran, 2006; Chase et al., 2009; Houston & Garrison, 2015). Scholars are converging on the Olmec heartland site of La Venta, an area 80 kilometers south of the Gulf of Mexico, and western-adjacent to the Yucatan Peninsula, as the place where the earliest writing emerged (Martinez et al., 2006; Law, 2015, p. 170). Maya writing had its origins in the 1000 years before the Classic period in an era of warring chiefdoms who depicted their conquests (Postgate, Wang, & Wilkinson, 1995, p. 471) At the time of the Classic period, urban centers used a fully-developed and complex system “that combines logographic and phonetic signs” (Law, 2015, p. 158), which could represent the spoken word.

The geographical variation of the dispersed city-states meant that each had territorial advantages and disadvantages in resources. Agricultural practices in Maya civilization are different to the kinds that fueled the development of Mesopotamian, Egyptian, and Chinese cities, yet in the Maya case, it was still “crucial to the rise of Maya civilization” (Sharer, 1994, p. 81). Different practices such as swidden, terracing, and gardening developed according to the various geographic conditions. Those areas favorable to intensive food production allowed for larger settlements, and larger populations, as exemplified in afore-mentioned examples, created the need for new social organization.

As a case-study, Ancient Maya cities exhibit extensive trade, urban populations, systems of complex writing, and all the other details of a functioning complex state-society. The numerous artefacts that depict Classic period Maya writing show a corpus of royal inscriptions concerned with divine kingship. Martin and Grube (2008) have argued that the change from Preclassic to the Classic period also showed a distinct change in “emphasis on the relationship between kingship and the cosmos.” In ways comparable to how Egyptian Pharaohs established political legitimacy, the Maya royal texts recognized the divine “arrival” of their founding dynasties (p. 17). What has not yet been found in the Maya historical record is administrative records.

The lack of administrative record-keeping, like in the China case-study, is frustrating, when considered alongside the Mesopotamia and Egyptian examples. As Law (2015), put it, there are “no records of accounting, monitoring

of production or tribute, communications with outlying centers, pedagogical materials, and other essentials of a burgeoning state” (p. 176). Given the role record-keeping played in the emergence of other civilizations, the logical conclusion is that it also played a major role in Maya city-states, they have just not survived, or are yet to be found. There is evidence from the Classic period that the Maya used bark paper to write on and make books, and this could be why these materials have not survived in the historic record. Law (2015) rightly questioned that “If the emerging administrative complexity of large city-states was not the principal motivation behind the development of Maya writing...then why did writing seem to burst on the scene at essentially the same time as large urban centers with large-scale monumental architecture and the institution of kingship?” (p. 178). More research is needed to answer these questions, but the encompassing evidence presented in this study allow for confident expectations in the future of Maya studies.

Maya civilization was a vast network of city-states that traded, engaged in warfare, intensive agriculture, had powerful kings and bureaucracies to administer their will; and as this paper hypothesizes, this would have required a dedicated scribal tradition that taught these important skills to the next generation of administrative scribes. As Law et al. (2015) similarly concluded:

“Training is indispensable if a record-keeping system is to be kept alive and functional... The literate civilizations in Mesopotamia, Egypt, China, and Mesoamerica all have a long history of script use—in the first three cases more than 3000 years—so they clearly had effective means for teaching the scribal art.”

Unlike the scribal exercises found in Mesopotamia and Egypt, little has been found in the Maya archaeological record. However, the overall historic and archaeological record shows abundant evidence that points to a scribal tradition as necessary in the functioning of the Ancient Maya civilization.

Overall, these four studies have provided ample evidence to support the theory that the emergence of formal education in human history happened independently alongside the increase in the scale of social organization. The lack of administrative and pedagogical materials in the last two case-studies, presents challenges, but in no way negates the theory proposed in this study. As the relevant literature attests, much of the scholarly opinions is in agreement that writing accompanied the rise of administration and bureaucracy, and that formal education accompanied writing.

The final section will add evidence from modern understandings of literacy learning, to support the claim that formal education had to accompany the development of literacy in Ancient civilizations.

## **5. Why Formal Education Emerged with Civilization**

The skills required in the administrations and bureaucracies of these new civilizations were pivotal to organizing and maintaining society. The new states were stratified in a hierarchical structure that created institutions and exerted strong control over trade, enforcing laws, and providing a new social reality that structured the dynamic interactions of commerce, production, distribution, and punishment. The skills required by bureaucrats and ruling elite to govern new institutions were centered on literacy and numeracy.

The transmission of these skills from one generation of ruling elite and bureaucrats to the next generation, required an institution of formal instruction, or school; the first schools in their respective societies. Formal education was necessary for civilization to operate, and likewise, the requirements of civilization were the impetus to develop the world’s first schools. It should be noted that the functioning of society did not require that everyone train in these new skills. As in the case of Egypt, learning literacy was seen as a way to join the elite status of society. In other words, to obtain a skill that few others possessed. This in varying measures, remained the case in societies until the 20th Century. In ancient societies, those who worked in administration and bureaucracy needed the requisite skills to perform their duties.

The reason these skills required formal teaching is due to the afore-mentioned evidence in learning through primary domains. Simply stated, literacy is an evolutionarily novel skill that needs organized, formal instruction, over a long period of learning, in order to become mastered. Evolutionary psychological literature has shown that children are motivated to learn information that aligns with the primary domains of folk knowledge. Literacy, numeracy, and scientific concepts present a gap between primary domains of learning, and what Geary (2007) has called secondary domains of learning. There has been great progress in the past twenty years to align theories of educational psychology with these evolutionary understandings (Carey, 2000; Geary, 2000, 2002, 2007; Lancy, 2010; Kirschner, Sweller, & Clark, 2006; Pinker, 1997, 2010).

Philip Gough (1980) has noted about children that “for all his cognitive and linguistic talents, the child has one peculiar linguistic shortcoming: he cannot read a word. Indeed, that is one of the primary reasons why we now send him to elementary school” (p. 179). While it is only since the 20th century that we strive to teach all

children this ability, those selected few children in ancient state-societies were cognitively no different in their need to attend school to learn literacy. There is ample evidence to support this conclusion. Children have to make a major cognitive effort learning to read (Ashby & Rayner, 2012, p. 61). Learning to read involves utilizing the visual systems to process written symbols and integrating it with the system that comprehends these images into language-based sounds (Simos et al., 2005). Literacy skills, along with all other skills, requires committing them to long-term memory, and during the process of learning, relies on an engagement between the working memory and long-term memory (Kirschner, Sweller, & Clark, 2006). Evidence shows that direct instruction facilitates this process of learning (Connor et al., 2004, p. 695) Similar struggles arise when learning scientific concepts that do not match human folk knowledge concepts of the world.

Concepts correspond to the mental representation of single word objects or ideas, and often scientific explanations require us to mentally change our folk representations. All normally-developed humans have the capacity for concept change, but it is “extremely difficult” to do, and “the main barrier to learning...is not what the student lacks, but what the student *has*, namely, alternative conceptual frameworks for understanding the phenomena covered by the theories we are trying to teach” (Carey, 2000; 14 *Italics* in original). Spelke and Kinzler (2007) similarly conclude that

“Although core conceptions are resilient, they can be overcome. The history of science and mathematics provides numerous examples of fundamental conceptual changes that occurred as thinkers became aware of the mismatches between the principles governing their reasoning and the world of phenomena they sought to understand” (p. 93).

These studies not only provide excellent evidence to inform pedagogical approaches in modern schools, but also provide further evidence why formal education arose at times when societies started utilizing writing, numeracy, and compiling scientific conceptions of the world.

This paper has provided a theory for why formal education arose concurrently with the rise of civilization in Mesopotamia, Egypt, and plausibly in China and Mesoamerica too. The function of formal education in these emergent ancient societies was to organize learning for children to acquire biologically secondary competencies (Geary, 2007). For the first time in human history, the knowledge and skills needed, at least by some sector of the society, presented a gap between children’s innate learning abilities and the novel skills of literacy, numeracy, and scientific concepts. The corpus of evidence presented in this study supports this conclusion and gives ample theoretical room for future studies.

How does this study weigh on the current educational learning, literature debate between constructivist, self-guided learning strategies versus direct instructional guidance strategies of learning? The evidence clearly demonstrates that children are best left to learn on their own, where observation and imitation suffice. In traditional hunter-gatherer societies, this is exemplified in children’s innate motivational bias for play, socializing in mixed-aged groups, and practicing important hunting and foraging skills. As many studies have shown, learning these important skills did not require formal instruction.

In attaining knowledge and skills that require evolutionarily novel learning, such as literacy, numeracy, scientific concept change, children need direct instructional guidance from teachers. Mayer (2004) reviewed the self-guided learning literature from the 1950s to the 1980s and found evidence that proponents of self-guided learning keep inventing new names and theories, yet the underlying approach has remained the same throughout the thirty years in question. Mayer (2004) concluded that “the debate about discovery has been replayed many times in education but each time, the evidence has favored a guided approach to learning” (p. 18).

Modern evolutionary psychology and neuroscience adds further evidence for why formal education arose in ancient state-level societies. Children needed structured schools when the knowledge and skills they were required to learn became too difficult to acquire by observation and imitation. Formal education, or schools, emerged in civilizations that utilized writing, “market pricing” in economics, and new scientific conceptions of how the world worked. Society could not transmit these skills and knowledge without formal instructional guidance, and a dedicated institutional system that valued these skills for the day-to-day operating of society. All normally developing children have the capacity to learn these skills and knowledge, but it requires teaching, and hopefully in the future, teaching that is better aware of our cognitive architecture and the respective strengths and weaknesses that lie therein.

## 6. Conclusion

By way of conclusion, this study proposes several points of summary and predictions for the future of this theory of education:

- 1) Education is strictly a human phenomenon.
- 2) Formal education first emerged in civilizations that developed the bureaucratic and administrative need for literacy, numeracy, and market pricing.
- 3) The historical independent emergence of formal education in several ancient societies is a universal phenomenon because it arises from human nature and the structural organization of societies.
- 4) Future scholars studying the Early Uruk period, for the transition from proto-cuneiform, to writing that represents speech, may consider that formal education played a major role in this development. As the archaeological and historic record expands in other emergent civilizations, again we can ask what role formal education played in the development of writing? For example, is the development of a writing system dependent on a few innovative people, or is the institutional repetition of teaching over the course of generations the way that writing evolves? This study suspects that the latter explanation will emerge as the answer to this interesting question.
- 5) We may predict that in civilizations such as the Indus Valley, which had systems of writing (yet to be deciphered) and advanced trading networks, that an institution of formal education existed within their civilization.
- 6) Finally, this theory of education can be falsified if we can show examples of formal education to have independently emerged in small-scale societies where observation and imitation might otherwise have been more parsimonious to learning.

The four examples of independently-emerging civilizations used in this study allow for valuable comparisons, yet this style of comparison requires caution not to extrapolate similarities beyond the evidence. Mesopotamia, Egypt, China, and Mesoamerica, despite their unique features and differences in the time of historical development, offer strong cases of convergence when analyzing the structural dynamics of state-level societies. Independent of each other, these civilizations built cities that functioned as the political, administrative, and religious centers of their respective societies. The institutions that developed within each society kept records of production, distribution, trade, taxes, religious ceremonies, military mobilizations, and relied on record-keeping and eventually the written word to maintain a functioning system. Whether writing developed for administrative purposes, religious divination, political legitimacy, or some mixture of each, the salient fact is that these systems of recording, storing information externally, and communication all required a dedicated institution ready to transmit these valuable skills to the next generation. As this study has shown, the transmission of literacy and numeracy skills required systems of formal education, because the skills and knowledge were evolutionarily novel, and therefore inherently difficult to learn.

This aim of this paper was to introduce a coherent and evidence-based theory about how and why formal education arose in the course of human history. The value of this theory has great potential for further studies. For example, Mesoamerican archaeologists and Maya language experts are still advancing knowledge in several areas surrounding the development of Mesoamerican civilization. As of yet, scholars have not found direct evidence of institutions of formal education, but all converging evidence, and drawing inferences from other civilizations suggest that some type of scribal school must have existed in the Maya civilization. Likewise, the development of the Shang China civilization must have developed a system of formal education to train scribes and administrative officials. There is also great potential that systems of formal education played a major role in the transition from record-keeping to writing that represents speech.

Finally, this study provides a socio-biological understanding for education as a human phenomenon, and a theory for the origins of formal education in the development of state-societies. The development of civilizations changed the concept of education, and with each subsequent century of innovation, it continues to become more difficult to become educated. In the 21st century, when societies place so much time, effort, energy, and resources into education policies, it is vital that we place an understanding of human nature at the center of education. Societies are deeply embedded within our human nature, and both in turn provide the limits, potentials, and possibility of education.

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