

Alternate Histories of Intelligence: How the intelligence might otherwise have been imagined.

Intelligence is a loaded word. Proclaiming some person, or some population has more or less of it brings with it a range of consequences for individuals and societies. The notion of IQ as a measure of intelligence represents a choice. More precisely, it embodies a series of implicit decisions about the nature of mind, the nature of people, and the nature of societies. Through making explicit many of the implicit elements of the psychological notion of intelligence, the present essay works to tease out some of the other paths that psychological conceptions of intelligence could have followed. While psychologists routinely evoke the word “construct” to describe notions like intelligence, they do so with such automaticity that they can frequently become seduced into thinking constructs, like intelligence, are themselves real things. Through consideration of other ways the notion of intelligence could have developed in views from other cultures, and less popular traditions within psychology, this essay serves to evaluate the construct validity of intelligence.

The primary goal of this paper is not to discredit the idea of IQ as intelligence (for that see Gould, 1981). The primary goal of this essay is to dig through the assumptions associated with IQ that provide the most fruitful sites for developing novel notions of the construct. To this end, I consider both work in psychology and a range of cultural perspectives on the nature of intelligence.

Defining Intelligence and its three assumptions

As a point of departure, it is critical to first define the key features of what I refer to as the psychological construct of intelligence. For reference, I am taking the idea of intelligence developed by Spearman (1904), which remains relatively intact in Herrnstein and Murray's work in *The Bell Curve* (1994). According to this position intelligence is a more or less concrete thing that can be measured in the same way one would measure height. Where the measurement device for height would be a ruler, this approach posits that IQ tests act as a measurement of intelligence. Subscribing to this concept as intelligence means subscribing to the idea that intelligence is a largely stable, likely hereditary, innate property of individual people. Each of these assumptions about intelligence brings with it baggage that is worth re-evaluating. I discuss three different kinds of assumptions integral to intelligence as the content, subject, and context of intelligence. In moving from content, to subject, to context, I intend to move from the surface assumptions embedded in the idea of intelligence deeper into some fundamental assumptions about the construct. To begin, I briefly discuss the key features of each of these assumptions in intelligence.

The content of intelligence

The content of intelligence is evident in the content of the tests. The principal components of intelligence tests are multiple choice math questions, abstract reasoning questions, and questions that focus on one's verbal ability. The decision to focus on these components of intelligence at the expense of other potential components represents a critical assumption. In reaction to this assumption I discuss a range of other potential kinds of content which intelligence could measure. This includes, emotional intelligence

(Salovey & Mayer, 1990; Goleman, 1995), creative and successful intelligence (Sternberg, 2007), and multiple intelligence (Gardner, 2006), which have emerged in the last twenty years.

The subject of intelligence

The idea of IQ as stable and innate makes important claims about the nature of it's subject, the individual person. From the perspective of IQ as intelligence, the extent to which an individual changes over time is not particularly important. I engage with this assumption through work in developmental psychology, primarily representation through Piaget's work. In this section I discuss how a core notion of psychology as development, as change over time, undermines any concept that intelligence can be measured as something stable, or innate.

The context of intelligence

The deepest assumption in intelligence is the idea that intelligence is a property of individuals. The idea of IQ as intelligence focuses attention on the individual as the context of study. Through consideration of Soviet psychology, and ideas about intelligence prevalent in Asian societies, this section considers how intelligence could be constructed around different context boundaries. Borrowing from the notion of distributed intelligence, I suggest that intelligence can be re-imagined as a way to discuss individuals, in a setting, with tools.

Alternative content for intelligence

The most widely written about suggestions for other ways to construct intelligence focus on alternative content. By reconsidering the kinds of elements to measure these approaches to critiquing intelligence do not necessarily reject other key

assumptions about intelligence. However, they do provide fruitful ways for thinking through how one might create very similar constructs of intelligence which focus on different kinds of thinking.

The most popular approach to this kind of research is Gardner's idea of multiple intelligences. Gardner (2006) suggested that IQ tests only measure a few varieties of intelligence and that other varieties of intelligence could also be measured. Gardner suggested that IQ tests, and in general schooling systems, do a good job engaging with visual-spatial, verbal-linguistic and logical mathematical intelligences, but do not do well at engaging with six other kinds of intelligence. He described these other kinds of intelligences as bodily-kinesthetic, musical-rhythmic, interpersonal, intrapersonal, naturalistic. In a similar line of reasoning Sternberg has proposed successful intelligence, the idea that intelligence can be conceived of as someone's ability to accomplish practical goals in a creative fashion (Sternberg, 1997). Emotional intelligence, another content focused approach, focuses on someone's ability to identify, assess, manage and control the emotions of one's self, others and other groups of individuals (Salovey & Mayer, 1990; Goleman, 1995). While all of these perspectives propose distinct alternative kinds of content to measure intelligence they each work in a similar fashion both with and against the idea of intelligence as IQ.

Significantly, studies of each of these proposed varieties of intelligence are not found to correlate with measures of IQ. In other words, if one accepts the validity of any of these ideas as a kind of intelligence one must give up on the idea that *g* or any other overarching measure can be created as a means to identify a core component of intelligence distributed across a given population. If one takes this research seriously, one

must embrace the idea that different people exhibit different levels of each of which ever set of intelligences one ultimately subscribes to.

With that noted, there are still substantial similarities between these varieties of intelligence and the idea of intelligence embedded in IQ. Each of the varieties of intelligence is still explored as a property of individuals, each is still something that different individuals have different quantities of, and each of the approaches does not focus on the extent to which any of these abilities develop or change over time.

A Changing Subject of Intelligence

Developmental psychology provides another avenue for exploring a key assumption of intelligence. Part of the core idea of intelligence as IQ is the notion that IQ tests measure a stable component of an individual's capability. From this perspective young children and adults can be plotted on the same scale. As one extreme, psychologist Arthur Jensen suggested that IQ could be used as a means to rank and compare the intelligence of animals, amoebas, and any yet to be discovered forms of artificial life (1979). Developmental psychologists, in this case represented by Jean Piaget, suggest that children move through a series of developmental stages in which their abilities and capacitances for thinking shift through very different ways of understanding the world. If one subscribes to the idea that there is substantial flux involved in the development of mental abilities then the idea that a child and adults intelligence are, more or less, the same thing becomes deeply problematic. In this case, the particulars of Piaget's psychology are not of direct importance. What is critical is to note that each of the stages Piaget identified in child development (Sensori-motor, Pre-operational, Concrete operational, and Formal operational) each engage with elements that are supposedly core

components of the stable notion of IQ. For example, many of the kinds of abstract reasoning problems that make up substantial portions of IQ tests effectively require the capacities that Piaget suggests are developed in the Formal operational period.

The example of Piaget's psychology is employed as a general example of a broad range of research in developmental psychology. The central point of considering this work is that if individuals change in critical ways over the course of their lives what sense does it make to talk about intelligence as something that is always the same? From a developmental perspective it would make much more sense to refactor intelligence as distinct attributes expressed differently at different points in one's life.

Expanding the Context of Intelligence

The idea that there could be different kinds of intelligence, or that the individual subject of intelligence might change through development each provide engaging ways to re-imagine intelligence. With that said, both still hang onto the core assumption of intelligence, that intelligence is a property of individuals. In this section I discuss a different research tradition, grounded in Soviet psychology, which leads to a radical way to rethink intelligence as property of groups, systems, and interactions between individuals and tools.

The idea of intelligence as a property of individuals is far more systemic to western societies than the first two notions. It is fundamentally connected to western metaphors about the mind. As Lakoff suggests, one of the most fundamental western metaphors for the mind is that of a container. "Via metaphor, the mind is given an inside and an outside." They suggest that this idea of the mind is so fundamental to western thought that "it is hard to think about the mind in any other way" (1999, p. 266).

Similarly, they suggest that the mind is conceptualized as a calculator, or a switchboard, or a set of gears.

This completely internal mind is not the only way in which cultures understand the mind. For example, a popular metaphor for the mind in Korea focuses on the role of the environment as the central force. In this case the mind is conceptualized as a white root. If the white root is planted in red soil it turns red. If it is planted in green soil it turns green. In this case, the surrounding soil is the element that makes the largest difference in the color of the plant (Plaut & Markus, 2005). In Japan the mind is frequently conceptualized as a willow that grows and matures over time (Ohnuki-Tierney, 1993). It is clear from these cultural perspectives that the idea of intelligence as internal is cultural. By acknowledging the critical role of the surrounding environment these other cultural perspectives provide a way to think about intelligence on different terms.

The idea of intelligence as environmental phenomena has resonance with several different kinds of psychology. For example, Mead's notion that the mind emerges from social phenomena demonstrates a path which western psychology might have developed along as an alternative to the primarily internal story which western psychology developed along (1934). While Mead's work was not substantively explored in the west, a similar line of thinking was explored deeply in the work of soviet psychology, first and foremost in the work of Vygotsky.

While the soviets never developed a theory of intelligence on western terms, the work of Soviet psychologists does have a direct bearing on the kinds of things that western psychology is about (Grigorenko, 2004). The October revolution brought about sweeping changes in the practices of Russian psychology. On several different occasions

psychologists were “purged” for engaging in work deemed to be bourgeois. This reflected a general practice in Soviet science. In biology these practices lead to outlawing Darwinian evolution, in psychology it led to outlawing IQ tests. Outlawing Darwinian evolution was disastrous for biology, the Soviet’s had turned their backs on one of the most important theoretical views and the work Soviet scientists conducted under the proposed rival theory was, more or less, entirely scrapped. The case for psychology was rather different; in this case there was some truth to the claim that the individualized idea of intelligence as IQ was itself a bourgeois component of western individualism. The history of the development of the western idea of intelligence demonstrates that the rational individual, the protagonist of Adam Smith’s *Wealth of Nations*, was used as a starting point for creating modern psychology (Danziger, 1997).

To create an alternative psychology the Soviet psychologists, at least those Soviet psychologists left after the purges, turned to Marx and Engels. Ideas about mind were in fact central to Marxism. For example, Engels insisted, “the alteration of nature by men, not nature as such, is the most essential and immediate basis for human thought” (Engels, 1883/1987, p.161). In other words, the interaction between man and nature was critical to understanding human thought. For Marx this was a critical component at the core of his philosophy. He believed that the division of labor itself was fundamentally connected to the creation of higher order thinking, and that the potential of the mind is fundamentally co-created between individuals and their environment, history and culture. This perspective takes the developmental psychology a step further, viewing the development of an individual, in the development of a community, in the history of a society, and the evolution of a species all as a continual developmental flux.

In the 1920s and 30s Soviet psychologists worked to turn the philosophy of mind at the core of Marxism into a psychology. The most well known work in this tradition is that Vygotsky's. For an example of how he operationalized Marxism into a psychology consider his account of reading. For Vygotsky, "The internalization of culturally produced sign systems brings about behavioral transformations" (Cole, et al. in Vygotsky, 1934/1978 p. 8). In this view language was created and is first used by individuals as a tool to communicate with others. Language is then is *turned inward* as a tool for thinking for individuals. This provides a means for thinking about thought on Mead's terms, as mental conversation with a generalized other (1934). From this perspective a range of culturally produced and sustained tools mediate thought. The internal mind is itself intimately co-constructed with other people and through things like language, or for that matter through things like mathematics. In both cases, math and language, each have a history and at different stages that historical development provides different levels of sophistication for thinking. Now, this should not be understood as the strong notion of what has become known as the Sapir Whorf hypothesis: that all thought is bound by language. Instead, this position is the softer notion that the boundaries and structure provided by language play an important role in shaping any individuals thought.

A more concrete way to see what this kind of idea of intelligence would have looked like is to consider one of Vygotsky's most famous ideas, the notion of the zone of proximal development. Vygotsky defined the Zone of proximal development as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" (Vygotsky,

1934/1978, p. 68). In this idea, there is a zone of development between the practices of an individual and the potential that they could exhibit through mediation of their activity provided by guidance. The first part of his quote, examining the capabilities of an individual without any assistance, could very well describe an IQ test. Now imagine if researchers talked about intelligence as a property of this Zone, as something that involves an individual in their best preparation, using the proper tools. This kind of psychology suggests a very different focus. It is not about the individual, but the individual in context, with guidance, and the historical state of the physical and cultural tools available to mediate their actions.

In the 1970s, spurred in part by the translation of much of Vygotsky's work, a new interest in soviet psychology flourished. Through Cole (1996), Engeström (1991) and Werstch's (1999), work perspectives emerging from Soviet psychology have found considerable resonance in the work of western learning scientists. Lee and Roth go as far as to suggest that Vygotsky, and the cultural historical work he inspired are "one of the best kept secrets of academia." (2007, p. 182). In the following section I explore how some of these ideas have grown into larger theories of mind and society.

Contemporary Approaches Acknowledging Environment and Development

Situated Learning and Communities of practice: Lave and Wenger's notion's of situated learning and communities of practice draw deeply on Soviet psychology and provide a space for exploring the way more social theories of thinking and learning could be used to develop broader ideas of intelligence. The central idea of their theory is that individuals develop skills and competence through participation in a community.

Through studies of how individuals develop from novices, to experts in different domains

they suggested that learning takes place through cognitive apprentices, in which novices develop through legitimate peripheral participation with experts (1991). Related to the idea of the community of practice they discuss the process of learning as a situated activity. In this context, all learning is situated, much like Vygotsky suggested, in both a physical and environmental context. Both the notion of the community of practice, and the idea that learning is situated work to shift the context of study away from individuals. A concept of intelligence drawing on these ideas would be much more concerned with the community and the situation than with the individual embedded in the community and situation.

Distributed Cognition: At roughly the same time as Lave and Wenger's work on communities of practice another group of psychologists proposed a related, but distinct, notion. They proposed that intelligence and cognition might be thought of as distributed entities. This research expands Vygotsky's ideas about how thought is mediated by tools.

The best way to explain how this theory works is to consider a concrete example. For this case, I will briefly present an example offered by Roy Pea of two ways to measure the diameter of a tree. With a conventional measuring tape, a forest ranger would follow the following 6 cognitive and physical steps:

1. Measure the circumference of the tree (6 feet);
2. Remember that the diameter is related to the circumference of an object according to the formula circumference/diameter equals 2π (or pi);
3. Set up the formula, replacing the variable circumference with the value of 6 feet;
4. Cross-multiply, getting $2\pi (\text{diameter-unknown}) = 42$
5. Isolate the diameter by dividing $42/2\pi$
6. Reduce the fraction $42/2\pi$ 1.9 feet (Pea, 1997, p. 70)

After completing this process, the ranger has thought through the work required to come to the conclusion. Now consider the same ranger using a different measuring tape, one where the “numbers have been scaled so that the algorithm for these calculations is *built* into the tool” (Pea, 1997, p. 70). In this situation the ranger simply wraps the tape around the tree and reads off the correct measurement, 1.9-foot diameter. Beyond simply augmenting or enhancing the process of thinking, this tool has fundamentally transformed it. One would not say that the tool is thinking, but it has embedded inside it a set of algorithms which allow its user direct access to answer a specific question without even understanding the processes required to otherwise answer the question.

If one is willing to entertain the idea that the boundary of the individual is not the container in which intelligence resides cases like this, as well as examples of how cockpit’s control their speed and large navel vessels move about the sea (Hutchens, 1995a & 1995b) suggest that intelligence might be better constructed as a property of systems. Beyond the idea that intelligence is a property of communities of practice this notion would suggest that intelligence could be imagined as a property of the interactions between individuals, tools, communities and systems.

Reconstructing Intelligence

In *Abilities Are Forms of Developing Expertise* Sternberg suggested that educators and psychologists should reframe the idea of ability away from a concept of static, innate, or immutable elements of an individual and instead understand ability as developing expertise. In this piece, Sternberg is proposing a substantial challenge to one of the core tenants of much of educational psychology by critiquing a notion of ability as innate he is questioning one of the central ideas of an intelligence quotient and the idea of

the general factor of intelligence. In place of the innate model, he proposes researchers adopt the idea that measures of ability are measures of developing expertise. If ability is reframed as developing expertise it would make sense to reframe intelligence around this notion of ability.

Sternberg uses chess performance as an example for how one would understand developing expertise. After learning the rules to chess, a new player can demonstrate different levels of proficiency at the game. That proficiency can be understood as a series of different sets of overlapping expertise. The player's experience with similar games, similar kinds of thinking, and the extent to which they practice and refine their skills are each a component of understanding their developing expertise. To take this example back to the kinds of tests of verbal ability on IQ tests, Sternberg suggested that such a test is actually a measure of overlapping sets of expertise. In this case the test measures, among other things, one's skill at puzzling out what the test giver wants, command of English vocabulary, reading comprehension, quick thinking, suppression of anxiety, and sustained concentration. As one acquires expertise in these kinds of practices one would become a better IQ test taker. This leads to an important nuance in Sternberg's argument. He is careful to note that he is not proposing that under the same sequence of instruction there would be no difference between two individuals' proficiency. In other words, he recognizes that there is some credibility to part of the argument for innate ability; it is entirely possible that there is a kernel of truth to this notion in the form of genetic endowment.

If one recognizes intelligence as developing forms of competence in a given domain it is critical to acknowledge the lesson of the Vygotskian tradition. The domains

themselves are the result of communities and the way in which communities have gathered together sets of tools as part of the practices of those communities. Sternberg explicitly recognizes that the content of Intelligence is multi-faceted. Still, his idea also requires acknowledging that the subjects of intelligence, individuals, are themselves developing competence in a given domain. Finally, by positioning intelligence in historically developed domains he brings the role of communities and their use of tools into dialog with the concept of intelligence. The idea that abilities are forms of developing expertise is a potent one. If one wants to hold onto the idea that, while socially enabled and engaged, intelligence is primarily a property of individuals, this proposal provides significant advantages. However, there are advantages to moving toward a notion of intelligence as a property of systems.

Thinking about Intelligence as System's Designer

It may seem strange to posit that intelligence might be reconceived as a property of something outside individuals. Many chose to reject the notion outright as a kind of knee-jerk reaction. I encourage those who hold this view to reflect on the fact that the idea of intelligence most individuals subscribe to is not so much a property of people as it is an outgrowth of a western ideology in the relatively recent past (Danziger, 1997). One's willingness to entertain this notion will pay theoretical dividends.

To imagine what this might look like consider Hutchin's discussion of how a cockpit remembers its' speed (1995). Hutchin's documents, in extensive detail, the processes involved in piloting a plane. The details of his description are not critical for this discussion, but suffice it to say that he successfully argues that if one is willing to take a step back and think of the pilot-in-cockpit as a single cognitive unit, then the

system begins to make a lot more sense. The design of modern cockpits removes the need for the pilot to attend to every element of the flight process, and in so doing it becomes fruitful to think about the system itself as a cognitive entity. With that distributed cognitive system perspective in place it now seems reasonable to ask questions about the intelligence of that system. For example, imagine that we have two sets of pilot-in-cockpit systems. The first consists of an expert pilot with a high IQ to boot in a cockpit so poorly designed that it requires every bit of her expertise to keep the plane in the air. The second consists of a novice pilot with a low IQ in a cockpit so well designed that the pilot can nod off now and then. The plane practically flies itself. The expert high IQ pilot might beat the novice low IQ pilot in almost any ranking of the intelligence of an individual. However, the novice pilot-in-cockpit system is likely to result in less pilot error, and more reliably successful flights. From the perspective of the systems design the system with the less individually intelligent pilot is actually more intelligent.

For another example, think back to Roy Pea's discussion of the park ranger and the tape measure. Just like the better cockpit the tape measure with the equations embedded inside it results in more reliable outcomes. This demonstrates a more general principle about intelligent systems. The less a system requires a person to extensively calculate, compute, or use their short term memory to retain pieces of information the more reliable that system becomes. Removing the need for the ranger to calculate creates "smarter" results.

These actor-plus-tool systems connect sets of artifacts and tools to domain specific practices. Clark provides an example from bartending that can provide additional clarity. Novice bartenders inherit a set of practices and artifacts developed overtime.

First, they inherit a set of different kinds of glasses for different kinds of drinks. As they learn to bartend they begin to line up those glasses as they take orders (Beach, 1988). They translate the temporal sequence of the orders into the special sequence on the bar. Through this process bartenders “actively structure the local environment to press more utility from basic modes of visually cued attention and recall. In this way, the exploitation of the physical situation allows relatively lightweight cognitive strategies to reap huge rewards” (Clark, 2008, p. 68).

In each of these cases, cockpits, bartending, and tree-measuring, individual actors with varying expertise are successful to varying degrees at accomplishing sets of tasks. With the critical role that the use of tools, historically dependent modes of expertise, and other individuals play in these cases many of the elements one would like to label as intelligent are actual properties of an individual interacting with tools and other individuals in systems. Instead of focusing so intently on individual’s abilities, it would be prudent to further develop ways of evaluating, comparing, and assessing the intelligence which different systems exhibit.

Conclusions

The concept of IQ as intelligence represents a set of assumptions about the content, subject and context of intelligence. This paper documented ways intelligence might have looked different if psychologists had developed it in accordance with different sets of assumptions. This is not simply an exercise for the imagination. The idea of IQ as intelligence is a choice. In light of the evidence it is prudent to spend some time redesigning the construct of intelligence. In work on multiple intelligences, successful intelligence, psychologists have spent a substantial amount of time redesigning the

content of intelligence. However, little work has focused on redesigning the subject of intelligence. Sternberg's notion of ability as developing expertise offers a considerable amount of potential for addressing these assumptions. Yet, this theory still predominantly focuses on intelligence as a property exhibited by individuals. I have argued that the most robust concept of intelligence need not retain the individual as its' context. The concept of intelligence does substantial work when deployed as an attribute of systems.

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