Spring 2014

The Avant-Garde Physician: Reviving the Humanities in Premedical Education

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THE AVANT-GARDE PHYSICIAN: REVIVING THE HUMANITIES IN PREMEDICAL EDUCATION

A thesis submitted to
Regis College
The Honors Program
in partial fulfillment of the requirements
for Graduation with Honors

by

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May 2014

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Acknowledgements

I would like thank Dr. Franco, my thesis advisor, as well as Dr. Palmer, my thesis reader, for their enduring patience, insightful comments, and tactful critiques throughout the writing process. Furthermore, much gratitude is owed to Dr. Bowie, the current Honors Program Director and soon-to-be Academic Dean, for not only his guidance in the thesis process, but also for his four years of mentorship. Finally, I would like to thank my family, both immediate and extended- without all of your support, I could have never made it past the first word.

I. Introduction

While the response of an individual to the question "What makes a good doctor?" might vary from person to person, I do not believe it would be a stretch to suggest that the word "intelligence" would likely be a common thread even in partial response. It seems that in matters as important as physical health, intelligence trumps all other traits, as the assumption is that intelligence is the greatest determinant affecting the treatment of patients' physical well-being. This should not be particularly surprising, as individuals' encounters with physicians are purposed with the examination and subsequent treatment of their body for any malfunctions, breakdowns, or potential insufficiencies. Such a reality holds true whether the occasion is a routine checkup with a well-known family physician, or an unplanned visit to the emergency room with the physician working at the time.

Often, however, after suggesting intelligence as a necessary trait, no further elaboration is provided. This is likely a result of the word's frequent use in our everyday lexicon. Yet the actually definition of intelligence is far from concrete, even in those professional fields that study intelligence directly. It has been defined quite concisely as an "innate general cognitive ability" (Burt, 1954, p. 76) or as "goal-directed adaptive behavior" (Sternberg, 1982, p. 24). Lloyd Humphreys, former chairman of the American Psychological Association Task Force on ability and achievement testing, asserted intelligence to be "the resultant of the process of acquiring, storing in memory, retrieving, combining, comparing, and using in new contexts information and conceptual skills; it is

an abstraction" (1979, p. 115). While Humphreys's view of intelligence is one relatively removed from its action, other definitions are more contingent on the action of intelligence. Such is the case in Mainstream Science on Intelligence, which characterizes intelligence as:

> A very general mental capability, that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly, and learn from experience. It is not merely book learning, a narrow academic skill, or test-taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings-"catching on", "making sense" of things, or "figuring out" what to do. (Gottfredson, 1994, p. 13)

Beyond the myriad of definitions for intelligence, there is a variety of approaches to understanding the human intellect- "intelligence theories". Three of these theories that often attract the most attention include psychometrics, the Catell-Horn-Carroll theory, and the theory of multiple intelligences. The first of these, psychometrics, is arguably the most commonly known in the field of psychological measurement. Intelligence quotient (IQ) tests lie in this domain and are frequently thought to be the best indicator of an individual's intelligence and successful job performance (Neisser et al., 1996). Though there are a plethora of IQ tests in use today, a commonality found in almost all tests is the *g* factor. This "general knowledge factor" was found by Charles Spearman to be the factor that explained the consistency in one's performance across a number of psychometric tests- the positive manifold (Spearman, 1950). An individual with a high *g* factor is predicted to succeed across a wide spectrum of cognitive tasks, and has been

linked to higher job status, continuing education, and greater income. Conversely, low *g* factors are correlated with higher incarceration rates, divorce, and need of welfare support (Geary, 2004).

Psychometric testing is not exclusive to the measure of intelligence. Aptitude tests are often applied in academic environments to predict a student's future scholastic performance. This testing is utilized within all levels of the academic hierarchy. The Secondary School Admissions Test (SSAT) is implemented in three separate levels to inform student admission: the Elementary Level for students applying to fourth and fifth grade, the Middle Level for student applying to sixth through eighth grade, and the Upper Level for students applying to ninth through twelfth grade. The SSAT is designed to test students on their mathematical skills, reading comprehension, logical understanding, and writing ability.

Most post-secondary institutions evaluate applicants based on the SAT Reasoning Test or the American College Testing (ACT) assessment; the former is said to measure an individual's literacy and writing skills, while the latter tests for general educational development that indicates "college readiness". In a similar fashion to the SSAT, these tests maintain most of their focus on the subjects of mathematics and English. The score that high school students receive for either test is significantly influential in determining if they are successful in being admitted to their desired institution.

Finally, the transition of a student from undergraduate to graduate education is often gated by standardized testing, such as the Graduate Record Examination (GRE), Medical College Admission Test (MCAT), Law School Admission Test (LSAT), and

Graduate Management Admission Test (GMAT). While each of these tests is created for and directed towards those interested in a particular field of study, all are said to measure critical thinking and cognitive ability rather than just basic knowledge of the subject, and thus fall under the umbrella of psychometrics (Neisser et al., 1996).

Another intelligence ideology that holds widespread acceptance is the Cattell-Horn-Carroll theory. The theory was first suggested in 1941, but has undergone significant revising as recently as 2011. This approach is not entirely separate from psychometric testing, as the hierarchy of factors used to evaluate intelligence places the *g* factor as the ultimate determinant. Ten broad abilities are designated as intelligence-derived, which are then further characterized into 70 narrow abilities. The most notable of the broad abilities are the Fluid Intelligence- the ability to solve problems, reason, form concepts- and the Crystallized Intelligence- the vastness of one's acquired knowledge and the ability to communicate it to others. These particular factors have been incorporated in several IQ tests since the theory's formation.

The final predominant theory I will mention is Howard Gardner's theory of multiple intelligences, for it is through the lens of Gardner's ideas that I will proceed henceforth. The multiple intelligence theory puts forth nine intelligences of equal weight: linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, interpersonal, intrapersonal, naturalist, and existential. Gardner argues that the aforementioned psychometric tests provide insight only into an individual's linguistic and logical-mathematical intelligence, discrediting the influence of the role of the other intelligences in determining an individual's aptitude.

In the pages to follow, I will utilize Gardner's theory to examine the traits and characteristics that are necessary for a successful, impactful physician. Though Gardner outlines nine "frames of mind" in total, my focus will include only four of these intelligences: linguistic, logical-mathematical, intrapersonal, and interpersonal. The reason for this limitation is that while I believe the other five intelligences are of great value and worthy of recognition, I do not believe they are of crucial importance to the work of a physician. Within each following chapter I address the intelligence in and of itself, detailing what distinguishes this intelligence from others, then explain its relevance to the practice of medicine.

Following this examination, I will transition my focus to the Medical College Admission Test (MCAT) and the premedical curriculum required prior to entering medical school. More specifically, I will outline the purposes of the test and curriculum, and why they are such essential tools used by medical school admissions departments. Furthermore, I will evaluate the MCAT and curriculum's propensity for identifying the presence of the four intelligences in a potential physician. Finally, I will delve into the upcoming alterations to the premedical process that will take effect in 2015, including the reasons for the change, how this might possibly affect the matriculating class of medical students in the future, and how this might change the efficacy in culling students with the necessary intelligences.

II. The Linguistic Intelligence

It seems fitting enough to begin with the intelligence that enables both the writing and the reading of this thesis- the linguistic intelligence. While the details of this intelligence will be provided in the pages to follow, its general function is to understand and speak written languages. This intelligence is arguably the one that is most shared among modern humans, and thus is it not surprising that it has merited the most examination in anthropologic study. Gardner outlines the framework of the linguistic intelligence in his work, including the connection between its physiological functions and their anatomical origins, as well as the intelligence's primary applications within human society (2011). This chapter will not only follow Gardner's work in each of these areas, but also extend his findings and theories into the realm of the physician, detailing why this particular intelligence is of importance for today's medical practitioner.

For the vast majority of individuals, the preponderance of linguistic operations is intimately associated with particular areas within the left hemisphere of the brain. But just as it would be excessively simplistic to look at a hemisphere of the brain as being an undivided, undifferentiated unit consistent in function throughout, so too would it be overly reductionist to leave the linguistic intelligence as a single, general operation. Thus, we will examine the linguistic intelligence in depth by looking at its syntactic, semantic, and pragmatic functions.

The syntactic function lies specifically within the Broca's area of the brain, located in the inferior frontal gyrus (Figure 1). Syntax encompasses the understanding of

grammar and parts of speech, both of which are intimately tied to the specific language being used. This operation is responsible for the ability to successfully construct and comprehend various arrangements of sentences, allowing for the formation of declarative, imperative, exclamatory, and interrogative statements.

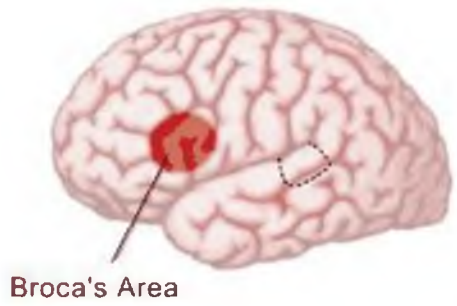

Figure 1: Location of Broca's area within the brain (Gazzaniga & Heatherton, 2006).

The semantic function, meanwhile, is more generally dispersed throughout the left hemisphere of the brain. Its successful development and use enable the understanding of the meaning of individual words and sentences, as well as written works in their entirety. Specifically, a proper semantic function allows for the comprehension of the intentions of language (the concepts that it is intended to evoke), as well as the extension of language (the object that the word/phrase is referring to) (Wood, 2011).

The pragmatic function differs from most other linguistic functions, as it is associated with the right hemisphere of the brain. Like semantics, pragmatics refers to the meaning behind a word or phrase. Proper pragmatic function extends beyond the explicit meanings of semantics, however, as it allows for the understanding of the implicit. For example, the use of pragmatics is required to understand that an individual asking you to

close the window is hinting that he or she is cold (Thomas, 1995).

While Gardner identifies the existence of innumerable applications of the linguistic intelligence in modern society, he acknowledges four in particular that hold the greatest weight: rhetoric, mnemonics, explanation, and metalinguistic analysis. All of these, I believe, have particular relevance for the work of a physician. The first utilization of this intelligence, rhetoric, is as a means of convincing others of a particular course of action (Gardner, 2011). Within rhetoric, there are three classifications that categorize the appeal that individuals make to someone whom they hope to convince: *ethos, pathos,* and *logos.*

The first of these, *ethos*, is an argument that appeals to the credibility and/or authority of the individual presenting it. Speakers properly utilizing this mode of persuasion must either be notable enough in the field of the argument to be considered credible on their own, or, if this is not the case, reference the work of such reliable individuals to validate their claims. An argument rooted in *pathos*, meanwhile, makes an appeal to the emotions of the individual listening.

An effective *pathos*-stemming argument is often one that demonstrates to the listener that they share an underlying value with the presenting individual. Other times, *pathos* may be used to convince individuals based on pre-existing emotions that might sway them in a particular direction, such as fear or hope.

The third mode of persuasion, *logos*, is an appeal based on logical rationale. Typically, such an argument will use a well-agreed upon fact, such as a statistic, as an origin, then employ a series of syllogistic contentions to support the overall claim. An

effective use of *logos* can also inform the *ethos* of a speaker, as it establishes what appears to be a logical thought pattern of the speaker. In order to be successful in convincing others of a particular point of view, it is essential to have a command of these modes of persuasion (Aristotle, 2007).

Such a command is heavily dependent on an individual's linguistic intelligence. One cannot hope, for example, to make a successful *ethos*-driven argument without a developed semantic function. A proper appeal to authority is reliant on understanding the meaning behind the reference made, which again is composed of extension (the object of reference) and intention (the concepts evoked by the reference). A compelling argument rooted in *pathos* is not complete without an effective use of pragmatics, meanwhile. The ability to appeal to the emotion of an individual is invariably tied to the implicit, as the method of evoking such emotion is seldom as direct as referencing the emotion itself, but rather accomplished through the presentation of something that is likely to elicit an impassioned response. Finally, the efficacy of defending a position grounded in *logos* is contingent on syntactic control, as the consistency of an argument can often be foiled by the flawed arrangement of a sentence.

This rhetorical aspect of the linguistic intelligence is, I believe, an absolute essential for a physician, as the successful use of rhetoric contributes to the strength of the patient-physician relationship. When a physician decides upon a treatment for a patient, it is the responsibility of that physician to explain the treatment's details, justifying the use of it in order to alleviate any possible apprehension the patient might have. To do this successfully, a physician must effectively utilize *ethos, pathos,* and

logos. For example, as a comprehensively educated professional, the physician's decision inherently contains an appeal to authority, establishing credibility. Beyond that, an effective physician can reference the work of others within the field whom have had experience with the proposed treatment. This is particularly applicable when a patient is beginning treatment in an experimental trial, where the physician is likely to have limited familiarity. In such a situation, knowledge of the previous work of others is not only essential in making the decision of enrolling a patient in a trial, but also for assuring the patient that the decision is well-founded.

Because patients awaiting treatment plans are often lacking emotional wellness as a consequence of their physical infirmity, the physician's appeal to emotion is essential for the establishment of confidence. The words of the physician must utilize the *pathos* mode of persuasion by addressing this vulnerability. This may include sympathizing with the patient's condition based on personal experience, or establishing a common ground that grows the patient's trust in the decision. A physician might also choose to hone in on the hopes that the patient has regarding the treatment, optimistically speaking of the potentially beneficial effects.

Finally, the patient-physician relationship is strengthened by the incorporation of *logos* in the reasoning for the treatment. For example, the qualms of a patient can often be ameliorated when presented with statistical information. Furthermore, detailing the mechanism by which the treatment will affect the patient can induce a feeling of security. Once again, the successful use of *ethos, pathos,* and *logos* is invaluable when informing the patient of the suggested plan going forward, and such use is intrinsically linked to the

physician's linguistic intelligence.

The second application of the linguistic intelligence is its mnemonic potential as a tool to remember information. Though the word mnemonic often conjures images of mental memorization, perhaps that of associating a face with a name, Gardner is clear to identify this particular function as the process of writing down information for the purpose of recalling it later, "ranging from lists of possessions to rules of a game, from directions for finding one's way to procedures for operating a new machine" (Gardner, 2011, p. 82). While the ability to recollect knowledge or instruct strictly from memory still has value in modern society, the invention of written language thousands of years ago sparked a transition moving away from purely cognitive recall. Before this linguistic innovation, the ability to commit long lists to memory was valued greatly. Gardner references the adolescent Iatmul males in Papa New Guinea who could name ten to twenty thousand tribe names and would later be responsible for passing the list down to their children solely through verbal communication. Though mental memory remains an impressive feat with numerous applications, this skill is gradually becoming overshadowed by the ability to store information via the written word (2011).

This application is particularly relevant to the work of a physician in light of the changes undergone by the medical field in the past fifty years. The pool of information surrounding medical conditions has grown exponentially as a result of the billions of dollars invested in research and clinical trials. Though beneficial, this advance has guaranteed the impossibility of knowing everything necessary to be an effective physician. The emphasis instead is on the ability of a practitioner to properly utilize the

resources available that contain this pertinent information. While this may not initially appear to be related to the linguistic intelligence described by Gardner, the process of evaluating mass amounts of data is invariably dependent on proper semantic and pragmatic function. That is, efficiently and efficaciously sifting through such information necessitates an understanding of the meaning behind the language being used, recognizing which areas are worthwhile and relevant to the physician's work at that time.

Within the mnemonic application of the linguistic intelligence, there is a converse side to the reliance of the modern-day physician on the input of others. That is, physicians must also be able to successfully supply others with information they have gathered in effort to further the work of those around them. The usefulness of this skill is seen in the small-scale setting of a hospital. For many patients, the length of their hospital stay will outlast the shift of the physician that treated them initially. Thus, the physicians are responsible for effectively conveying the information to their successors. While often times a verbal exchange will encompass the most pressing issues that are vital to the successful treatment of the patient, the task of passing on all the information relevant to the case is left to the paperwork transferred from one physician to the next (though the actual medium of paper is being rapidly replaced by electronic means). Consequently, practitioners' linguistic intelligence must not be confined solely to noting information for their own understanding in the future, but also for the understanding of other physicians unfamiliar to the patient.[1]

[1] While this practice of recording information is a task that is gradually transitioning into the hands of hospital scribes, this process is far from complete enough to deem this linguistic ability as unnecessary for a physician.

Though this ability has been examined in the context of a general hospital, it holds particular importance in the field of primary care. For while an individual may visit and be in contact with the same physician for a long period of time, if this individual relocates or changes physicians, the incumbent practitioner is often without any verbal communication from the previous doctor, and thus is entirely reliant on the supplied notes and documentations.

The third application of the linguistic intelligence outlined by Gardner is the crucial role it plays in explanation. Though explanation is included in the first two applications, Gardner lists this particular element to refer to language's pedagogical function (2011). That is, language is indispensable in the learning process, as the vast majority of teaching methods rely on linguistic presentation, be it oral or written. The implications of this for physicians are quite significant, as the field is heavily dependent on the successful acquisition of a large base of knowledge.

Aspiring physicians, for instance, must obtain a vast expanse of knowledge in medical school that they are expected to retain throughout their career. The ability to obtain this information from a variety of professors and practicing physicians is dependent on one's linguistic dexterity, as the methods by which the instructors educate will vary greatly. Furthermore, the linguistic intelligence is especially important in this application because a physician's learning process does not conclude upon the reception of a medical degree. Though the education of physicians during their residency and beyond is largely experiential, practicing physicians must also continually grow their expertise by means of reading academic journals and medical textbooks. The ability to do

so is heavily dependent on a developed linguistic intelligence.

The fourth and final application of the linguistic intelligence is its function in explaining its own activities (Gardner, 2011). This "metalinguistic analysis" is, I believe, best viewed as an extension of language's role in explanation, the third operation of the linguistic intelligence. Its use is seen in every educational classroom when students raise their hands to ask, "What did you mean by …?" This linguistic application is both within the question itself that shows consideration of the original speaker's meaning, as well as the self-reflection that will ensue by the speaker. An advanced linguistic intelligence allows for the refining of a spoken or written concept that stems from the processing and questioning of the concept itself.

Similarly to the third application, this clarifying aspect of linguistics is first seen in developing physicians in medical school as they receive education for their future careers. The utilization of this function is also frequently found in the life of a practicing physician, largely due to the recent development of the medical field into a team-driven profession. In this environment, the successful collaboration of physicians is fundamentally dependent on the sharing and receiving of ideas and information from each team member. A contributing member must be able to inquire beyond the initial presentation of information, especially when ambiguity persists. Not only does the following clarification benefit those listening, but the speakers themselves benefit from the reconstruction of their ideas.

It is evident that linguistic intelligence is an indispensable attribute for the aspiring and practicing physician. Without it, a practitioner is ill-equipped to establish a

proper patient-physician relationship, as well as to grow and maintain the necessary knowledge to effectively treat individuals. Thus, it is fitting for medical school admissions boards to evaluate this intelligence by means of the MCAT and required courses that assess for this ability.

III. The Logical-Mathematical Intelligence

The focus of this next chapter will encompass the logical-mathematical intelligence. This particular intelligence is heavily associated with the general intelligence factor *g*, as it is believed to be indicative of an individual's overall intelligence. Consequently, the logical-mathematical intelligence that which is most tested for by standard IQ tests. A high logical-mathematical intelligence is suggested to be characteristic of an individual with great potential for success across a wide array of endeavors, as it indicates a developed mode of critical thought and problem solving. The following pages will trace Gardner's examination of this intelligence's development and application, as well as investigate which elements within it hold weight in the work of a practicing physician (2011).

As was done for the linguistic intelligence, we will begin our look at the logical-mathematical intelligence by examining its mapping within the brain. Unlike the linguistic intelligence, however, the logical-mathematical intelligence does not appear to be as constrained regarding discrete cerebral locations, or at least not enough to produce a confident consensus. However, it is generally agreed upon that the true heart of mathematical ability is stored within the right hemisphere of the brain, as this half is responsible for an individual's comprehension of numerical concepts and the relation of one number to another.

The left hemisphere, meanwhile, is necessary for the understanding of mathematical signs- a function that is inherently dependent on the developed abilities

produced by the right hemisphere. An individual's ability to plan is intimately linked to the right frontal lobe of the brain, as individuals reporting lesions to this area frequently present a reduced ability to problem-solve. The left parietal lobes and the adjacent temporal and occipital regions (Figure 2) are hypothesized to control left-right orientation and the ability to make calculations, though the research maintaining such conclusions is not conclusive. Gardner theorizes that such functions are capable of stemming from various regions in the frontal lobe, primarily within the right hemisphere. Furthermore, Gardner believes that the logical-mathematical intelligence is not organized as discretely and specifically as many of the other intelligences he describes, is rather more flexible in the housing of its operations (2011).

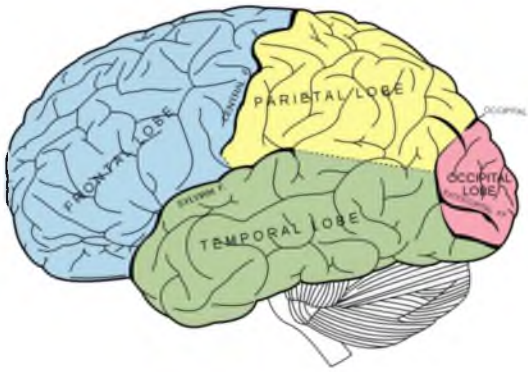

Figure 2: Lobes/regions of the human brain ("Human Brain", n.d.).

The capabilities associated with the logical-mathematical intelligence are more commonly disrupted by general deteriorating diseases rather than lesion-esque damages. General breakdowns of the nervous system are often detrimental to an individual's logical-mathematical intelligence due to the neural delocalization that is hypothesized to occur. Such delocalization is supported by recent electrophysiological studies, which

have shown rapidly changing electrical activity within many regions of the brain from wide ranges of logical-mathematical activity. It is information such as this that lends credence to the commonly held belief that the logical-mathematical intelligence is indicative of overall intelligence, and thus may be supreme to others. While Gardner does recognize the validity behind some proponents of such an idea, overall he deems this intelligence to be separate and distinguishable enough to warrant its own category on an equal plane to others (2011).

Gardner's rationale is largely informed by the unique development of the logical-mathematical intelligence. He uses the widely accepted work of Jean Piaget to detail cognitive development, which I believe to be very beneficial in explaining the elements within this particular intelligence, as well as to later articulate why this intelligence is of value for a practicing physician (as cited in Gardner, 2011). In Piaget's cognitive theory, the process by which an individual acquires the intelligence is one of gradual abstraction. That is, the progressive transition from a mind dependent entirely on the material world to one able to exist based on mental processes independent of one's direct experiences with the world.

The starting point of this growth is seen, unsurprisingly, with the infant. Prior to eighteen months of age, the existing world according to the individual is limited to what can be immediately seen at that very instant. Evidence of this is seen by the common infantile game "peek-a-boo"- when an adult hides his or her face from an infant, the face ceases to exist in the mind of the newborn. Thus, when the visual barrier is removed and

the face reappears, the infant is greatly surprised by its reemergence into the world as they know it.

Eighteen months after birth, the child's mind loses this temporal inhibition as it gains a sense of "object permanence" (Gardner, 2011, p. 136)- the first sign of development for the logical-mathematical intelligence. With this often comes the ability to classify objects into categories and group sets according to similar characteristics. Despite this, however, children of only a few years still lack the ability to compare quantitatively, as they have yet to apprehend an understanding of a numbering system. While a child may be capable of counting, this process is a mnemonic routine comparable to reciting the alphabet, as the child is yet to understand its application to the surrounding world. The characteristic of something as being more or less in comparison to something else is instead qualitative and dependent on its spatial constitution. From this we are able to see the immaturity of a child's logical-mathematical intelligence, as the state of an object is still dependent on the material world.

When a child reaches four to five years of age, the act of counting grows from being merely ritualistic to meaningful, as they learn that the final number listed when counting off a group of things is the total amount present. The following years, therefore, allow for comparisons in quantity unfettered by an object or group's spatial occupation. From this, a child can learn operations including addition, subtraction, multiplication, and division. The maturation of the child's logical-mathematical intelligence allows for the reliance on such functions in and of themselves; for instance, if a child has two groups of the same quantity and adds an equal amount to both groups, they can be certain that the

two groups' quantities are still equal to each other without recounting them. Soon the child will be capable of performing such exercises on numbers without representations of physical entities, a further abstraction from the material world. This important mathematical progression holds weight within the realm of logic, as it translates to the existence of syllogisms, tautologies, deductions, etc. For example, at this stage a child will comprehend the reasoning of why one statement cannot be true if the opposite statement is true.

The final stage of cognitive development is, as outlined by Piaget, one in which individuals become capable of carrying out formal mental operations. That is, they can create and understand functional sets of words, equations, and symbols for the purpose of manipulation. As Gardner describes, "where once [the child's] physical actions transformed objects, now mental operations transform sets of symbols" (Gardner, 2011, p. 138). This ultimate point in the development of the logical-mathematical intelligence is indicative of complete abstraction from the material world. The now adolescent is able to form scientific hypotheses based on logical understanding and syllogistic reasoning.

While understanding the progression by which the logical-mathematical intelligence develops may not seem crucial to understanding the intelligence in general, I believe that doing so helps to accomplish two goals. The first goal is that this process sheds light on the association between logical and mathematical cognition, helping to explain why Gardner groups the two abilities into a single intelligence. It is a relatively commonly held belief that mathematics and logic often go hand-in-hand, as individuals who possess competence in one area frequently excel in the other as well. The reason

behind this, however, is less commonly known, and often is simplified into an individual being categorized as "left-minded". Piaget's cognitive theory shows that the relationship does exist, and demonstrates why the two so often exist as a pair.

Willard Quine, an American logician and philosopher, characterized the linkage between the two as a progression, claiming that "logic is involved with statements while mathematics deals with abstract, nonlinguistic entities, but that at its 'higher reaches' logic leads by natural stages into mathematics" (as cited in Gardner, 2011, p. 142). The position was supported by logician Bertrand Russell, who metaphorically described the relationship, "they differ as boy and man: logic is the youth of mathematics and mathematics is the manhood of logic" (as cited in Gardner, 2011, p. 142). While competence in logic and mathematics can be found independently of one another, it is clear why Gardner has included them as a duo in the logical-mathematical intelligence.

The second goal behind explaining the development of the logical-mathematical intelligence is that doing so reveals its application to the work of a practicing physician: abstraction. That is, physicians must be capable of separating themselves from the physical world that is within their grasp and instead must be able to rely on well-agreed upon truths within the scientific community. This can be illustrated through the example of jaundice, also known as icterus. Jaundice is a condition in which yellow pigmentation exists on the skin, the conjunctival membranes of the sclera, and/or other membranes throughout the body. It is caused by an increased concentration of bilirubin (a product of hemoglobin breakdown) within the blood, and is most commonly associated with hepatitis or liver cancer (Journal of the American Medical Association, 2013).

Recalling our stages of development, physicians lacking logical-mathematical intelligence would be bound to the physical world that is within their reach. Thus, their evaluation of a patient presenting jaundice would most naturally lead to the conclusion that said patient is suffering from a malfunction or deficiency of the skin or eyes, as those are the physical features that are visibly affected. Consequently, the testing that such a physician would likely call for would be localized to the aforementioned areas, and the critical organ that is failing, the liver, would go unaddressed.

A physician with a matured logical-mathematical intelligence, meanwhile, would prove capable of looking beyond the seemingly obvious conclusion that leads to the incorrect diagnosis, and instead rely on the information and truths previously obtained in the field of medicine. Such a physician would be able to move through the logic and syllogisms of a differential diagnosis, such as the one shown below for a patient presenting with jaundice (Figure 3). Rather than limiting their possibilities, physicians with developed logical-mathematical intelligences can move from one step of diagnosis to the next, even when neither step has a visible connection to the initial symptoms observed.

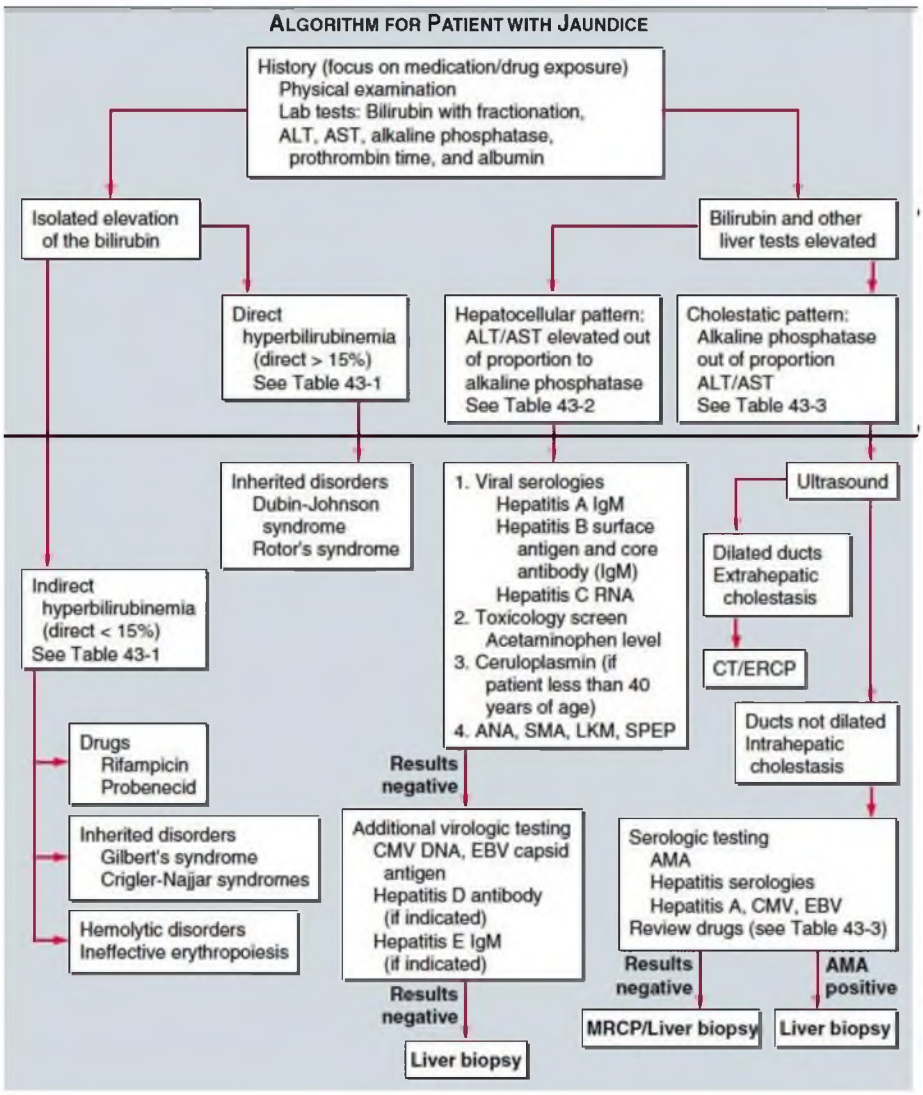

Figure 3: Differential diagnosis used for patient presenting with jaundice ("TBL", 2011).

The expanse of medicine is far too large for physicians to limit themselves to the physical world at their fingertips. Rather, one must prove capable of abstracting themselves from the insufficient information in front of them, and instead rely on the truths and protocols determined by the medical community. While memory is an important tool for a physician (as was discussed in the Linguistic Intelligence chapter), the ability to utilize reason is even greater. This is because when reason functions as

one's guide, a lapse in memory can be filled in simply by following one syllogism to the next. Gardner demonstrates that the ability to do this comes with a developed logical-mathematical intelligence by quoting mathematician Henri Poincare, who stated, "I need no longer fear lest I forget one of the elements, for each of them will take its allotted place in the array, and that without any effort of memory on my part" (as cited in Gardner, 2011, p. 145).

It is apparent that the logical-mathematical intelligence is an essential quality for the practicing physician. Without it, one is bound to the physical world in front of them, and is therefore unable to rely on the given truths that have been abstracted both by physicians themselves, as well as past workers in the medical industry. Consequently, it is quite reasonable that medical school admissions boards test for the presence of this intelligence in aspiring medical students, both through the MCAT and required classes.

IV. The Personal Intelligences

The two final intelligences to be discussed are the intrapersonal intelligence and the interpersonal intelligence. While these two modes of intellect are undoubtedly distinct in their function and expression, their development is inherently linked to each other. Consequently, Gardner chose to explain the two as part of a single chapter, "The Personal Intelligences" (2011). In a similar fashion, this section will work to illuminate both of these intelligences, including their housing within the brain, methods of development, and finally, their applications to the work of a physician. While the pages to follow do intertwine the intrapersonal and interpersonal intelligence in particular areas, it would be a mistake to combine the two completely, as each holds distinct characteristics and plays a role in independent functions.

The parts of the brain most associated with the personal intelligences are the frontal lobes (Figure 3). Similar to the other intelligences, much of the information acquired regarding the housing of the personal intelligences comes from the study of various pathologies within the brain, be it lesions or disease-related damage.

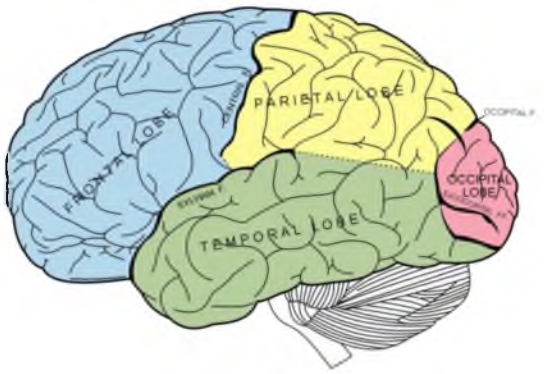

Figure 2: Lobes/regions of the human brain ("Human Brain", n.d.).

This may not come as a surprise to many, as there are a great number of miraculous stories of individuals who survive severe brain injuries with nothing but personality changes. Most well-known of these anecdotes is that of Phineas Gage, a 19th century railroad construction foreman who lived quite normally after a large iron rod pierced his skull. Gage's initially inexplicable case was instrumental in the discovery that the characteristics of one's personality are largely contained in the frontal lobes, as the rod's damage was confined primarily to his left frontal lobe (MacMillan, 2000). A different, but perhaps more relatable, example in contemporary society is the pathology of autism. While the spectrum of symptoms is quite large, a common affection is the impairment of social capabilities in which the individual experiences difficulties in communication that can produce a hindered sense of self. In spite of this, many individuals with autism prove capable of retaining computational functions such as musical or mathematical performance, sometimes to a degree much greater than the average unaffected individual.

Less well known is the case of Zasetsky, a young soldier of World War II who experienced the reciprocal impairment of the aforementioned cases. At the age of 23, Zasetsky suffered a bullet wound to the left parieto-occipital area of the brain during the Battle of Smolensk in modern-day Russia. Following the injury, Zasetsky was comatose for a significant amount of time, under the care of Russian neuropsychologist Alexander Luria. When Zasetsky finally awoke, he was unable to perceive the entire right side of his body. Furthermore, Luria reported that Zasetsky showed severe reductions in speaking and writing capability, basic motor functions, and cognitive tasks as simple as describing a picture or ordering the seasons. His person-related functions, however, were documented by Luria to be entirely intact. That is, Zasetsky continued to present desire, will, and sensitivity to experience as functionally as an uninjured adult would be expected to. While the mnemonic practice of recalling a word's definition was diminished, Zasetsky could comprehend the general connotation of a word by relying simply on the feeling it evoked (as cited in Gardner, 2011).

Specific aspects of the personal intelligences are hypothesized to be dependent on particular areas within the frontal lobes. The work of neurologists Frank Benson and Dietrich Blumer, for instance, suggests that damage to the high regions of the frontal lobes is often secondary to depressive personality changes, such as apathy, slowness, and listlessness. Meanwhile, injury to the lower regions of the frontal lobes is frequently associated with euphoria, hyperactivity, and irritability (as cited in Gardner, 2011).

Interestingly enough, the frontal lobes of the brain are not crucial to developed personal intelligences because they contain the neurons responsible for the specific

functions involved. Instead, this region of the brain serves as the rendezvous point for information sent from the two realms of the brain most responsible for the functions of personal intelligence: the limbic system and the posterior region of the brain. The former, composed of various structures from the telencephalon, diencephalon, and mesencephalon, houses an individual's emotional and motivational function, which together determine one's internal state. The latter, most notably the parietal and occipital lobes, is responsible for the sensory information taken in from the surrounding environment. The knowledge attained by these two pivotal regions converges within the neural networks of the frontal lobes, allowing for their integration.

The intrapersonal intelligence is, as the name suggests, the capacity for knowing one's self. Gardner refines his definition of this intellect even further by limiting the knowledge to one's emotions, clarifying, "the core capacity at work here is *access to one's own feeling life*" (2011, p. 253). The most basic form of this intelligence is the simple distinction between the feeling of pleasure and the feeling of pain. An individual with a matured intrapersonal intelligence, meanwhile, is able to understand a more complex array of differentiated emotions. A readily understandable example of this is individuals' recognition of an occurrence being a "blessing in disguise". That is, they are capable of acknowledging the transition in their feelings about an event from being initially hesitant and negative to one more accepting and in favor of it. An additional component of this intelligence can be thought of as "meta-emotion", meaning that not only is one capable of recognizing the emotions being felt, but can also analyze how the cognitions and effects that have been produced as a result.

Intrapersonal intelligence is unique in that the desire to attain it seems to be more universal than other forms of intelligence. For example, there are many people who possess no musical intelligence whatsoever and are content to remain as such; the same could also be said about some individuals who lack kinesthetic intelligence. Perhaps this is a result of intrapersonal intelligence seldom being associated with intellect, just as a kinesthetically gifted individual is rarely called intelligent simply because of their athleticism. Rather than being labeled as unintelligent, individuals lacking intrapersonal intelligence are almost viewed in a pitiful manner. One might suggest that this is because the idea of "knowing oneself"- which is the general core of intrapersonal intelligence- seems almost innate to human beings. The process of introspection is a natural byproduct of the rational thought that separates *Homo sapiens* from other animal species. Thus, a person who lacks intrapersonal intelligence is missing an integral part of what it means to be human.

Like other forms of intelligence, intrapersonal intelligence can be evaluated on a quantitative scale; though comparing such quantitation to that of another individual would present a challenge. This is as a result of the scales of measurement for two individuals being entirely different. For most intelligences, the subject that is being "learned" is fixed and separated from the individuals attempting to learn them. Linguistic intelligence, for example, is based off the understanding of a particular language and the usages of words within it. The depth of linguistic knowledge is finite and knowable, and thus the progress of an individual in attaining such knowledge is measurable. The depth of intrapersonal knowledge is neither fixed nor bound. Furthermore, though the amount

of intrapersonal knowledge within an individual that is capable of being measured is not quantifiable, it is reasonably safe to assume that such amounts vary between individuals. This is to say that because some people are more emotionally complex individuals, they have more information that is capable of being learned than someone who is relatively simple in their emotions.

It should be noted that intrapersonal intelligence is not the closeness of an individual to achieving some "gold standard" of emotional stability, security, etc. There is no ideal state of emotion that lies at the apex of emotional intelligence. Rather, the peak of intrapersonal intelligence is seen in individuals who wholly understand themselves, inside and out. The differentiation with these two scales is that in the latter, individuals who are greatly emotionally unbalanced are capable of possessing intrapersonal intelligence, so long as they are cognizant of the nature and specificities of their imbalance.

Now that the details and interworking of the intrapersonal intelligence have been explored, it is necessary to evaluate their applications to practicing medicine. It is well agreed upon that the work of a physician is quite strenuous and difficult. While there are many different discernments falling under the general classification of "physician", the common thread throughout them is the care of individuals' health. Such a task is of utmost importance, as those who are under a physician's care are dependent on that care for successful day-to-day living. Physicians who understand the seriousness of this situation and care about the impact of their work will experience the other edge of the swords; that is, the stress that comes with caring about the outcome. This stress is two-

fold, as physicians first feel the mental pressure of performing to the best of their ability to ensure the highest level of care for their patients. Considering the given complexity of the human body and the intricate methods by which it can be cared for, providing optimal healthcare is by no means a simple task. Rather, it requires constant mental vigilance and enduring engagement of cognition. Such a task is a daunting request for physicians, and being aware of the stakes of their actions can cause extensive anxiety in their minds.

After physicians have administered their care, they must monitor the changes that follow for the patient receiving treatment. Doing so is undoubtedly an emotionally taxing experience, as the empathetic response that is rooted in the human condition causes the physician to vest concern in the patient's health. While the degree to which one is affected by this is dependent on the particular physician, even a relatively stoic practitioner will likely experience emotional disturbance with repeated exposure. This affection is augmented by the weight of personal and professional responsibility, as a physician is liable for the patient's health if improper care was administered.

Processing such mental and emotional distress successfully is intimately contingent on a developed intrapersonal intelligence. As was mentioned previously, such intelligence does not predicate emotional security that is easily capable of dealing with such trauma. Though such a capability would be beneficial to a physician, it is not a necessity if one is able to compensate for its absence. Such counterbalance is dependent on a matured intrapersonal intelligence, as there are actions that can be taken to prevent occupational anguish from hindering professional work. For example, if physicians are aware that they are especially vulnerable to grief when their patient's health deteriorates,

they can undergo regular therapy as a means of coping. This may simply allow for physicians to vocalize their feelings about the issue, or perhaps provide a method by which they can cope with such situations in the moment.

The interpersonal intelligence extends outwards to the community that affects an individual. Gardner's definition specifies that "the core capacity here it *the ability to notice and make distinctions among other individuals*", with particular emphasis on their motivations, intentions, temperaments, and moods (2011, p. 253). At its most primitive level, the interpersonal intelligence can be seen as operational in young children who have recently learned how to discern whether their parents are upset or pleased with them. This basic intellect is limited to reading moods and feelings only when they are made explicit, as is typically the case when a father or mother is communicating with his/her child. Individuals with developed interpersonal intelligence, meanwhile, are able to interpret temperaments of others even when it is less obvious or attempting to be hidden from them. Arguably the greater skill that comes with the evolution of this intelligence is an individual's subsequent action that is informed by the understanding of those whom they are interacting with or attempting to influence.

If the logical-mathematical intelligence enables physicians to abstract themselves from the material world, the interpersonal intelligence is what allows them to reengage back into it. While the ability of physicians to separate themselves from the patient is often necessary in order to make logical decisions regarding protocol, there are many choices that are dependent on the physician being able to read the patient beyond what is simply observed or stated. For example, a physician must be capable of perceiving the

patient's level of honesty. Perhaps the patient is withholding the truth out of embarrassment, or possibly because of the audience present at the time. For instance, if the perpetrator of domestic abuse is present while the victim is disclosing the situation to the physician, it is unlikely that the victim will provide an honest account. In another example, if patients seek treatment as a result of illegal activity, they may withhold information if they are unsure of the doctor's legal obligations. In order to ensure proper treatment of the patient, the practicing physician must discern the accuracy of the information being provided.

Furthermore, a developed interpersonal intelligence is essential for a functional patient-physician relationship. There is no time in life in which people feel more vulnerable or fearful than when their body is in a state of disrepair, as they are seemingly powerless to restore it. It is absolutely crucial for a physician to be capable not only of assessing the physical infirmities affecting the patient, but also to be able to perceive the emotional damage that has likely incurred. After gauging these affections, the physician must act to ensure that the patient's altered emotional condition receives attention. With severe detriments to emotional status, a physician might encourage the patient's use of a therapist specialized in the treatment of those with damaged health. Even if the patient is not distressed enough to merit outside psychological treatment, physicians must adjust the way they speak to the patients based on their perceived temperament. For example, if it is evident that the patient is fearful about receiving treatment, it may be necessary for the physician to take extra time to explain the details of the procedure, as well as the reasons why it is necessary. Doing so not only establishes trust within the patient-

physician relationship, but also ensures that the patient's hesitation will not prevent them from receiving optimal care.

The successful utilization of one's interpersonal intelligence is inherently contingent on a well-developed intrapersonal intelligence. The way in which one perceives others is inevitably tinted by the perceiver's own qualities and experiences. As such, the way in which one person reads the emotions of another is inescapably biased, which can lead to the incorrect action taken in response. Take, for example, a physician who does not have children who is treating a newborn with a mild fever. The fever does not evoke much concern from the physician, as he has dealt with many similar cases that have been resolved without a problem. The newborn's parents, however, may be much more concerned than the physician because they have not witnessed as many cases as the physician. If the physician is unable to recognize his own bias of being more knowledgeable about the mildness of the condition, he is liable to view the parents as overly distressed, possibly dismissing them as hypochondriacs when addressing them. No matter how in-touch the physician's interpersonal intelligence is, he will be unable to utilize it successfully, as it will not be informed by a developed intrapersonal intelligence.

It should hopefully be apparent from the preceding pages that the personal intelligences are essential to the physician, and should therefore be incorporated into the medical school admissions process quite heavily. To close this first section of this thesis- the intelligences- I will include a partial script from the pilot episode of television show *House M.D.*, one of the most popular dramas aired in the first decade of the 21st century. In the show, Dr. House is a brilliant physician who is renowned for his astounding

intellect, but also infamous for his resentment of patients. Through Gardner's framework of *The Theory of Multiple Intelligences* (2011), one might say that Dr. House exceeds in the linguistic and logical-mathematical intelligence, but falls short in the personal intelligences. The following is a conversation between Dr. House and two of his fellow physicians aimed at diagnosing a patient.

Dr. Foreman: Shouldn't we be speaking to the patient before we make a diagnosis?

Dr. House: Is she a doctor?

Dr. Foreman: No, but she may—

Dr. House: --Everybody lies.

Dr. Cameron: Dr. House doesn't like dealing with patients.

Dr. Foreman: Isn't treating patients why we became doctors?

Dr. House: No. Treating *illnesses* is why we became doctors. Treating *patients* is actually what makes most doctors miserable.

Dr. Foreman: So you're trying to eliminate the humanity from the practice of medicine?

Dr. House: If we don't talk to them, they can't lie to us. And we can't lie to them. Humanity's overrated. (Shore, 2004)

It is evident from this interaction that the consequence of a physician who lacks the personal intelligences is the inability to value patients for their dignity and inherent humanity. Thus, while the linguistic and logical-mathematical intelligence and

undoubtedly of necessity in the practice of medicine and should therefore be tested for in aspiring physicians, so too should the intrapersonal and interpersonal intelligence.

V. The Current Admissions System

Now that we have covered the intelligences that are indispensable for a practicing physician, we can shift our focus to the ways in which medical school admissions boards evaluate (or fail to evaluate) for their presence within candidates. There are many variables that affect an applicant's chances to be admitted into medical school, but in effort to hold to the purpose of this thesis, the scope of analysis will be restricted to two factors: an applicant's Medical College Admissions Test (MCAT) score and Grade Point Average (GPA). These two factors were chosen because they are used as the first line of defense for admissions boards. Within the year 2013 alone, over 48,000 students applied to medical school (Mann, 2013). Consequently, the possibility of combing through the application of every single student who applies is simply not realistic. Rather, medical schools must be able to have a quick method of evaluating an application that determines if it merits a closer look. While individual medical schools do not release the specificities of such a process, I do not believe it would be too far of a reach to speculate that one's MCAT score and GPA play a large role in this algorithm.

The first factor to be discussed is the MCAT. As the name suggests, this test is required for entry into almost every medical school in the United States. Simply put by the exam's developer and administrator, the American Association of Medical Colleges (AAMC), the MCAT is a "standardized, multiple-choice examination designed to assess the examinee's problem solving, critical thinking, and knowledge of science concepts and

principles prerequisite to the study of medicine" (American Association of Medical Colleges [AAMC], 2013b).

The exam's current "phase" has been in use since 1992, and includes three subjects: the Physical Sciences (containing general chemistry and physics), the Biological Sciences (containing organic chemistry and biology), and Verbal Reasoning. A writing section was incorporated as well in the past, but was excluded in 2013. Each subject is scored on a scale from 1-15, making the maximum possible composite score 45. The exam is graded on a bell curve, resulting in an average score of 25.5 for nearly ninety thousand tests in 2012 (AAMC, 2012c). The average applicant to medical school in 2012 had an MCAT score of 28.3, while the mean score for a matriculated student was 31.2 (AAMC, 2012b). While the consideration given to an applicant's MCAT score varies between medical schools, a survey conducted by Kaplan (one of the primary MCAT preparatory companies) found that 76% of pre-med advisors deemed the MCAT to be a very important part of medical school admissions (2012).

So the important question is: does the MCAT evaluate an applicant for proficiency in all the intelligences we have outlined? First, let us look at the Biological and Physical sciences sections of the MCAT, of which Kaplan makes the following statement: "The MCAT is not just a science test; it's more importantly a critical thinking test. This means that the test is designed to let you demonstrate your thought process in addition to your thought content" (2012a). To do this, the MCAT utilizes two primary question types. The first form of question is passage-based, in which the test provides a section of prose between one and four paragraphs that is often accompanied by a

diagram, and asks a series of questions related to the information given. This is the most common question, typically composing around 80% of the test. In one of the Kaplan practice tests, for example, the given prose describes an experiment in which two horizontal plates are a given distance away from one another, and the test-taker must calculate the electric field present between the two based on a given voltage (2012b).

In order to answer such a question correctly, the test-taker must prove proficient in multiple areas. First, one must be capable of comprehending the prose. This includes understanding the information being supplied, as well as the ability to discern which material provided is relevant enough to merit attention. The latter is especially important, as the test purposely includes nonessential information to distract the test-taker; additionally, the MCAT must be taken in a timely manner, for there is little over one minute allotted to the test-taker per question. Second, the individual must possess the previous knowledge required in order to answer the question. In this example, test-takers' success is tied to their ability to recall that the electric field is equal to the quotient of the system's voltage over the distance of separation. Such a formula is integral to the study of electromagnetism within second semester physics- a course required for entry to medical school and highly suggested before taking the MCAT. Thus, we see that test-takers' comprehension of this equation is dependent not only on their ability to learn it within the classroom, but also to retain the information for the time to follow. Third, the test-takers must be capable of thinking critically to integrate their initial knowledge with the significance in the provided prose to solve the problem.

Given these necessary proficiencies, we begin to see the test's reliance on both the logical-mathematical and linguistic intelligence. The former is crucial for the preliminary understanding of the information, as the comprehension of this physics concept demands abstraction from the physical world. That is, the theory behind voltage and electric fields is not intuitively understood or automatically concluded by most college students, as its workings are beyond the realm of the naked eye without practical experimentation. Therefore, test-takers are dependent on their ability to understand the information supplied to them as a given truth. Students must then solidify the concept in their mind to be used later, such as on the MCAT. Doing so requires a developed linguistic intelligence, as individuals frequently rely on linguistic presentation of a concept to fully commit it to memory.

When evaluating the prose for significance, the test-taker is again dependent on the linguistic intelligence, as this aspect of intellect affects one's understanding of semantics and pragmatics. As was mentioned in the Linguistic Intelligence chapter, the former is necessary for comprehending the explicit meaning behind a word or sentence. The application here should be obvious, as the test-taker must understand the denotations of the text. Pragmatics, on the other hand, extends beyond the outright meaning into the realm of the implicit. When dissecting the mass of information provided by the MCAT, true control of pragmatics is indispensable, as the way in which particular pieces of information is presented often alludes to their importance.

Finally, in order to answer the question one must utilize the logical-mathematical intelligence to act upon the mathematical equations involved. The test-taker is often

required to rearrange the equation in order to isolate the variable they desire to solve for; many questions will actually forego the use of real numbers and instead ask the test-taker to define the variable only by its relationship to the other variables involved. This connection to the logical-mathematical intelligence requires very little explanation, as the ability to manipulate mathematical expressions is deeply connected to this intelligence.

The second kind of question used is the discrete question, which is not accompanied by a passage. Instead, the test poses a question based on knowledge that the test-taker is expected to know after taking the suggested classes. Kaplan labels these questions as "wild cards", as they are liable to test any realm of the test-takers scientific knowledge base, and thus are difficult to prepare for specifically (2012b). One example of such a question is seen within the Biological Sciences section of a Kaplan practice test: "Which of the following compounds has the most stable structure? - A: Cyclopropane; B: Cyclohexane; C: Cyclononane; D: Cyclodecane" (2012b, p. 98). This particular question stems from the field of organic chemistry. Test-takers' ability to determine the correct answer in this situation is dependent on their understanding of two primary concepts. First, one must comprehend the method of organic compound naming. That is, based on the given compound name, what is the physical structure of the molecule? Second, the test-taker must grasp the theory behind compound stability based on angle strain. Both concepts are integral to the study of organic chemistry, and thus such a question is fairly representative of what one might expect to find on the MCAT.

For this second question type, we find the test-taker to again be dependent on similar aspects of linguistic and logical-mathematical intelligence. For the initial

understanding of the material within an organic chemistry course, one must possess a developed logical-mathematical intelligence capable of learning based on a given truth beyond what is clear to the naked eye. The linguistic intelligence is then necessary in order to store the information within one's long-term memory, as the MCAT will often be taken well over a year after completing the course.

Now that we have examined the Biological Sciences and Physical Sciences sections of the MCAT, we can evaluate the final portion of the test: Verbal Reasoning. Unlike the other sections, all Verbal Reasoning questions are passage-based. The length of passages ranges between four and ten paragraphs, followed by four to seven questions. Also unlike the rest of the test, the Verbal Reasoning passages and questions are not limited to the sciences. Test-takers are just as likely to be faced with readings from philosophy or literature as they are ones from the natural or physical sciences. While there is a great amount of variability within the Verbal Reasoning section, Kaplan refines the list of questions asked into six fundamental categories: "Main Idea, Detail, Inference, Application, Tone, and Logic" (2012b, p. 37).

The first of these question types, "Main Idea", asks the test-taker to assess the primary point of the passage provided. In order to answer successfully, one must not only be able to understand the information being conveyed, but also determine the author's reason for writing. To do so, the test-taker must identify the implicit intentions of the writer, then determine the reading's scope. The second step is crucial to finding the right answer; many questions will include multiple answers that may, in fact, be related to the author's purpose for writing, but in reality are too specific or too broad to be correct.

With "Main Idea" questions, we see the MCAT testing for the linguistic intelligence, specifically for the presence of semantic and pragmatic proficiency.

The "Detail" questions of the Verbal Reasoning section evaluate an individual's ability to recall specific inclusions from the reading. The correct answer is always explicit within the passage, though some details may be more hidden than others. Because "Detail" questions assess test-takers for their retention of the reading, the mnemonic facet of the linguistic intelligence is being put to work. A devil's advocate might make the claim that rather than relying on memory, one can simply refer back to the reading to find the answer; this is a valid point, as all passages are available to the test-taker throughout the Verbal Reasoning section. However, such an approach would hardly be time-efficient, as only ninety seconds is allotted per question. Furthermore, several of the "Detail" questions on the MCAT are "except" questions; that is, they ask the test-taker to identify the one detail that was not present in the reading. Such questions would present great difficulty for those who simply rely on scouring the passage for the correct answer, as they would have to locate the three details that do exist in the reading and choose the leftover answer as the correct one. We see, therefore, the test-taker's reliance on the mnemonic aspect of the linguistic intelligence. One's development in this operation allows for relative ease in answering these questions, as the correct answer will be readily identifiable. At the very least, test-takers who utilize the linguistic intelligence will have some general recognition of the passage structure, allowing them to skim over the paragraphs quickly to find the right answer.

The next question type, "Inference", is a call to the test-taker to identify a statement or position that is consistent with the main idea presented in the passage. More specifically, one must make an inference based on what is believed to be the conclusion of the author. Unlike a "Detail" question, the answer to an "Inference" question can seldom be linked to a single statement within the passage. Rather, it is dependent on the test-taker's ability to comprehend the author's conviction, then extend it to another logical statement. As such, "Inference" questions call on an individual's logical-mathematical intelligence, as one must abstract themselves from the physical world they know and instead cling to the words and conclusions of the author. Additionally, the linguistic intelligence makes an appearance in these questions, as the passages within the Verbal Reasoning section almost always make an argument of some sort. As was discussed earlier, a successfully developed argument contains elements of *ethos, pathos,* and *logos*. "Inference" questions evaluate for the test-taker's ability to trace the *logos* aspect of the author's claim and extend it one step further to a logical deduction.

"Application" questions from the Verbal Reasoning section are quite similar to "Inference" questions, as they ask the test-taker to consider the significant concepts present in the passage and relate them to a separate context. For instance, a question might present an analogy or metaphor and ask the test-taker to identify the answer choice that parallels the relationship in the passage. In order to answer correctly, one must be able to comprehend the essential points within the reading, understand the separate context being proposed, and make the connection between the two. The first two tasks are intimately dependent on the test-taker's linguistic intelligence, as one cannot hope to

analyze both contexts without a dexterous command of syntax, pragmatics, and semantics. Analyzing the relationship between the two, meanwhile, is contingent on the logical-mathematical intelligence. The realization of a connection that one would not necessarily otherwise make requires the abstraction of oneself from the physical world in which these two situations bear little relation, and instead to break both down into a series of individual components to identify similarity.

The fifth type of question, "Tone", tests for one's ability to interpret the feelings or opinions of the author. Because passages within the Verbal Reasoning section come from a variety of disciplines, the attitudes of the author being analyzed by the test-taker may be pertaining to a number of subjects such as an event, a theory, or even another person. In order to succeed on this type of question, test-takers must utilize their interpersonal intelligence, as they must analyze the mindset of another individual. Using the distinctions made in the Personal Intelligences chapter, this use of the interpersonal intelligence would most likely be categorized as primitive, as the test-taker is not using the information gained to inform interactions with the individual being evaluated, but instead are only reporting what they have perceived.

"Logic" questions are the final question category within the Verbal Reasoning section. While several other question types rely on the use of logic, Kaplan distinguishes this category as one that "asks you about the role of a test element in logical structure of the passage" (2012b, p. 39). In other words, questions of this form ask the test-taker to identify the function that a particular word, example, or paragraph plays in informing a specific idea. As the name would suggest, such questions rely heavily on the logical-

mathematical intelligence. This is, again, because in order to answer the question correctly, one must abstract themselves from the physical world they know, and instead grasp onto the logic provided to them by the author. Only by doing so can the test-taker decipher how a particular phrase or illustration supports the argument. Like "Inference" questions, "Logic" questions rely on the *logos* aspect of the linguistic intelligence. Test-takers must prove capable of analyzing the contention of the author extensively enough that they can identify the support beams that hold up the writer's claims.

The second criterion that is greatly relied upon by medical school admissions boards is an applicant's GPA. While only a small portion of the classes taken by an applicant are those required by medical schools, the GPA that results from these select classes is often weighted quite heavily in the admissions process. Therefore, it would only be logical for this required curriculum to test for the presence of the necessary intelligences, as this would ensure that an applicant's GPA is a reflection of their potential. Currently, the required undergraduate curriculum prior to admission to most medical schools is as follows: mathematics, principles of chemistry, organic chemistry, biology, physics, and English. While some institutions vary in the amount of semester hours they require for each, in general students must complete two full semesters of the aforementioned courses.

The first of these requirements, mathematics, necessitates very little explanation with regard to the intelligences it evaluates for. Most medical schools recommend that mathematics course taken be at least at the calculus level, and therefore we see a clear dependency on the logical-mathematical intelligence. As was clarified in the Logical-

Mathematical Intelligence chapter, the final developmental stage of this intelligence is seen, "where once [the child's] physical actions transformed objects, now mental operations transform sets of symbols" (Gardner, 2011, p. 138).

Within principles of chemistry and organic chemistry, a student is evaluated for both their linguistic and logical-mathematical intelligence. Principles of chemistry is often students' first introduction to chemistry, and thus their ability to comprehend these brand new concepts is deeply dependent on the understanding of the subject's explanation. Whether this explanation comes from a professor or a textbook, its understanding is derived from one's linguistic intelligence. Furthermore, students in this introductory course must exhibit proficiency of the logical-mathematical intelligence, as they are required to perform mathematics on a regular basis, ranging from stoichiometry to percent yields. Organic chemistry relies heavily on a student's ability to understand and predict chemical mechanisms, as well as to memorize the effects of various reagents within those mechanisms. Here we see the linguistic intelligence and the logical-mathematical intelligence intertwined in practice, as the inability either to recall reagent specifics or to logically infer the progression of a chemical reaction will result in failure.

While the spectrum of what classifies as introductory biology is quite wide, the skills that are relied on are shared by most courses. Mnemonics is an essential function at work in any biological course, as exams continually demand students to recollect information, ranging from the characteristics that distinguish a cell as being eukaryotic to the eight primary taxonomic ranks for organism classification. Additionally, every biology course is heavily infused with the scientific method- a process that was designed

from the ground up on the basis of logically informed inferences and syllogisms. It is evident therefore, that students' ability to succeed in the biological sciences is intimately contingent on their linguistic and logical-mathematical intelligences.

The final science course of the premedical requirements, physics, places a great amount of stress on a student's logical-mathematical intelligence. At the heart of physics is a deep reliance on mathematics, and thus a student must be proficient in the manipulation of numbers and numerical expression in order to succeed. What's more, the second semester of most physics courses places focus on the operations of electricity, magnetism, and quantum mechanics- all of which are conceptually complex enough that they force the student to rely on many truths provided in the classroom. At work here is the art of abstraction, and thus a student must exercise logical-mathematical intelligence throughout the course.

Just as the intelligence corresponding to the mathematics requirement needed little explanation, so too is the intelligence tested in the English requirement quite predictable. All four linguistic functions described in the Linguistic Intelligence chapter- rhetoric, mnemonics, explanation, and metalinguistic analysis- are both grown and evaluated for throughout the duration of an English course. Such functions are developed through the readings one is exposed to, as well as through the writings that one must complete.

From this analysis, it is clear that the MCAT is successful in evaluating those who take it for their linguistic and logical-mathematical intelligence, as all three sections test various aspects of each. However, the personal intelligences seem to be relatively

ignored, as the only questions to address one's competence in this area are the "Tone" questions within the Verbal Reasoning section. In a similar fashion, the required premedical curriculum quite ostensibly evaluates for the linguistic and logical-mathematical intelligence, while there is little to no consideration given to the intrapersonal and interpersonal intelligence. Considering these tools are designed to be predictors of an applicant's capabilities necessary for the eventual study of medicine, it seems as though there is a significant amount of necessary knowledge that is currently going untested.

VI. Changes Ahead

In the fall of 2008, the AAMC appointed twenty-one of its committee members with the task of reviewing the current MCAT exam and recommending necessary changes to it. The group, named the MR5 advisory committee, was selectively composed of 21 members from a number of departments: "medical school deans, admissions, educational affairs, student affairs, and diversity officers, basic and clinical sciences faculty, pre-heath advisors and other baccalaureate faculty, a resident, and a medical student" (AAMC, 2013b). This would be the test's fifth major modification process since its beginning in 1928, the most recent revamp having been in 1991. The amended MCAT phase will begin administration in 2015, and thus it is aptly referred to as the MCAT^{2015}.

While the committee was chosen to lead the process, the methods of evaluation were by no means limited to the input of the aforementioned members. On the contrary, the operation was aided by the contribution of advisory committees from an amalgam of discernments from multiple countries. Furthermore, information was collected from over 75 outreach events hosted by the AAMC, as well as thousands of surveys that were extended to individuals related to nearly every step of the process to becoming a physician, beginning at undergraduate. At surface level, the decision to revise the current test was made in an attempt to "increase the exam's value to medical school admissions committees and examinees" (AAMC, 2013b). But while this publicized intention is accurate, its vagueness and lack of specification hides the reality that this modification is, in fact, likely to be the test's largest overhaul since its creation.

At the core of the exam's alteration is the root movement of the premedical process towards a focus on required *competencies* for applicants rather than required *courses*. That is, rather than having an outlined set of courses that an applicant must complete prior to applying to medical school, there is a set of scientific competencies that students must attain at some point in their education. For all intents and purposes, competency is defined by the AAMC-HHMI (Howard Hughes Medical Institute) Committee as being "the knowledge, skill, or attitude that enables an individual to learn and perform in medical practice and to meet or exceed the standards of the profession" (2009). The AAMC-HHMI Committee identifies eight scientific competencies deemed to be necessary for entering medical students:

1. Apply quantitative reasoning and appropriate mathematics to describe or explain phenomena in the natural world.
2. Demonstrate understanding of the process of scientific inquiry, and explain how scientific knowledge is discovered and validated.
3. Demonstrate knowledge of basic physical principles and their applications to the understanding of living systems.
4. Demonstrate knowledge of basic principles of chemistry and some of their applications to the understanding of living systems.
5. Demonstrate knowledge of how biomolecules contribute to the structure and function of cells.
6. Apply understanding of principles of how molecular and cell assemblies, organs, and organisms develop structure and carry out function.

7. Explain how organisms sense and control their internal environment and how they respond to external change.

8. Demonstrate an understanding of how the organizing principle of evolution by natural selection explains the diversity of life on earth. (2009, p. 22).

It is from these eight competencies that educators at various undergraduate institutions are advised to design their educational programs for premedical students, or at least this is the intention stated by the AAMC-HHMI Committee. The reasoning behind this transition from required courses to required competencies "is to provide greater flexibility in the premedical curriculum that would permit undergraduate institutions to develop more interdisciplinary and integrative science courses" (AAMC-HHMI, 2009, p. 2).

Though this intention seems significant and worthwhile in and of itself, I believe transitioning the focus of premedical education towards competencies transforms the perceptions commonly held by premedical students regarding the courses they must take in order to apply for medical school. That is, many students view the current class requirements simply as boxes that must be checked prior to admission into medical school, without any true relevance or necessity to the work of a physician. More specifically, it is a commonly held belief by students that "medical schools stress organic chemistry and physics not because they are critical to medicine but because they are tough courses that tend to eliminate large numbers of applicants" (Gellhorn, 1976, p. 7). It is important to note than this transition will not result in premedical students avoiding the courses that have been taken in the past- most upcoming students applying to medical

school will have similar course loads as those before them. But by shifting the focal point towards competencies and identifying which courses are designated to address each one, students will likely be able to maintain their motivation for courses that may have seemed less relevant in the past.

While the MCAT^{2015} and the premedical curriculum are focused around these competencies, the AAMC provides further categorization between the MCAT topics/curriculum and the competencies. More specifically, the AAMC outlines ten Fundamental Concepts- defined as "the big ideas in the sciences that provide the foundation for learning in medicine" (AAMC, 2014)- and four Scientific Inquiry and Reasoning Skills- defined as "the inquiry and reasoning skills that are required to solve scientific problems" (AAMC, 2014)- that serve as a link between the tested information and the scientific competencies (Figure 5).

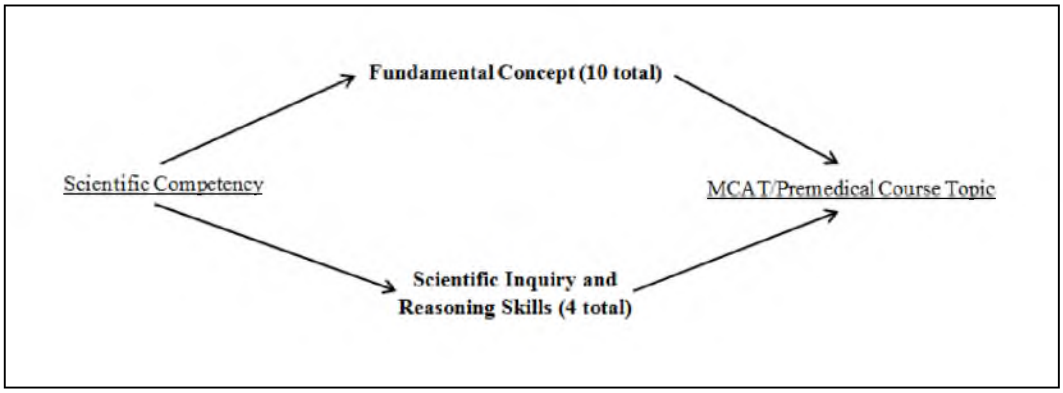

Figure 5. Schematic showing terminology relationships.

This further differentiation by the AAMC allows for increased specification with regards to the distinct scientific concepts that are being tested. Nearly all of the

Fundamental Concepts and Scientific Inquiry and Reasoning Skills are rooted in scientific competencies and are tested for specifically in a particular MCAT section/premedical course. The specific distribution of these Concepts and Skills will be covered in the pages to follow.

The MCAT^{2015} will consist of four prominent sections: Biological and Biochemical Foundations of Living Systems, Chemical and Physical Foundations of Biological Systems, Psychological, Social, and Biological Foundations, and Critical Analysis and Reasoning Skills. For brevity's sake, the aforementioned sections will hence be referred to as the Biology, Chemistry, Critical Analysis and Reasoning, and Behavior sections, respectively. The Biology, Chemistry, and Behavior sections will each consist of 67 multiple choice questions to be answered in 95 minutes, while the Critical Analysis and Reasoning section allots 90 minutes to answer 60 total questions (AAMC, 2012d).

Though the official names given to these sections are undoubtedly more complex than the current MCAT, the revised test will incorporate significant portions and themes that are used on the current test. For example, the Biology and Chemistry sections of the MCAT^{2015} (which are the updated versions of the Biological Sciences and Physical Sciences sections, respectively, and can collectively be referred to as the "natural sciences") will remain relatively consistent through the transition. These sections will undergo editing to some degree, as was foreshadowed by the AAMC's president and CEO Dr. Darrell Kirch, who affirmed that "the content will be updated to stay current

with the exponential growth of medical knowledge, focusing on the areas medical school educators and students think are most important for medical school" (Kirch, 2012).

The largest addition to the natural sciences sections will be the supplemental inclusion of material from first-semester biochemistry courses, which provides explanation for the eight additional questions being asked in both the Biology and Chemistry sections, as well as the corresponding twenty minute extension to their time limits.

Perhaps the most significant change being undergone by the Biology and Chemistry sections of the MCAT^{2015} is the aforementioned transition to a focus on competencies connected to Fundamental Concepts. The Biology section, for instance, has three Fundamental Concepts attributed to it:

> 1. Biomolecules have unique properties that determine how they contribute to the structure and function of cells and how they participate in the processes necessary to maintain life.
> 2. Highly-organized assemblies of molecules, cells, and organs interact to carry out the functions of living organisms.
> 3. Complex systems of tissues and organs sense the internal and external environments of multicellular organisms and, through integrated functioning, maintain a stable internal environment within an ever-changing external environment. (AAMC, 2014) .

As was referenced earlier, it is evident that these Fundamental Concepts are more subject-specific than the scientific competencies; each of the Fundamental Concepts for

the Biology section is, however, rooted in one or more competencies. Fundamental Concept #1 stems from the aforementioned Competency #5 and Competency #8, which stress a student's understanding of biomolecules and the organizing principles of evolution, respectively. The second Fundamental Concept, meanwhile, addresses Competency #6, which includes the structure and function of various assemblages. Lastly, the third Fundamental Concept has its origins in Competency #7, which targets an organism's response to external stimuli.

The Chemistry section of the MCAT^{2015} follows suit with the Biology section, as it functions to address two Fundamental Concepts:

> 1. Complex living organisms transport materials, sense their environment, process signals, and respond to changes using processes understood in terms of physical principles.
> 2. The principles that govern chemical interactions and reactions form the basis for a broader understanding of the molecular dynamics of living systems. (AAMC, 2014).

The first Fundamental Concept within the Chemistry section is intended to address Competency #3; that is, it evaluates a student for their understanding of the principles and applications of physics. The second Fundamental Concept, on the other hand, gives attention to Competency #4, which looks at the principles and applications of chemistry.

Similar to the natural sciences sections, it appears as though the Critical Analysis and Reasoning section of the MCAT^{2015} will bear great resemblance to its predecessor of

the previous test, the Verbal Reasoning section. Though comparison of the two is limited because the revised version has not yet been released, the description of the Critical Analysis and Reasoning section appears to hold true to the format and content of Verbal Reasoning. That is, the test-taker is provided with a series of passages drawn from a variety of discernments (including science and non-science fields), then is asked several questions about the provided reading. Test-takers' success on this section is not dependent on any previous knowledge they possess regarding the fields from which the passages are drawn, as all the required information is provided. The only amendment to this section of the test that stands out is its length- while before the test-taker was allotted 60 minutes to answer 40 questions, the MCAT^{2015} will allow 90 minutes for 60 questions.

The Critical Analysis and Reasoning section is unique from the three science-based sections in that it has its roots in what the AAMC designates as Scientific Inquiry and Reasoning Skills (SIRS) rather than Fundamental Concepts. Amongst the many skills that may be helpful for premedical students, the AAMC lists four as being particularly essential:

1. Knowledge of scientific concepts and principles.
2. Scientific reasoning and problem solving.
3. Reasoning about the design and execution of research.
4. Data-based and statistical reasoning (AAMC, 2014).

Curiously enough, the AAMC only links two of these four SIRS to scientific competencies. That is, SIRS #3 and SIRS #4 are rooted in Competency #2 (scientific inquiry) and Competency #1 (quantitative reasoning), respectively, while the first two

SIRS are presented without any external linkages. The reasoning for this is unclear at this time, as both SIRS #1 and SIRS #2 appear to be connected to the second scientific competency, which includes the inquiry, discovery, and validation of scientific knowledge. Furthermore, the AAMC does not currently recognize any specific courses offered at a majority of institutions that evaluate for these SIRS in their curricula. This is undoubtedly a fact that merits some concern, as it means that the AAMC believes testing of these skills will only come from the MCAT and will not be reflected on a premedical student's GPA.

The Behavior section of the MCAT[2015] is the final section to be discussed, and unlike the others, it has no origins rooted in any of the scored sections offered in the past[2]. Because of its unprecedented nature, this section has received the most attention from those affiliated with the test. As its official name suggests, the Psychological, Social, and Biological Foundations section evaluates test-takers for their knowledge in psychology, sociology, and biology as it relates to behavior. More specifically, the AAMC describes the Behavior section and its focus as follows:

> This section tests your understanding of the ways in which psychological, social, and biological factors influence perceptions and reactions to the world; behavior and behavior change; what people think about themselves and others; the cultural and social differences that influence well-being; and the relationships between social stratification, access to resources, and well-being. (2012d, p. 91).

[2] While unscored, trial versions of the Behavior section were included in the 2013 and 2014 MCAT, they were entirely optional for the test-taker

Thus, in a similar way that chemistry, biology, physics, and biochemistry are recommended courses to be completed in order to be prepared for the natural sciences sections, test-takers are highly encouraged to complete courses in both psychology and sociology before sitting for the MCAT^{2015}. While in the last chapter I was able to incorporate personal experience when discussing both the current MCAT as well as the suggested classes, the original nature of the Behavior section precludes this approach as a possibility. Not only is this section yet to be taken by individuals within the confines of an official MCAT exam, there is not even a semblance of practice questions from this section available to the public. And while the classes that are advised to be taken beforehand have been available to students for quite some time, I have not taken them personally, and therefore am unable to discuss the skills and intelligences instilled by them as I did with the previously described classes.

We are forced, therefore, to rely heavily on the words professed by those responsible for creating and administering the test in order to understand the rationale behind the incorporation of the Behavior section. For this knowledge we will once again turn to the AAMC's Dr. Kirch and his published statement to premedical students regarding the MCAT^{2015}. During his introduction of the Behavior section, Dr. Kirch stated:

> It's about understanding people- how they think, interact, and make decisions. Together with a solid foundation in the natural sciences, an understanding of behavior, perception, culture, poverty, and other concepts from psychology and sociology all contribute to the well-rounded physician…We also want our doctors

to have good bedside manner, communication skills, and an ability to interact with people. (2012).

Dr. Kirch's statement sheds light on the Behavior section's intentions and applications, albeit in a very general, non-specific way. Like the other sections discussed, the comprehensive and in-depth analysis of the Behavior section is provided through the Fundamental Concepts that it is linked to, of which this section has five:

1. Biological, psychological, and socio-cultural factors influence the way that individuals perceive, think about, and react to the world.

2. Biological, psychological, and socio-cultural factors influence behavior and behavior change.

3. Psychological, socio-cultural, and biological factors influence the way we think about ourselves and others.

4. Cultural and social differences influence well-being.

5. Social stratification and access to resources influence well-being. (AAMC, 2014).

It is apparent from the words of Dr. Kirch and the Fundamental Concepts that the addition of the Behavior section to the MCAT^{2015} is purposed with the evaluation of applicants for their ability to form relationships with their patients. As was established in the Personal Intelligences chapter, the act of forming relationships with others and understanding them is inextricably linked to the presence of a developed and functioning interpersonal intelligence. Gardner maintains that "the core capacity here is the ability to notice and make distinctions among other individuals", with particular emphasis on their

motivations, intentions, temperaments, and moods (2011, p. 253). Though the success of the Behavior section in testing for the interpersonal intelligence is still to be determined, the additional section's intentions (as stated by Dr. Kirch) are undoubtedly encouraging.

Furthermore, it is arguable that by evaluating test-takers for their interpersonal intelligence, the Behavior section will also assess the test-takers' level of intrapersonal intelligence. Such a claim is corroborated by a previously agreed-upon truth: the development of one's interpersonal intelligence is necessarily dependent on the intrapersonal intelligence. In order for test-takers to demonstrate the presence of a matured interpersonal intelligence by means of a high score on the Behavior section, they must first possess a dexterous intrapersonal intelligence that allows them to recognize the biases and imperfections that exist in their own perspective.

The one hesitation that remains over the Behavior section is that unlike the other sections of the MCAT^{2015}, it does not, at this point in time, appear to be linked to any scientific competencies. This is an inconsistency that remains unaddressed in any publication by the AAMC, and thus it is not yet clear if the absence of Behavior-related competencies was an intentional decision or not. What seems more likely than this is that such Behavior competencies are currently in the process of being created, and are simply not refined enough to yet be publicized. It seems reasonable that the competencies of the three other sections would be complete and yet those of the Behavior section would be unfinished, as a consequence of the latter being added to the repertoire of the MCAT quite recently. Thus, it seems likely that this hesitation will be remedied in the near future, and therefore does not rouse an overwhelming amount of concern. While having

scientific competencies to ground the Behavior section and its future direction should undoubtedly be a goal of the AAMC, for the time being it seems as though the section's Fundamental Concepts will suffice.

By examining the MCAT^{2015} before its implementation, there is an inherent limitation that precludes our ability to truly assess the exam's efficacy in evaluating students for the intelligences we have deemed necessary. We are therefore forced to rely on the exam's publicized content and the intentions, both implicit and explicit, of the AAMC as indicators for the test's ability to cull students successfully. Similarly, the incorporation of psychology and sociology into the recommended courses and the change from required courses to required competencies is too new for the consequences to be effectively studied. Operating within these boundaries, it seems as though the overall process of medical school admissions is moving in a hopeful direction, as the personal intelligences that seem to have been neglected or forgotten by past tests are beginning to make an appearance. While time will be the ultimate judge, it appears as though the MCAT and the premedical curriculum are moving in a direction that will demand more breadth of those who partake in order to succeed.

VII. Conclusion

When I first decided that my focus for this thesis would be the efficacy of premedical education in evaluating for the necessary qualities in hopeful physicians, never did I think I would arrive upon such a hopeful outcome. Rather, I had printed off dozens and dozens of studies regarding the premedical curriculum that had all come upon one general conclusion: the system is flawed. Granted, at the time of these studies' publications, the system that was being evaluated was that which had been in place since 1992, which I myself have conceded as being insufficient. Furthermore, the net I cast for my initial research was limited to peer-reviewed articles, and thus did not include any publications of the AAMC forecasting the changes ahead. The point remains, however, that my predictions about this thesis becoming a dramatic statement professing a need for change in the overall medical school admissions process have been dashed. Instead, I have come upon the reality that hope exists for the physicians of the future. Though it would be excessive to proclaim next year's changes to be the panacea for all woes that plague inadequate physicians, I maintain that the process is moving in the right direction.

While dwelling upon this uplifting conclusion, however, I came upon an unsettling realization: I am not a product of this new-and-improved system. These changes that I have deemed as being beneficial for the physicians of tomorrow are not ones that I myself have experienced. The MCAT that I took in June of 2013 contained only the Biological Sciences, Physical Sciences, and Verbal Reasoning sections, and thus my score did not reflect any interpersonal or intrapersonal intelligence. Furthermore, the

two courses that are suggested to evaluate for these intelligences, sociology and psychology, are ones that I will graduate without having taken. Therefore, my GPA in no way reflects any competency of mine in these fields.

In August of this year, I will begin my own medical education at Creighton University School of Medicine. When I first received the news from Creighton regarding my acceptance, I was understandably overjoyed and initially did not think of anything other than the incredible reality that was the last four years of hard work paying off. But when the elation of telling my family and friends of the news faded away, I was able to process the acceptance in the light of this thesis' conclusion. That is, I began to analyze Creighton's decision to accept me into its medical class of 2018 *despite* the fact that neither my MCAT score nor the GPA of my required sciences was in any way a reflection of my intrapersonal or interpersonal intelligence. I was therefore faced with a seemingly straight-forward, yet undoubtedly significant, question: how did Creighton know that I am capable of becoming a physician who is competent in the necessary areas? What's more, how can I myself be sure of this?

In effort to answer these questions, I began to reflect upon my past four years at Regis. I recalled my first class period at Regis, sitting down and hearing the wise words of Dr. Daryl Palmer and Dr. Mark Bruhn as they introduced us to our first Honors course "The Idea of a University: Balancing Heart and Mind". In the semester to come, this class would introduce those of us in the Honors Program to the struggle of heart and mind as studied by Robert Pirsig, John O'Malley, Plato, and several others. Through the juxtaposition of these authors, we were able to unpack the human tendency to demote

emotion and overemphasize reason in our daily lives. We would question the role of education in our growth as individuals, as well as how the University is meant to play a part in our own learning process. Day after day, our dissection of the balance between emotion and reason would grow our intrapersonal intelligence, as we would be forced to examine the presence of this paradox within ourselves.

Unbeknownst to me at the time, this first course at Regis would be just one of the many classes I would take that would teach me the necessity of open-mindedness in education. This continued into the Honors course of the following spring, "Tradition and Innovation", in which we would take an in-depth look at the humanities and the interdisciplinary blends that exist within them. What's more, class discussions would contrast the ways of the past with contemporary practices, using James Joyce and Homer to usher us along in our evaluation of the roles that the past and the present play in the human story. Each class period would draw from the social sciences, and in doing so we as students would gain a further insight into the interactions between human beings.

The spring of sophomore year brought with it "Chaos and Order", during which our class analyzed the existence as human beings in relation to society and the natural world. Through the works of formative scientific thinkers such as Charles Darwin, we were able to gain further insight into not only what our understanding of the world is, but also the modes by which mankind has come by such understanding. In doing so, our class exercised and cultivated our intrapersonal intelligences as we explored the origins responsible for our own identities.

A year later our Honors class entered into "Justice for All", in which we were challenged with examining notions of peace and justice in a global context. Through the scope of Rauls, Kant, Bentham, and many other great thinkers our class analyzed the various ways in which an individual person and an entire society can strive towards the common good. Each student was tasked with detailing his or her own personal definition of justice, and from there exploring what personal experiences and biases were responsible for the formation of this definition. After becoming aware of these characteristics within ourselves, we extended the process outwards by theorizing how such characteristics would affect our interpersonal interactions with those around us.

Finally, in the fall of our senior year, our class began "Magis and the Search for Meaning". At the core of this course was the inquiry from which a Jesuit education stems: how ought we to live? With the wise words of Victor Frankl, Andre Dubus, and Fyodor Dostoyevsky to guide us, our class engaged in discussions that would prod us all into a deeper understanding of how each of us derives meaning from life. We would then turn this introspective exploration outwards as we asked what consequences this would have for the way we desired to impact the world. Each day we would learn not only who we were in an existential frame of reference, but also how this reality affects the ways in which we interact with others and society in an attempt to lead meaningful lives.

After looking at a mere portion of the education that I have received at Regis University outside of the sciences required for medical school, it is quite clear to me that my intrapersonal and interpersonal intelligences have been challenged, grown, and evaluated all along the way. Every year I have been forced to demonstrate the skills of

introspection and interpersonal awareness, and I can say with a great degree of assurance that my personal intelligences have been just as, if not more than, comprehensively addressed as my linguistic and logical-mathematical intelligence.

It appears to me, therefore, that the liberal arts, Jesuit education offered by Regis University is ahead of the curve in its cultivation of future physicians. While medical school admissions boards have neglected to assess their incoming students for their intrapersonal and interpersonal intelligences, Regis has demanded that all its students, premedical or not, develop these intelligences to great maturity. It is because of this that I can say with great confidence that I am prepared to become a physician that will successfully utilize all the necessary intelligences in practice.

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