A FALLIBILISTIC APPROACH TO EDUCATION POLICY

A Thesis

by

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ABSTRACT

Drawing on classical and contemporary sources in the philosophy of science and education, I argue that a robust understanding of fallibilism is absent from current education policy decisions. An inadequate appreciation of the uncertainty involved in the scientific method detracts from the education process, particularly affecting students who are subject to a hodgepodge of insufficiently supported "best practices."

After explaining how this problem affects current education policy decisions, I explore the sources and nature of fallibilism. I describe different characterizations of the theory, emphasizing scientific fallibilism, and discuss its roots in the conjunction of finite human capabilities and complex, indeterminate, and dynamic systems.

I suggest that a solution to the problem fallibilism poses for the practice of education should derive from the unique nature of the educational task, and I survey a number of influential theories of education in order to distill common elements. I argue that these essential and enduring aspects of education should be preserved in revisions to education policy, and suggest a set of principles to guide future decision making about the implementation of new research.

While I argue that philosophical analysis is suited to the task of guiding education policy and serves as a useful lens through which to evaluate evidence-based policy proposals, I recognize that the solution offered is itself subject to the constraints of fallibilism. The resulting process functions more as a system of checks and balances than a concise algorithm for decision-making.

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1. INTRODUCTION: SOME PROBLEMS WITH RESEARCH-BASED EDUCATION POLICY

In the Preface to his *New Organon*, Bacon chides those at both extremes of the epistemic debate about how knowable the world is. At one extreme, with destructive results for truth and inquiry, some claim that we have established all significant laws of nature. "Those who have taken it on themselves to lay down the law of nature as something that has already been discovered and understood," he writes, "have done great harm to philosophy and the sciences. As well as succeeding in producing [false] beliefs in people, they have been effective in squashing and stopping inquiry" (1999, p. 1). At the other extreme, some people have advocated complete skepticism on various pretexts, asserting "that absolutely nothing can be known—having reached this opinion through dislike of the ancient sophists, or through uncertainty and fluctuation of mind, or even through being crammed with some doctrine or other." Bacon supports instead a more moderate path - that followed by some of the earlier ancient Greeks.

Bacon explains how the pre-Socratics walked a careful line between skepticism and dogmatism. They neither presumed "to pronounce on everything" nor despaired of "coming to understand anything" (Bacon, 1999, p. 1). They recognized the road to understanding was not an easy one; often "they complained bitterly about how hard investigation is and how dark everything is, and were like impatient horses champing at the bit." They did not forsake the objective of useful and true knowledge,

however. Bacon likewise promotes a method of inquiry that painstakingly seeks to establish progressive "degrees of certainty."

Education policy decision-making in the United States today bears undesirable resemblance to the attitude of overconfidence critiqued by Bacon. I focus on American policy, though the problem may be evident elsewhere, given the progressively technocratic, or expertise-driven, nature of policy decisions in the United States, especially over the course of the past decade. Mr. Obama has been dubbed the "big data President"; federal decisions are increasingly justified with reference to statistics and recent research (Scola, 2013). Policy makers regularly ignore the fact that scientific findings are subject to the constraints of fallibilism, as are the rest of our individual and collective bodies of knowledge. Witness the federal implementation of "theories of best practice" with no other justification than that they represent the latest research. Consider the language used in Britain's 1997 High Reliability Schools Project for evidence of this modern phenomenon:

> The High Reliability Schools Project is an attempt to move beyond the goal or relatively successful schools towards the creation of schools which are absolutely successful and which have eradicated failure. Using the latest information from the study of highly reliable organisations such as air traffic controllers and nuclear power plants (Hamilton, 2002, p. 147-148).

Highly respected science is heralded as the solution to all our educational woes. Or consider the evolution of the standards movement over the past few decades:

> Back in the late 1980s, establishing curriculum standards sounded like a good idea. Wouldn't it be great if each subject taught in school (language arts, science, mathematics, history, the arts) had its own clear-cut descriptions of what to teach and how to teach it? These recommendations could be based on a meta-analysis of the latest research in the subject, consultations with top experts and theorists, and systematic reviews of pedagogy and practice. Sometimes the states began by

> accepting the premises of the national curriculum standards; others started fresh. Almost all subscribed to the more-is-better school of rulemaking, generating hundreds of standards, targets, benchmarks, goals, and procedures. The resulting mandates undermined classroom practitioners' autonomy and professionalism in a variety of ways. Teachers were increasingly told by their states what to teach, when to teach it, and how often in pre-scripted, word-for-word, "teacher-proof" programs that not only ruled out teachers' creativity, but their humanity as well. Across the country, teachers were forced to post outside their classroom doors, in arcane code, which among thousands of state standards (e.g., Reading, C.4.viii.23) they were meeting at each minute of the school day (Zemelman et al., 2005, p. vii-viii).

This major policy shift grounded in the "latest research" resulted in untold harm to the education system. Improper policy decisions have ramifications for students' development and education, physiological and psychological welfare, and economic and societal outcomes. They also have consequences in the realms of epistemological ethics and procedural justice. Falsely inflated degrees of certainty are pretended for the sake of political efficiency, and individuals are excluded from the decision making process and burdened with disproportionate levels of risk. Examining the sources and nature of uncertainty and fallibility lends depth and direction to recommendations regarding education policy in America, substantiating a plan for improved policy proposals with a more thorough theory of human development and understanding.

The administrators and political actors responsible for poorly justified policy decisions are treated in this essay as well intentioned. "A Critical Thinkers Guide to Educational Fads" adeptly characterizes the forces influencing their decisions. The authors assert that most administrators lack a substantive conception of education, and are often fully occupied with "troubleshooting short-range problems, handling complaints, settling disputes, and making sure that legal and bureaucratic requirements

are met" (Elder and Paul, 2007). Teachers, likewise, are busy with matters of "day-to-day survival": planning lessons, grading assignments, handling disciplinary matters, communicating with parents, navigating school politics, implementing new programs, and so forth. Although it shapes their daily practice and determines students' long-term success, questions related to philosophy of education appear too abstract and removed from their daily operation to merit serious attention. Similarly, activist citizens challenge, influence, and redirect school operations, but limited and local interests are often their main concern. They typically lack (or think they lack, due to the elevated stature of scientific evidence) the background to battle research-based policy proposals.

It is apparent that a framework for making decisions about the translation of new research into policy is necessary for the wellbeing of those affected by it. Attitudes of complete skepticism towards scientific progress and uncritical embrace of each latest finding are both unhelpful. Strategies derived from such ethical approaches as the Precautionary and Proactionary Principles, which prioritize caution and courage, respectively, in situations of uncertainty, can be useful to an extent, but are not specific enough to the educational context to provide more than general guidance. Because it impacts a natural relationship dating back to the dawn of parent-child interaction, education reform ought to respect certain boundaries and values that technological advances, for example, need not.

The guidelines proposed will themselves necessarily be characterized by the properties of fallibilism. This means they will be incomplete, open to error, and subject to modification. In the spirit of Baconian inquiry, however, we must continue to "champ

at the bit" in pursuit of greater degrees of certainty regarding the principles that ought to regulate the policies to which we daily subject millions of vulnerable students.

2. THE SOURCES AND NATURE OF FALLIBILISM

While conspicuously absent from education policy decisions, fallibilism is the received view in philosophy of science and epistemology. Baron Reed writes in "How to Think About Fallibilism" that "[a]lmost every contemporary theory of knowledge is a version of fallibilism" (2002, p. 143). Philosophers of science define fallibilism as the notion that none of our beliefs is free from the possibility of error, as demonstrated, for example, by the continuous revision and evolution of scientific theories.

There are as many ways of being wrong as there are types of knowledge and inquiry. Historical study can go astray, to name a few ways, by neglecting sources, relying on inaccurate sources, interpolating patterns, misinterpreting motives, fabricating events, ignoring groups of people, or allowing the influence of biases – through ignorance or ill-intent. Philosophical inquiry can lead to inaccurate conclusions through errors in logic, deductions, and assumptions; misinterpreting texts; twisting language; relying on incomplete information; and so forth. Scientific research meets imperfection through flawed methods, personal biases and social influences, inaccurate statistical analysis, confounding of correlation with causation, and many more inlets. Even barring all error or malpractice on the part of the investigator, scientific inquiry only yields partial evidence, which could result in faulty conclusions. Mistakes in this field are so common that one analyst now posits that "most claimed research findings are false" (Ioannidis, 2005, p. 696).

Ronald Swartz gives a concise statement of the features of fallibility that are particularly relevant to this inquiry:

> The history of fallibilism is an account of the growing awareness that human beings, despite the fact that they can at times invent ingenious ideas, can never be perfect or know that what they believe is absolutely true…what separates fallibilists from those with other views on the nature of knowledge and the nature of man is that they are willing to admit that human understanding is limited and imperfect. For fallibilists, the knowledge or beliefs of any given period may well be superseded by new and better ideas at a later time (1980, p. XVIII).

Several varieties of fallibilism exist, among them strong and weak fallibilism (Kekes, 1972, p. 301). My focus in this essay is the fallibility of scientific knowledge, which finds its origins in the nature of scientific inquiry.

2.1 Methodological sources of scientific fallibility

Because it is grounded in an inductive method, natural science only ever approximates truth. In contrast to that of a deductive proof, the conclusion of an inductive proof is merely probable; it is not guaranteed to follow from the stated premises, as is the conclusion in a sound deduction. Rather, the accumulation of evidence provides progressive support for the conclusion, while leaving it vulnerable to the destructive influence of counterexamples. Einstein once wrote that no quantity of evidence could confirm his theories beyond doubt, while a single counterexample could disprove them (Silk, 1981, p. 293). Further complicating the matter is the issue of determining what constitutes a true counterexample and what is merely an apparent one, subject as counterexamples are to the constraints of fallibilism. So it goes for all scientific knowledge.

The related fact that science progresses through the amendment of theories lends further depth to the notion of scientific fallibilism. We ought to expect the continual revision and overturn of scientific claims with improvements in method and the collection of new evidence. Sometimes this means theories are tweaked to incorporate new data; other times theories are entirely rejected as dead ends. A robust understanding of fallibilism makes particularly absurd, then, the unilateral implementation of "theories of best practice" on only the grounds that they represent "the latest science." Likewise, rhetoric along the lines of "science tells us," used by such institutions as Harvard's Center on the Developing Child, is misleading and dangerous (Harvard, 2016). *Science* doesn't tell us anything, much less anything definitive; *scientists* theorize based on available evidence.

Foundationalism, a main epistemic competitor of fallibilism that grounds beliefs in certain knowledge (Poston, 2015), meets difficulties with five aspects of science in addition to those described above: the relativity of rational judgments, the social nature of science, the necessity of ancillary assumptions, the underdetermination of explanation by evidence, and the theory-laden nature of observation (Burbules, 2000, p. 14). Premises that seem self-evident to one are judged inadequate and rejected by another. Philosophers and scientists alike increasingly recognize the communal influences on the practice of science (p. 24). The examination of any particular scientific question depends on taking for granted a network of other beliefs and assumptions, using as tools or cornerstones in the investigation of one question what may turn out to be inaccurate responses to other open questions. A related problem is that a potentially infinite number

of explanations fits any given data set (p. 17). Finally, any given observation is colored by the observing individual's prior knowledge and preconceptions, mode of observation, and assumptions; it is never "neutral" (p. 15). These obstacles to certainty about scientific claims defeat attempts to ground decisions in indisputable empirical evidence.

2.1.1 Implications for translation of research into practice

Because scientific findings do admit *degrees* of certainty, one might be tempted to determine an acceptable level of risk in new policy implementation by analyzing studies' design, quality, margins of error, reproducibility, and other such factors. A leading provider of this sort of information is the Institute of Education Sciences (Institute, 2015). This federally funded organization has reviewed nearly 11,000 studies to date, with the goal of informing the education decision making of researchers, teachers, and policy makers (What, 2015). There are a number of problems with this approach. Firstly, meta-studies are also fallible. Secondly, they are constrained by the same neglect of variables and values as other scientific studies. Finally, there is arguably no acceptable level of risk when it comes to human welfare. Young students especially put their current, and to an extent future, wellbeing in the hands of educational authorities. Quantifying their welfare and deciding their fate through a cost-benefit analysis is inhumane and inappropriate given the gravity of the task. Putting a number on the tolerable level of suffering indicates complacency with policies' harmful effects and ingrains this attitude into practice, which may have wider consequences on the relationship between the educator and educated. Cost-benefit analyses represent a

method fitting for material or mechanical calculations, not those in which the welfare of vulnerable, uninformed, and unconsenting individuals is on the line. Checking new policy proposals against fundamental principles about the nature of education and the human person, on the other hand, would help to keep education reform on track and prevent the most egregious violations of this essential human endeavor. As will be discussed at length later in the essay, knowledge of these principles is characterized by a higher degree of certainty and less risk should elements of them prove incorrect.

Bacon proposes science as the *via media* between the "Scylla and Charybdis" of certainty and skepticism, but a misunderstanding of its method has led to a new instantiation of dogmatism with science as its object. To state it plainly: the very method proposed to combat dogmatism has become a source of dogmatic belief. Bacon himself, the Father of Empiricism, described the best hoped for outcome of scientific inquiry as incremental improvements, or "progressive stages of certainty" (1999, p. 86). When public policy reflects ignorance of the limitations of scientific inquiry, it creates a mistaken source of authority. Unfortunately a lack of concern for fallibilism runs throughout the education system, perhaps compounding its effects as future policy-makers are educated in reverence for this new idol of the theatre, or mistaken source of authority. In "The Role of Philosophy of Science in Science Teacher Education," Michael Bentley and James Garrison describe sampling a number of science textbooks designed for use in classrooms. They observe a conspicuous absence of discussion about the scientific method and the sort of results it delivers: "[t]he type of reasoning process underlying what is described as the scientific method is not discussed...often the

textbooks we examined declare that particular scientific formulations 'have been proved'" (1991, p. 69). A science education saturated with such sentiments could easily serve to perpetuate the picture of scientific findings as conclusive and indisputable that fuels modern policy decisions.

2.2 Natural foundations of scientific fallibility

In contrast, some philosophers and scientists suggest that the reason scientific theories persistently meet revision is the intractable complexity of the systems they aim to describe. This indicates the existence of a deeper source of our fallibilism, particularly relevant to complex systems like education, rooted in the nature of the physical world and our access to it. As Adam Jaffe explains in "The Science of Science Policy," "Everything is related to everything else, and typically through more than one mechanism" (2008, p. 134). Due to the complexity, dynamism, interrelation, and perhaps inherent stochasticity of many natural systems, we will always be far removed from complete description of them. Daniel Sarewitz suggests in *Frontiers of Illusion: Science Technology, and the Frontiers of Progress* that complex systems may always evade effective scientific analysis: "Not only does modern science have no experience of success with prediction of highly complex, evolving, interactive systems but new scientific theories of complexity suggest that such systems may be inherently unpredictable in detail" (1996, p. 86). Stuart Kauffman agrees: "My claim is not simply that we lack sufficient knowledge or wisdom to predict the future...It is that these things are inherently beyond prediction. Not even the most powerful computer imaginable can

make a compact description in advance of the regularities of these processes," (2008). Erwin Schrödinger provides additional support for this notion in *Science Theory and Man*, explaining at length the role of randomness in laws of nature. He describes how "chance is the common root of all the rigid conformity to Law that has been observed" (1957, p. 136) and the only things observable to us are average values (p. 137).

An example of the typical evolution of physical theories from determinacy to indeterminacy can be seen in the development of the kinetic theory of gasses (Schrödinger, 1957, p. 109). A picture of gas molecules as smooth, perfectly elastic spheroids was replaced with an undefined system that obeyed a number of mechanical laws, which in turn was replaced by a system governed only by the laws of conservation of energy and momentum and resulting only in average values (p. 110).

It used to be the going belief that exact predictions about a physical matter would be possible given complete knowledge of initial conditions; in other words, "the system under consideration ha[d] to be extended to comprehend the entire universe," and then the mechanisms at play could be traced to an accurate conclusion (Schrödinger, 1957, p. 53). This would be an enormous task even if the universe were well understood, but it is now commonly accepted that upwards of 95% of it is composed of unidentifiable matter and energy (Finkbeiner, 2016). Physicists today claim that even this incredible extension would not be enough to ground accurate prediction, due to the indeterminacy of the subject matter. So not only is it an issue that "a physical system cannot be determined by a finite number of observations [while] in practice a finite number of observations is all that we can make" (p. 79), but apparently even an infinite number of

observations would not suffice. Swartz explains our resultant state of knowledge in *Knowledge and Fallibilism* as follows:

> Some of our ideas might be partly true, or contain true aspects, but no idea can be absolutely true, because we can always conjecture a more informative theory that might contain more of the truth. If we accept…that all ideas have an infinite number of assumptions associated with them, then no statement of verbal account of an idea can contain the complete truth, since it is always possible to further explain any theory…there are always some aspects of all ideas which must remain unknown. Also, since absolute truth is never attained, human understanding can always be improved: what we know at any moment in time may eventually be superseded by new and better ideas (1980, p. XXVI).

Because of the infinite assumptions involved in any theory, there is always more that can be said to achieve greater clarity, and there will always be aspects of the theory that are unexplored. An understanding of scientific knowledge as limited in this way suggests that we should use appropriate caution in treating the paradigms it creates as definitive pictures of the way things are. Sarewitz critiques the spectacular goals of the National Academy of Science, such as "maintaining a leadership position in those technologies that *promise to have a major and continuing impact* on broad areas of industrial and economic performance," as lacking critical engagement with the infinite possibilities for interpreting data (emphasis added):

> There is nothing necessarily wrong with any of these goals, just as there was nothing wrong with sixteenth-century astronomers adding another epicycle or two to better explain the observed position of the planet Mars. But they fail even to acknowledge, much less confront, the roots of the intellectual crisis of science and technology policy: a paradigm that promotes the creation of discrepancies at a far faster rate than our capacity to adjust or respond to them. The way human beings – even scientists, and perhaps especially scientists – view the world is severely bounded by particular interpretations of reality that Kuhn calls paradigms but that, in a different context, could equally well be labeled myths. These interpretations are crucial parts of rational inquiry and daily decision making; without their constraint, people would be immobilized by an infinity of options. Because it is so difficult – impossible, really – for any one person truly

> to 'see' any more than the tiniest slice of reality, people depend on interpretation, paradigms, and mythologies to understand the world…The way that we view the world determines the way that we draw our maps; the way we draw our maps will determine the paths we can follow in the pursuit of progress (1996, p. 190-191).

Sarewitz points out that science produces questions at a faster rate than answers, and is driven by paradigms that are essentially functional myths. The myths are the best we can do as finite, fallible human beings; without them, we would be overwhelmed by infinite interpretive possibilities. One interesting result of our infinitely limited empirical knowledge is substantial disagreement about what theories are, how they are confirmed, and what their function is (p. 388). "One of the most lively and persistent debates in the philosophy of science," Sarewitz writes, is the one about the status of scientific theories: do the entities they employ really exist? Do they offer a true account of the world? Our understanding of the subject matter is so constrained that we struggle even to describe what science is doing and to distinguish between fictional and actual entities.

2.2.1 Further implications for translation of research into practice

Applying knowledge of the limitations of scientific knowledge to its influence on education policy, we recognize that a practice predicated on the isolation of particular variables and necessary exclusion of infinite systemic relations does not serve to construct comprehensive recommendations about a complex, multivariable system not subject to the same limitations. Scientific experiments by necessity fracture complete systems to evaluate a manageable question and control for a finite number of variables. Experiments typically work by attempting to isolate a single effect, and quantitative

research in particular is predicated on a view of nature as "regular and predictable" (Johnson and Christensen, 2015, p. 34). This excludes subject matter that is dynamic, chaotic, situational, social, contextual, personal, or unpredictable.

Philosophy is not bounded by the same methodological constraints, and as a result can deal with education as a unified entity. It provides tools more fit to the task. Abstractions and explicit calculations – which get the scientist into trouble when they are mistaken for comprehensive descriptions – are not necessarily components of a philosophical position. An example from formal epistemology might clarify the issue. Epistemologists regularly justify their use of complex mental calculations of probability in their descriptive theories of rationality against the criticism that few would have the mental acumen to perform such calculations with an analogy to playing catch. While few can solve the operations necessary to calculate the ballistics trajectory of a projectile, most are able to intuit where to place their arms to complete a soft pass. The complexity of the universe is an obstacle to full analysis of it, but not necessarily to operation in it.

Education is a practice as old and as natural as parenthood. Perhaps science's role should be subordinate to philosophy's in the realm of education policy, acting as a supplement to common sense and moral sense rather than as a dependable dictator. Philosophy is better positioned to make systemic recommendations and analyze how targeted policy proposals will impact the larger endeavor. It is equipped to satisfy the following objectives, outlined in "A Critical Thinkers Guide to Educational Fads" as essential components of a substantive education:

> By a substantive concept of education we mean one that highlights the essential components of education, consequently one that has clear implications for how

> we should understand "the educated person" and how we should design the educational process. Many popular concepts of education are non-substantive in that they are vague and fragmented, and therefore superficial and misleading. They do not highlight the common dimensions of the various disciplines...Instead, they lead to instruction that mainly trains, indoctrinates, or socializes rather than educates the individual. They produce "counterfeits" of educated persons because they ignore essential abilities, standards, and traits in the instructional process (Elder and Paul, 2007).

2.3 Illustrative examples of scientific fallibility

One group of students particularly vulnerable to the consequences of unsubstantiated educational fads is the special education cohort. Consider two examples from the history of special education.

2.3.1 Craniosacral therapy

Craniosacral therapy (CST) – also called craniopathy, neural organizational technique, and cranial manipulative therapy (Jacobson et al., 2015, p. 184) – gained prominence over the past several decades as a viable treatment for autism and other learning disabilities (p. 175). The practice involves mild maneuvering of the cranium in an effort to rebalance cerebrospinal fluids (Hartman, 2006). Practitioners were convinced the therapy could "improve an astounding range of maladies" and claimed "abundant...success with patients." CST received governmental recognition, with Florida's legislature passing a bill to make April 2002 "Craniosacral Therapy Awareness Month" (Jacobson et al., 2015, p. 177).

The American Cancer Society, meanwhile, claims that while CST appears to alleviate symptoms of stress, there is no evidence that it assists with the treatment of any

disease (Russell and Rovere, 2009, p. 187-189). The procedure instead "lacks a biologically plausible mechanism, shows no diagnostic reliability, and offers little hope that any direct clinical effect will ever be shown" (Hartman, 2006). Despite these findings, the method remains popular, resulting in a regrettable waste of time, money, and opportunity for genuine intervention. Once understood as an empirically-supported best practice, a preponderance of evidence now suggests CST is no more than quackery backed by pseudoscience. Its apparent early evidential confirmation has had a far-reaching impact on the public. Had the layperson understood science through the lens of fallibilism rather than trusting fully in the words of apparent experts, the fad would have been more readily discarded when evidence mounted to discredit it.

One might argue that CST was not grounded in science, and its longevity is a result of too little faith in science rather than too much. CST had the makings of a credible theory, however:

> According to the original model of cranial osteopathy, intrinsic rhythmic movements of the human brain cause rhythmic fluctuations of cerebrospinal fluid and specific relational changes among dural membranes, cranial bones, and the sacrum. Practitioners believe they can palpably modify parameters of this mechanism to a patient's health advantage (Hartman, 2006).

Founding physicians posited initially credible biological mechanisms. The theory was also backed by anecdotal evidence, from practitioners and patients in the field, and took decades to be labeled as pseudoscience. Whether or not the theory ever resembled a proper scientific one, the resulting protracted waste of time and money – measured by years of educational time and funding misdirected to finance a fruitless intervention - can be attributed to a misunderstanding of the scientific method.

2.3.2 Reading recovery

A second example of an apparently evidence-based theory of best practice that was later discredited is "Reading Recovery" (Jacobson et al., 2015, p. 179). Since 1984, more than a million students have participated in Reading Recovery, a remedial literacy program designed around intensive immersion in reading. Initial studies reported great success: the least proficient readers caught up with their peers and maintained the gains for three years. Proponents of the method claim that during its 18-year history, over eighty percent of participating students reached grade-level proficiency.

Jacobson et al., however, point out a number of flaws with these studies' methodology (2015, p. 180). In several, only data from those students who successfully completed the program were examined, while students who dropped out were omitted from the sample. Additionally biasing the sample population, students who had already failed the first grade were excluded from the Reading Recovery trial. Competing studies indicate a success rate closer to sixty percent, and demonstrate a significant decline in proficiency in the months and years following graduation from the program.

Furthermore, a confounding variable of teacher training was identified. Students in the control group were tutored by substitute teachers, while Reading Recovery students were instructed by teachers with a minimum of two years of formal training. A final problem with the methodology of the studies that reported great success was that all students were tested with an instrument designed by the creator of Reading Recovery, on information explicitly taught in the program, which means that students participating in the program were more familiar with the assessment than the general population.

Meta-studies indicate that Reading Recovery is no better than other available programs, and may be worse than some (Jacobson et al., 2015, p. 180). Skepticism about the program has reached such a level that a group of educational experts has officially denounced the practice, going "on record as concluding that the effectiveness of Reading Recovery is questionable and it should not be considered a scientifically based treatment for reading programs" (p. 180-181). As with CST, one might be tempted to argue that this case reveals a need for greater rather than less influence of science on education policy. What is at stake is not the involvement of science in policy decisions, however, but the degree of faith policy-makers place in a given set of findings. If scientific theories are understood to be fallible, continually evolving, and underdetermined by evidence, problems similar to the persistence of programs like Reading Recovery (and public insistence on its benefits) would be less common. Reading Recovery continued for decades and shaped the curriculum of over a million students, despite accumulating evidence to the contrary.

There are a number of ways studies can go awry and evidence can be misconstrued. Consulting other fields of expertise earlier in the process could have prevented decades of misused dollars and human capital. Consulting the teachers on the ground might have revealed hesitations about conflicts of interest imbedded in the study and other confounding variables; teachers would be the best positioned to recognize differences in results based on levels of attention given to different groups of students rather than the brilliance of the program. Teachers perform tiny experiments in their classrooms all throughout the day; conscientious teachers are usually well equipped to

spot ineffective practices, identify fluctuating variables, appreciate the relational factors of pedagogy that cannot be quantified, and adjust their practice accordingly. Educational researchers meet problems trying to imitate this process when they impose programs on existing ecosystems, blind to the relationships and dynamics already at play. An interventionist would not be aware, for example, that Mo has separation issues when it's Dad's turn to drop him off, that Abby and Lionel cannot be seated next to each other, that bubbles help Curly calm down when his temper flares, that Alia regularly confuses c's and o's, that Larry is acting out because there's a new baby at home, that April always skips the number three when counting, that Adhal is capable of writing his full name but will pretend he can't when asked by strangers, that Bex needs to take a bathroom break at noon, and so forth.

One might argue that new policies need to be tested in the complex ecosystem of a classroom one way or another. New policies may offer better ways of doing things, and teachers should handle these idiosyncrasies as they arise. My argument is that they should be dealt with at the front end of policy proposals rather than treating instances of student individuality as anomalies to be managed if and when they arise. Student individuality is the rule rather than the exception – it should be built into the philosophy of education undergirding policies. Policies cannot effectively be designed for a standardized child, and personal uniqueness should not be treated as a distraction, or as noise in a study's evaluation. To take one example, instead of structuring the curriculum so that students progress according to the duration of "seat time" spent on various subjects, advancement through content could be paced according to individual mastery

of objectives. For another example, consider a policy in a preschool classroom that tailors behavioral expectations to a plan developed with the help of a student and her parents rather than enforcing an inflexible and perhaps culturally insensitive set of rules unresponsive to a child's individual needs and temperament. The outcomes of such an individually-tailored policy may be evaluated according to the same metrics as the standardized version, using whatever criteria the district deems fit.

Systems complexity researchers like Kauffman would confirm the colossal number and dynamic nature of variables at play in a classroom environment, which adds to the difficulties of modeling and offering targeted solutions. The existence of untold, ever-shifting factors including nutrition, emotional status, degree of sleep-deprivation, parental involvement, stress levels, environmental stimuli, time of day, temperature, social pressures, and extracurricular experience make careful study design all the more important.

Those familiar with the fundamentals of developmental literacy could have explained problems in Reading Recovery's methodology stemming from the need for basic phonetic competence before reading is possible. Decoding letter-sound combinations is a prerequisite for comprehending words, but Reading Recovery asked students to run before they could crawl.

Those versed in the history of education (or any other social practice, for that matter) might have cautioned administrators against anything billing itself as a quick fix. The track record of silver bullet solutions for social problems is unimpressive at best.

While Aristotle did not explicitly theorize about literacy instruction, he explained that certain traits could only be developed through instruction, and others only through practice. There seems to have been a confusion of these two domains in the Reading Recovery program. Instructors attempted to train students through repeated rehearsal when explicit instruction was instead necessary. Aristotle also advocated for temperance and moderation, naming a number of virtues that need to be developed in concert. Focusing on one to the exclusion of others – as was apparently the case with the intensive reading immersion that took hours away from other activities each week – can have detrimental effects on the character and wellbeing of the student.

It is difficult to overestimate the costs of falsely credited theories of best practice. At-risk students are deprived of meaningful education, and valuable resources that could otherwise be devoted to research or effective practices are wasted (Jacobson et al., 2015, p. 177). For the 1999-2000 school year, the federal government spent nearly 50 billion dollars on special education services. Studies show limited results with regard to academic performance. Again, the argument here is not against scientific input in education policy, but against a misunderstanding of the nature of scientific inquiry and the strength of the recommendations it is able to offer.

One teacher, recognizing the hazardous attraction of innovative policy proposals, blogs about the need for education professionals to review them with a skeptical eye. "We teachers are just as susceptible to snake-oil sales pitches, fads, and cultural pressures as any professionals," he writes, explaining that they are also subject to the "bandwagon effect," and become "no-holds-barred converts" once select stakeholders

lend support (Pennington, 2009). He notes the particular draw of ideas purporting to be backed by substantial evidence, observing that "teachers are especially vulnerable to new ideas labeled as 'research-based,' 'best practices,' or 'standards-based,'" and that they "could all do with an occasional reminder that one of our primary duties as teachers should be to act as informed 'crap detectors.'"

3. THE UNIQUE CONTEXT OF EDUCATION

3.1 Enduring features of human nature

In Jonathan Swift's influential political satire *Gulliver's Travels* we find a compelling argument for conservatism and against political utopia in light of human imperfectability (2003). Through his encounters with various societies that have failed to weed out human failings, his inability to conform to the most perfect society of horses, and his ultimate loss of natural human features through this final effort, we are made aware of non-fictional societies' persistent historical failure to establish anything resembling a utopia. As Swift noted centuries ago, and Aristotle discussed millennia before him with his description of the inevitable corruption of any political regime (Politics, 1985), there appear to be certain undesirable features of humankind that no amount of education or social engineering can eradicate.

Likewise, it can be argued that individuals possess to a more or less universal degree certain admirable features and inclinations that ought to be respected by longstanding institutions. Aristotle was among the first to formally distinguished man from other types of being, and many philosophies since followed suit. He wrote that we have a rational soul, and thus a higher *telos* than that merited by the vegetative soul of plants and the sensitive soul of animals (Ethics, 2009). Certain virtues of thought and character are appropriate to a rational soul and necessary for its flourishing; these ought to be cultivated through instruction and practice. A more modern formulation of this delineation is the capabilities approach outlined by Martha Nussbaum. In response to the

question, "What activities characteristically performed by human beings are so central that they seem definitive of a life that is truly human?" she lists such capabilities as imagination, affiliation, and play (Garrett, 2008). Ancient and modern theories alike understand human nature as possessing with some uniformity a number of desirable and undesirable features.

Philosopher David Neil Silk echoes this view of enduring human nature: “Since I doubt that people have changed any with respect to the principles of learning since Plato’s time, I also doubt that the basic task of inducing learning, that is, teaching, has changed very much. For these reasons,” he writes, “we approach new ideas in the Philosophy of Education with a healthy skepticism” (1981, p. 291). Given the regularity of human nature through the millennia, Silk suggests that radical ideas in education reform may not reflect students’ actual interests. Granted there have been enormous developments in our tools and in our understanding of the world – consider the Copernican and Darwinian revolutions, the development of higher math, and the increase in popular literacy. Teachers may now use and teach others to use these concepts and tools, but, according to Silk, the basic task of education and the nature of learning remain unaffected.

Aristotle makes a stronger statement about policy innovations. Recognizing another durable feature of human nature, he advised politicians against too-frequently amending the laws of a nation. Citing the difficulty of promulgating new laws and the resultant confusion about the legal status of the actions in question, and stressing citizens’ loss of respect for capricious institutions, Aristotle recommended leaving alone

well-established rules of conduct (Politics, 1985). While communication over great distances is no longer the problem it was in Aristotle's time, social confusion in the face of frequently shifting legal and societal responsibilities is. Unstable policies are a breeding ground for miscommunication about and evasion of the law. Similar principles to those recommended by Aristotle regarding administrative constancy should be applied to education reform.

3.2 Mobilizing enduring features of human nature in education policy

This is all to say that the role and territory of innovation in education is bounded by immutable facts about human nature and the educative process. When explicit features about individuals, communities, and the teacher-student relationship in particular are recognized, reform no longer appears an open-ended voyage of discovery, but its scope and trajectory are instead restricted and directed by definite guideposts. To be more specific: there are values such as personhood that reform should not touch, and features such as truth-seeking, fallibility, and relatedness that innovation should respect.

Given that there is a limited role for innovation in education, it remains for us to clarify what form and ends it should pursue, and what features it should not interfere with. Tradition, folk wisdom, and philosophy offer one ready source of guidance here. Investigating what features of education are most fundamental and enduring will help to determine what goals education reform should seek to preserve.

There is a potential problem with deriving guidelines from tradition, folk wisdom, and philosophy, however. As discussed, there are several varieties of

fallibilism, and some cast so broad a net as to include all sources of human knowledge. Peirce simply described fallibilism as the position that "none of our beliefs is immune to error" (Weintraub, 1993, p. 251). Even though some of the examples of philosophy or folk wisdom considered may turn out to be faulty, the project of checking empirical evidence-based policy proposals against these sources of wisdom is a worthy one for several reasons.

First of all, philosophy and folk wisdom have a number of advantages over scientific studies relevant to the subject matter of education. They are not limited in scope and purpose as science necessarily is by its method – innumerable uncontrolled variables and various value claims pose no insurmountable problems for philosophical inquiry, which deals readily with complex and dynamic systems, and marks ethics and value theory as its proper territory. Folk wisdom can offer viable directives without needing to describe all the mechanisms and empirical characteristics involved; as explained earlier with the baseball analogy, one can know how to do something without knowing how to explicitly describe what that something is.

Broadly speaking, science is more concerned with descriptive claims and extensional knowledge, while philosophy often ventures into the normative and intensional realms. A study of emerging literacy, for example, could reveal that a particular program moved the majority of students up two levels on the standardized evaluation for their age group. It would require philosophical grounding to move from this observation to the claim that the program is good for children and should be implemented. Further studies could indicate that high levels of literacy are good *for*

certain life outcomes, but not that they are desirable. Philosophy is designed to tackle the what's, why's, and so what's of problems like education, while science provides empirical support for the how's. If nothing more, philosophy and folk wisdom serve to help set up a system of checks and balances for policy proposals. While new research can suggest improvements to educational methods, consulting philosophy of education in their implementation ensures the outcomes the methods serve are desirable ones, and protects against innovations that violate basic principles about human development and relationships.

Finally, fallible knowledge admits degrees of certainty, and derives strength from longevity and consensus. Philosophy of education is at least as old as Socrates, and several of its major tenets have remained consistent throughout the history of the field. These seem to coalesce around virtue ethics, one of the best established, time-tested, cross-referenced theories of human development and flourishing. Though aspects of the theory have altered some with time, its foundational principles (e.g. our inclination towards flourishing, the set of virtues that assist us on that trajectory, their particularity to the type of being we are, and so forth) endure. It is outside the scope of this paper to provide a full justification for Aristotle's philosophy of education, but should one strongly object to his system, the framework for decision-making advocated by this paper remains a viable one. The principle of subsidiarity discussed in the final chapter in fact encourages individual reflection on philosophy of education. The major outcome I advocate is that policy decision makers be explicit about the implicit view of human

nature contained in their philosophy of education and whether or how this picture is represented in the proposals they consider.

Take, for example, laws restricting the marriage and procreation of individuals with disabilities last century. There was widespread belief that parents were the primary source of their children's disabilities, grounded in genealogical analyses, Mendel's laws of heredity, and various sociological studies (Barr, 1913; Turnbull et al., 2011, p. 102). This belief encouraged the eugenics movement, which sought to advance the human race through selective breeding and elimination of unfit parents. Policies restricting the marriages of people with disabilities were established, and over 50,000 individuals were sterilized. Reviewing these policy proposals through the lens of virtue ethics would have revealed several prohibitive problems. A flourishing society was indeed the end goal, but the flourishing of individual citizens, of primary importance for Aristotle, was neglected. Individuals in this case were treated as a means to a better society, which is backwards from Aristotle's view of society as a means to better lives for individuals. Issues that should have prevented these policies' implementation include the following: people were not viewed in their totality, treated as ends, and understood as individually unique with regard to both personal characteristics and pace of development. Their physical, social, and moral flourishing was inhibited by policies grossly restrictive of their personal decisions. The picture of a human being and ideal education represented in these policies is not compatible with virtue ethics, subsidiarity, or fallibilism – two additional principles that will be recommended in greater detail below. In brief, the

policies did not allow room for later revision, or allow decisions to be made at the lowest feasible level.

3.3 Influential philosophies of education

To flesh out this argument for the use of principles derived from philosophy of education to check research-based policy proposals, it is useful to review the major tenets of several philosophies of education that are compatible with Aristotle's. Variations on the theme of flourishing and the steps according to which it is pursued can be found in a number of educational theories subsequent to Aristotle's. Consider the following models:

1. Recall that Aristotle thought humans had a *telos* of *eudaimonia*, and we reach this *telos* through the development of *arete*, or virtues. He described two types of virtue - virtues of thought, developed through experience, time, and instruction, and virtues of character, developed through practice.
2. Montessori was a constructivist; she emphasized natural development and freedom within limits (Crain, 2010). She acknowledged children as individuals and tracked development across different domains over time. She explained that children develop with guidance and according to internal maturational forces, particularly within "sensitive periods," or spans of time in which they are especially inclined to master various tasks.
3. The key word for Arendt was natality, which indicates the fact that we are born into a preexisting world (Arendt, 2006). She thought we ought to protect

children from the world and the world from children, until children are ready to become political adults. The purpose of education is to introduce children to world, to help them learn to live in the world. Education protects or conserves the new from the old and the old from the new. It requires adults in authority, and a strong education in tradition so that students can be or contribute something unique.

4. Kipling's "If" outlines qualities of a virtuous man that mark his completed education and development (Kipling, 1943). They primarily deal with integrity in social interaction.
5. C.S. Lewis thought education helped us learn to recognize, and thus love, and thus serve the true, good, and beautiful (Lewis, 1974). He also thought we needed to learn to grapple with our limitations in doing so.
6. Gesell argued that nurture and nature both play critical roles in development (Crain, 2010). He claimed that many physical traits and skills are heritable and develop in a general sequence, but specific milestones vary from child to child contingent on genetic mechanisms. His theory lent to recommendations of guiding one's children responsively while respecting their unique and natural rates of growth. Development cannot be rushed; best outcomes result from monitoring and responding to a child's internally-regulated schedule.
7. Rousseau also thought children develop according to nature's plan (Crain, 2010). He claimed that they possess innate abilities and are specially in tune with sensory experience. His theory led to the belief that constraining a child

with too many expectations will make her overly dependent on societal approval. Rich experience in natural environments, and focus on self-mastery, he considered ideal.

8. Erikson argued that people develop through eight primary stages of life, progressing through a sequence of dilemmas from the tension between trust and mistrust to the dialectic of integrity and despair (Crain, 2010). As young children, students likely face the initiative-versus-guilt conflict, with the desired outcome of "purpose."
9. Piaget theorized that mental development is actively constructed (Crain, 2010). He explained that children assimilate new concepts into their cognitive maps and make accommodations in these maps when new information does not fit.
10. Chomsky argued that the capacity to learn and use language is a highly specialized trait that only humans possess (Crain, 2010). He described how children rapidly master complex linguistic rules according to some interior scheme. Between three and six, students rapidly develop advanced grammar.
11. Vygotsky thought that people can only be understood in the context of their cultural environment, and that internalizing social interactions develops higher mental functions (Crain, 2010). With the help of a more knowledgeable other, students can progress within a "zone of proximal development." As a result, guardians and teachers ought to be cognizant of students' current ability levels in order to scaffold developmentally

appropriate learning. Adults scaffold instruction by offering greater or lesser degrees of support depending on the student's need.

12. Bandura wrote about how people learn through imitating observed models and mentally coding these social observations, with the result of what teachers *do* being more important than what they *say* (Crain, 2010). He theorized that behaviors like violence, cooperation, gender identity, and self-efficacy are acquired through reinforcement. A child is always watching, learning, and imitating: pro-social behavior and self-esteem can be encouraged through modeling and offering opportunities for success.
13. Kohlberg thought people develop moral reasoning in six stages (Crain, 2010). A person progresses from responding to authority and punishment to evaluating universal principles, from an inflexible understanding of rules and consequences to a more relative consideration of intentions. Progress can occur at any age. It is important for educators to understand that a child learns moral reasoning neither through direct instruction nor according to an internal schedule, but by working through moral dilemmas. Asking students to reason through problems and challenging their thinking is the best way to develop proficiency in this domain.
14. Dewey's philosophy of education was grounded in the pragmatist tradition; he prioritized meaningful participation in the democracy of the classroom, for the sake of initiating children into the larger democracy of the state. He advocated for a curriculum that met students where they were, and he

opposed authoritarian methods of instruction. Practical life skills and "learning by doing" were key features of his proposed curriculum, and an environment infused with "the spirit of art, history, and science" characterized the ideal school setting (PBS, 2015). The desired outcome of such an education was students "saturated" with a "spirit of service" and prepared with effective tools of self-direction to enter and contribute to a society "which is worthy, lovely and harmonious."

15. Foucault analyzed the power structures inherent in and encouraged by the institutionalization of education (Cheshier, 1999). He focused particularly on the stigmatization of those who fell outside categories deemed normal by institutional forces. Foucault criticized the ways education (among other instantiations of power) turned people into subjects, in the sense of things subservient to a higher authority.
16. Martin Buber theorized that an I-thou relationship – characterized by trust, wonder, and mutual respect, a communion of two subjects – is necessary between beings, while an I-it relationship is appropriate only between a person and an object (Buber, 1958). In contrast to an "it," a "thou" isn't limited by discrete boundaries, but is open-ended. He isn't to be used or merely experienced, but rather entered into relationship with. Meaning and identity in life are found through this open-ended relationship.

A recent textbook on best practices in education points to "a strong consensus...about how kids learn best. Virtually all the authoritative voices and documents in every

teaching field are calling for schools that are more student-centered, active, experiential, authentic, democratic, collaborative, rigorous, and challenging" (Zemelman et al., 2005, p. vii).

Closer examination of the theories outlined above reveals substantial philosophical consensus on the key issues at stake in education, particularly regarding its purpose and its treatment of individual students. What follows is a survey of some commonalities important to this project.

3.4 Common threads in philosophies of education

A majority of the theories emphasize the natural course of development, a common trajectory shared by all children in its major points, while individually tailored in its details. Both of these elements are critical. On one hand, people follow a predetermined progression of maturation, which proceeds according to a natural pattern that is relatively standardized. On the other, the milestones and accidental features of this progression vary from person to person. The important conclusions from these dual aspects of development are recognition of both a common nature and individually unique identities. The existence of a common nature allows us to make claims such as "all people tend towards flourishing, in regular ways," and recognition of individuality provides for concerns such as those raised by Montessori of not forcing developmental milestones and those raised by Foucault about authorities coercing individuals into conformity with a standardized model.

A related commonality highlighted in a number of the theories of education is the necessity of guidance to further this natural course of development. While educational and environmental supports are not the sole cause of development, they are needed to facilitate certain domains. It is necessary to strike a balance between bestowing guidance and allowing space for natural processes to transpire. Vygotsky describes the appropriate district of intervention as the "zone of proximal development," for example, and Chomsky emphasizes children's innate, internal capacities. Our theorists outline another dual aspect of education: protecting children from some aspects of life and introducing them to others. Arendt focuses on protecting the old from the new and the new from the old – preserving the importance of both domains – and thoroughly raising children in tradition that they might have the opportunity to contribute something novel; Lewis and Kohlberg accentuate the moral dimensions of development in their explanations of the need to teach children to love what is good and shun what is wrong.

In these latter aspects of development, the importance of society and culture in general, and adults and guardians in particular, is evident. Arendt, Vygotsky, Bandura, Gesell, Aristotle, Kohlberg, and Dewey especially stress the necessity of attentive, responsive, and mature educators. Without them, cognitive, physical, emotional, social, and moral development alike would be stunted. The end result of education, therefore, not only involves some notion of virtuous adulthood, but requires it for the perpetuation of the system. This virtuosity spans several domains – Aristotle calls them virtues of thought and character; other theorists divide them according to function or related life stage. All include at their completion an element of self-direction.

The theories surveyed give further instruction about the character of the guidance adults are to provide and the appropriate attitude of the teacher towards the student. The relational nature of teaching is particularly emphasized in Buber's philosophy, and complements elements of Aristotle's, Arendt's, Bandura's, Foucault's, Lewis', Montessori's, and Vygotsky's. Buber says an "I-thou" relationship is called for between human beings. This means the two subjects hold each other in equal esteem, and recognize with wonder the open-ended character of the other. In Aristotle's terms, the teacher recognizes the student as an equivalent being, a fellow rational soul. In Arendt's terms, the unique, unpredictable contributions of the next generation should be respected and protected, while the students are prepared for a world formed by equally complex and valuable adults and traditions. Bandura reiterates that we learn through imitation of like beings; Vygotsky spells out the closeness and dynamism of the teaching relationship. Montessori respects children's creative capacity, and preserves the open-ended nature of their individual inquiry. Lewis honors the spiritual capacity of students for boundless pursuit of the true, good, and beautiful through relationship with an unbounded other. Foucault reminds readers that students are beings not to be dominated or oppressed.

I have summarized complementarities pertaining to the who, what, when, where, how, and why of education, discussing the types of beings involved, the nature and situation of the educational task, the steps towards its completion, and its final purpose. The uniqueness and "thou"ness of individual students, the need for mature and caring

educators, the different domains and stages of development, and the common trajectory towards flourishing were covered.

The great complementarity between these disparate theories of education, and the common themes shared among them, indicate strong cohesion in the history and philosophy of education regarding the questions of what education is, how it works, what its outcomes ought to be, and how the individuals involved should be treated. These questions are especially critical to a project aiming to counter-balance the latest scientific discoveries with the wisdom of another discipline. To understand what should be preserved in education, we need to understand what features are most enduring and fundamental to the endeavor.

I will explore in the final section a system for evaluating education policy proposals grounded in a representative theory of education, one of the earliest and most fundamental, but also one whose outcomes are implicated in the other theories surveyed.

There is a considerable degree of correlation between the philosophical consensus and traditional "folk wisdom" on this issue. In "A Critical Thinkers Guide to Educational Fads," the authors describe the ideal outcome of education in familiar, everyday terms (Elder and Paul, 2007):

> Educated persons share common intellectual standards and abilities. An educated person values and seeks to achieve clarity, accuracy, precision, relevance, depth, breadth, logicalness, and significance in thinking...An educated person demonstrates intellectual humility, intellectual honesty, intellectual autonomy, intellectual integrity, intellectual perseverance, intellectual empathy, and fair-mindedness in thought, work, and in every part of life. These characteristics are the essential foundations for the right use of the mind. Lacking these characteristics, humans think and act egocentrically, do not respect reason and evidence (except when it is in their selfish interest to do so), and are indifferent to the welfare of others (with whom they do not egocentrically

> identify)...[Students] come to act more reasonably and effectively in every part of life....They use their learning to raise the quality of their lives and the lives of others. They become reasonable and fair-minded persons...They are able to use their reasoning skills to contribute to their own emotional life and transform their desires and motivations accordingly. They come to think, feel, and act effectively and with integrity.

You will notice remarkable confluence between the Critical Thinkers' statement about the desired intellectual outcomes of education and the philosophies examined above: the authors effectively describe a number of virtues of thought and character. While some philosophers of education propose more radical revisions to the education system than are admitted by folk wisdom, even these rarely stray too far from the fundamental principles mobilized in this project. On the whole, the theories presented offer more detailed or systematized constructions of the truths presented in basic folk wisdom. Where the two methods offer differing conclusions, both may be used to check and balance proposed policy innovations. I will consider in greater detail in the final chapter what to do when principles derived from philosophy or folk wisdom apparently contradict.

4. CONCLUSION: RECOMMENDATIONS FOR FUTURE POLICY MAKERS

While existing education practices are not beyond reproach, my focus in this paper is the implementation of policies inspired by new research. For the assessment of existing practices, a method can be derived from the process explored below. The research and motives behind existing practices could be reverse-engineered, and a similar method could be employed to check relevant components against time-honored principles. This method starts with historical research into why policies were implemented, and proceeds to compare the findings with the pertinent philosophical positions.

One might also point out that fallibilism and uncertainty affect every field in which new research must be translated into practice. Educational practice is one particular case study of a broader phenomenon, and one in which the issues created by overconfidence in science would benefit from speedy rectification. Additionally, it might be possible to determine more general characteristics of the problem and appropriate measures with which to address it upon conclusion of this analysis.

4.1 What to expect from policy reform

One general principle can be found in the unlikely source of the skeptical philosophy of David Hume. Firstly, Hume differentiated between the scientific method, which scientists practiced, and the "experimental" method, which he preferred (Letwin, 1998, p. 84). In following the experimental method, one proceeds by deducing general

rules through an analysis of individual occurrences. The scientific method, on the other hand, he described as drawing various inferences from a pre-determined abstract principle. While more aesthetically appealing, the scientific method he thought less suited to "the imperfection of human nature" and named a "common source of illusion and mistake."

Hume's skepticism, on the other hand, did not leave him so far from approximations of certain truth that he refused any universal pronouncements. In fact, he "even [proscribed] general rules, as if for all men and all times" (Letwin, 1998, p. 83). He derived these not from empirical evidence, but from the wisdom gained from a lifetime of human experience. He thought that attempts to resolve political questions with science were perilous, and he drew instead from perceived regularities in men and nature (p. 84). It is encouraging to the project of delineating general principles about education and human nature due respect by policy innovations that one of the foremost skeptics of rational inquiry not only allowed, but relied on similar methods.

One such rule had to do with a pursuit related to our own, that of establishing or maintaining a suitable political order. Hume's advice: don't seek a utopia, seek to safeguard the existing order from its own frailties (Letwin, p. 89). "Just as in the good man the passions are in balance, so in the good government," Hume argued, "the various powers and interests are arranged to prevent any one from becoming excessive." This recommendation about political governance accords remarkably with a fallible view of human knowledge and endeavors. The best we can hope for, Hume seems to say, is a system that uses its intrinsic features to check and balance one another.

Education policy can take a number of forms. Educators and educated are guided and constrained by federal policy, state policy, district policy, and school policy, to name a few. One significant influence on policy decisions is educational research. In an attempt to stay ahead of the curve, in many settings, administrators apply recent findings and an accompanying system of accountability to the school system under their charge with little apparent critical reflection. From this "pathos for the new" what results might be described in Hannah Arendt's terms as an "astounding hodgepodge of sense and nonsense" (Arendt, 2006).

In "Decision Making Under Conditions of Uncertainty: Experimental Assessment of Decision Models," researchers at the Institute for Science, Technology and Public Policy reach a conclusion about decision making that supports Swift, Aristotle, Silk, and Arendt's cautionary counsel. Their study of simulated high stakes military decisions reveals that experienced decision makers possess an "action orientation," preferring to "do something" even when "doing nothing" is objectively the most favorable option (Vedlitz et al., 2005, p. 23). The authors conclude that a change in protocol might be necessary to encourage optimal decision making given this inclination to action: "programs may need to pay more attention to this action orientation and minimize the risk of only making action-based choices when sometimes, 'doing nothing' is actually the best option." It is feasible that experienced administrators and policy makers suffer the same action orientation, preferring to "try something" when faced with challenges in a school system, even if the resultant action is less favorable than the status quo.

Consider a routine example from Head Start classrooms in Clark County, Nevada, one of the largest school districts in the nation. In light of current research on the negative effects of an overabundance of "direct instruction" – the term for the pedagogical style in which a teacher delivers a lesson and students sit and listen – on children in early stages of development, teachers were banned from using alphabet posters in their rooms "because it's rote learning and that's bad." This well-intentioned effort to protect students' free inquiry in fact misinterpreted recent publications and neglected the existence of different types of knowledge and learning, to the detriment of the education of an extremely vulnerable population.

An alternative method of education reform that does not in one fell swoop "thrust aside" tradition and "all the rules of sound human reason" (Arendt, 2006) is one that A. weighs new policy suggestions against a time-honored set of principles respecting the nature of education and B. delegates decision-making to the lowest feasible level.

4.2 Applying principles derived from subsidiarity and fallibilism

The practice of relegating decisions to the lowest feasible level is time-honored principle in certain social institutions. Known as "subsidiarity" in the Roman Catholic tradition, for example, the practice was prescribed by Pope Pius X in the encyclical *Quadragesimo Anno*:

> Just as it is gravely wrong to take from individuals what they can accomplish by their own initiative and industry and give it to the community, so also it is an injustice and at the same time a grave evil and disturbance of right order to assign to a greater and higher association what lesser and subordinate organizations can do. For

> every social activity ought of its very nature to furnish help to the members of the body social, and never destroy and absorb them (1931).

Subsidiarity is valuable in general for its tendency to preserve integrity, function, and autonomy at various levels of natural hierarchies: it frees higher levels of organization for decision-making that can only occur there, and preserves lower levels from subsumption and therefore destruction. The principle is particularly valuable in contexts of uncertainty, where there is legitimate disagreement about the most beneficial course of action. Allowing a potential plurality of decisions not only fosters a number of "experiments," the outcomes of which can then be compared, but it exonerates one overarching authority from coercing disagreeing parties into questionable practices.

It is well-acknowledged that certain questions, often those of purpose and value, lie outside the domain of scientific inquiry. Sarewitz points to a few in *Frontiers of Illusion:*

> What types of scientific knowledge should society choose to pursue? How should such choices be made and by whom? How should society apply this knowledge, once gained? How can 'progress' in science and technology be defined and measured in the context of broader social and political goals? (1996, p. ix)

In other words, science has a cultural pedigree and social posterity; its process results from and is productive of information and values that must be analyzed with non-scientific tools. Sarewitz continues to explain that the most important factors in policy debates do not stem from scientific data, but from a source closer to the average citizen, the "matrix of cultural values that guides society in its struggle to advance" (p. 95). It is critical to distinguish the role of this matrix of values from the role of science. Expertise in the mechanics of embryonic stem cells, for example, does not directly translate to

greater moral capacity to judge the ethicality of their use in research; facts about stem cells can inform ethical judgements about their use, but not make them. The costs of relinquishing one's status as an ethically relevant citizen are estimated by some to be severe. Robin George Collingwood theorizes that "reliance on rules and theories derived from natural science, divorced from the context in which they were to be applied, is what bankrupted modernism" (Baggini and Stangroom, 2005). Collingwood refers here to the devolution of a modernism that rejected tradition into a postmodernism characterized by unresolve. Because the scientific information provided by experts is a. fallible and b. limited in scope, the general public cannot and should not defer to them in all matters of decision-making. Principles derived from folk wisdom, philosophy of education, fallibilism, and subsidiarity are helpful here.

The principles for decision-making under conditions of uncertainty depend on the nature of the decisions being made. They will look different in an educational context, for example, than in a laboratory setting. In education policy decisions, these principles should center on a robust notion of human nature, as the primary material involved and affected.

From the concept of fallibilism itself we can deduce a number of features about people: we are finite, often mistaken or uncertain, and more complicated than we can understand, since knowledge about ourselves as part of the material universe is also subject to the constraints of fallibilism. We are also capable of pursuing truth and attaining greater degrees of certainty, and are perhaps fundamentally inclined to do so.

A framework for decision making that gives due respect to these characteristics would value the autonomy, complexity, fragility, and intrinsic drives of individual agents. In practice, this framework might translate to such a principle as "avoid 'innovative' policies that present a one-dimensional picture of the student and what is good for her" or "pursue innovation that enhances students' abilities to seek greater certainty."

4.3 Applying principles derived from virtue ethics

Further guidelines for evaluating new policies could be derived from Aristotle's analysis of human nature and subsequent additions to his analysis by Thomas Aquinas and Martha Nussbaum among others. Aristotle situated humankind at the top of a hierarchy of beings, as possessing souls with nutritive, sensitive, and rational capacities (Ethics, 2009). Whereas plants achieve flourishing though nutrition and physical development, and animals, through the additional exercise of basic desires and locomotive powers, man is further inclined towards knowledge and understanding.

Taking the purpose of education to include developing the groundwork for human flourishing, education policy should work in conjunction with and not against the framework that enables flourishing. If Aristotle's framework is taken as a reasonable one, this means virtues of thought and character should be fostered, and vices discouraged. Virtues of thought – which he says are developed through instruction, experience, and time – include virtues having to do with reasoning, like wisdom, comprehension, and intelligence (Ethics, 2009). Virtues of character – which he explains

are developed through practice – include such traits as justice, temperance, and fortitude. Further conditions that qualify these characteristics as virtuous include intentionality, awareness, and delight. Maximum virtuosity is achieved when one knowingly and cheerfully pursues desirable character. Parochial schools might consider Thomas Aquinas' amendment of faith, hope, and charity, three theological virtues without which he thought a definition of human flourishing was incomplete.

Given this set of criteria for what characteristics allow for human flourishing, it remains to translate them into a strategy for decision making. A simple rule of thumb would be to encourage policy revisions that promote or at least make space for the development of virtues of thought and character. Favorable educational policy would lend to the instruction and habituation of virtues. Such policy could manifest in a variety of forms, including pedagogy, curriculum, assessment, and institutional organization.

Consider the following examples. Teacher training programs that emphasize modeling of and reinforcing examples of virtues would be fostering a desirable pedagogical style. This could look like a teacher verbalizing her thinking process and indicating the tools used to reach her final judgment when faced with a complex question from a student, and praising evidence of the same in her students, thus modeling and incentivizing virtues of thought.

Curricula that provide explicit instruction regarding and opportunities for practicing virtues of thought and character would likewise fit the mold of an education conducive to flourishing. School policy aimed to promote the full development of the humans in its charge would incorporate the virtues in its standards and lessons. The

virtue of 'courage,' for example, which is developed through practice since it is a virtue of character, could be built into lesson plans requiring students to defend an unpopular stance to their peers.

District policy allowing the administration of meaningful assessments that both evaluate virtuous behavior and encourage it through their completion would be another example of beneficial regulation. Innovative programs like Kentucky's Danville Independent Schools have developed assessments that require virtue in their preparation and execution. Students at these schools maintain portfolios of their best work and perform regular "presentations of learning" for the community (2016). In contrast to standardized state tests, completed in isolation in a stressed expenditure of energy and then forgotten, these assessments require the enduring engagement of the whole person. Rather than hunching over a desk filling in bubbles - which admittedly requires the limited exercise of some virtues of character and thought as students refrain from cheating and apply their learning - students are participating naturally as citizens in a society, developing thoughtful answers to questions posed by interested community members. Assessment can function in this way as a continuation of learning rather than mere evaluation of it.

Finally, an example of institutional organization that promotes the development of virtue would be one that respects all stakeholders as rational beings and acknowledges students' capacities and limitations through its structuring of space, time, and communication.

Unfavorable policy, on the other hand, would exclude the development of virtue either through neglect or active encouragement of vice. This could happen in many ways. Through excessive focus on one virtue or one aspect of a virtue, other qualities necessary for flourishing could be ignored. Such results are evident in high performing students who lack integrity, technically skilled students without fortitude, or charitable and just students without the intellectual tools to evaluate their good intentions. A recent high profile example of the consequences of this type of unbalanced education can be seen in the longitudinal results of the Knowledge Is Power Program (KIPP, 2016). KIPP graduated at-risk students from high school at unprecedented rates, only to have a staggering number (67%) drop out of the post-secondary programs to which they were admitted (Tough, 2011). Program evaluators concluded that an absence of emphasis on certain key character traits, specifically "grit" or resilience, contributed to the trend. Unreflectiveness about the type of beings we are and the purpose of education make missteps like these easy traps to fall into.

As with the examples of craniosacral therapy and Reading Recovery, it may initially appear that empirical evaluation discovered and solved its own problems in the case of KIPP. The improvements made in later theories of best practice over previous ones were suggested by new and better studies. If it is the case that science is the best tool for finding and correcting its errors, why not advise more rather than less reliance on scientific studies? As explained in the craniosacral therapy and Reading Recovery examples, it was inordinate trust in scientific evidence that created the problems to begin with. While later studies eventually served as correctives to previous errors, reference to

guidelines derived from philosophical principles could have mitigated the harm caused in the interim. Furthermore, consultation with other sources of knowledge could have identified a number of the issues in question before the policy was even implemented. Finally, it remains the case that scientific findings will always be characterized by a degree of uncertainty, and reference to a solid philosophy of education would provide a worthy check to questionable policy implementation.

A more modern formulation of Aristotle's virtue ethics is found in Amartya Sen's capabilities approach, which was further developed by Martha Nussbaum (Wells, 2015). Some of the fundamental capabilities Nussbaum highlights include life, health, choice, thought, emotion, imagination, reason, affiliation, and play (Garrett, 2008). Similar to the translational framework described above, policy in line with this understanding of human nature would honor and promote the exercise of the capacities understood as being part of what make us human. Policy that in some way systematically or significantly denies or inhibits the exercise of these capacities would not pass the capabilities test.

4.4 A defense of philosophy as a valuable tool in education policy decisions

Policy revisions proposed in the name of science, then, could be checked against a matrix of virtues and capabilities to ameliorate the potential consequences of fallible results. Applying a time-tested, philosophically-grounded redundancy provides insurance against overconfidence in the scientific method.

Furthermore, philosophical evaluation may prove a more fitting tool for subject matter with agency and personhood. The method of hypothesis, experiment, and evaluation is fine for inanimate or low-stakes material, but a certain modicum of dignity is appropriate for human subjects. Because the subject matter of the inquiry is equal in autonomy, dignity, and complexity to the inquirers, it is not suitable for the inquirers to reduce the subjects to mere objects for experiment. At minimum, educational experiments should be backed by a theory with a high degree of certainty, developed in respect to enduring features of human nature, and the subjects ought to be made aware of the experiments in which they are participating. It is a well-recognized feature of human subjects research that the individuals involved should be informed and consenting whenever possible. The philosophical framework recommended as a supplement to educational research does not attempt to map every empirical datum relevant to education, but aims towards a noble end while acknowledging the inescapable complexity and indeterminacy present in human affairs. The framework described in this chapter refrains from treating the people involved in the education system as mere subjects of research or composites of observable behavior, respecting them instead as dynamic and teleological beings.

The Harvard Center on the Developing Child has the professed goal of driving "science-based innovation that achieves breakthrough outcomes for children facing adversity" (Harvard, 2016). Their theory of change involves fast-paced experimentation, or "the rapid design and testing of new intervention strategies grounded in the science of early childhood." Rapid change sounds desirable when conditions are unfavorable, but

change implies progress, and this is not guaranteed by the scientific method. Harvard researchers acknowledge the hazards involved in their method: **"**For us, innovation means taking risks…and learning quickly from ideas that don't work." Here again, risk-taking is not necessarily ignoble, if those bearing the brunt of the risks a. consent to them, and b. reap the major benefits. In the case of the Center on the Developing Child, it would appear that the most significant costs are born by the children of failed experiments, whose situations have little room for further stressors. While it may be argued that the costs borne by children deprived of the benefit of successful experimentation are also significant, these costs represent the failure of a positive rather than a negative responsibility of researchers – the aspirational responsibility to help, instead of the definite responsibility to refrain from harming – which many see as a supererogatory rather than an obligatory responsibility. We cannot hold researchers accountable for failure to improve every aspect of school for every student across all nations and for the duration of mankind; they are constrained by limited time and resources. Their position of power over those in the education system, however, requires them to employ what resources they do command with the greatest respect for those they intend to serve.

Additional problems with standard means of program evaluation arise from the complexities of human nature. Self-reports are notoriously unreliable and fraught with perverse incentives, and data collection by a third party is riddled with issues stemming from the observer effect. Any teacher will tell you that how his classroom behaves in front of onlookers bears little relation to its habitual operation. This becomes a serious

problem when one is seeking to measure the typical and enduring impact of a program change. The difficulties of quantifying or measuring the most important aspects of education aside, the mere presence of an assessment or assessing figure significantly alters the function of the observed individuals.

For an extreme example of this issue, consider the regular safety and performance inspections to which the federally funded Head Start program is subject. Typically a several minute warning precedes the commencement of a formal inspection in Clark County. Phone calls are traded between school sites to warn of an impending visit by a person of authority, and staff snap into shape, rushing around to meet compliance with whatever measures is of interest on a given day. In an organization governed by an impossible number of (occasionally conflicting) rules, and in which termination is threatened weekly and "100% compliance, no excuses" is the unofficial motto, the staff's frantic response is understandable. The resultant measures of success are, however, completely inauthentic.

A frontloaded philosophy of education, in contrast, that aims towards virtue and capability development from its genesis, respects the humanity of those involved, preserves them from haphazard experiment, acknowledges fallibilism and the related difficulties of objective description and measurement of complex systems, and inclines towards local decision-making (while still granting appropriate oversight), provides a worthy check against this sort of nonsense. As discussed at length above, there are questions that lie outside the purview of science, and in consequence require other means of resolution. Sarewitz explains one aspect of this issue in *Frontiers of Illusion,*

writing, “When scientists ridicule public opinion [that differs from their own about matters loosely related to their area of expertise], they implicitly argue that wise decisions about the potential societal impacts of research can only be made by experts” (1996, p. 65). He explains that in actuality, “of primary importance are the underlying social and moral dilemmas that drive public concern.” Not only are there a great number of value-laden decisions unreachable through the scientific method, but scientists additionally acknowledge that certain branches of inquiry do not admit of predictive theories. There are questions of value that science is not fit to answer, and there are questions of fact that science is unable to answer. Sarewitz highlights the hypocrisy of those encouraging a scientific answer for every question while maintaining the indeterminacy of the scientific method. He explains, furthermore, that whether or not our societal questions are too complex for science to resolve, “non-experts” deserve and ought to be given a voice. Sarewitz’s neat complaint against scientism segues nicely into a summary of the key principles that should be used to check science-based policy proposals.

In the proposed remedy to unquestioning translation of the latest research into educational practice, principles derived from fallibilism, subsidiarity, and virtue ethics serve as a counter-balance to empirical findings. Historically well-established ideas about the nature of education and the beings involved offer one reasonable check against over-hasty implementation of new research. Should the proposed policies violate any closely held truths about the task of education and what treatment is appropriate for human beings, administrators should seek another solution. While the principles

highlighted offer a viable and comprehensive framework for evaluating policy proposals, there is some reasonable disagreement about the details of what makes for an ideal education. Thus, the principle of subsidiarity may come into play to a greater or lesser degree in different contexts as those involved in the educative process examine and compare ideas about what guidelines are conducive to human flourishing.

Scientific research, on the other hand, serves to challenge and refine theoretical notions about human nature and development. It may be the case that well-supported findings in, say, neuroscience, help tailor practitioners' understanding of what it means for a person to live a good life, and how to provide the best supports for growth in that direction. In this way scientific inquiry can serve as a corrective to philosophical arguments, and the two disciplines of science and philosophy check and balance each other. Philosophy should remain the primary evaluator of policy proposals, however, as a method better suited to the subject matter, as discussed above. While we ought to expect revision to scientific theories, it would be highly surprising if our entire conception of human fallibility and flourishing proved without merit.

One objection that might arise to this proposal is that checking new policies against principles derived from virtue ethics, fallibilism, and subsidiarity requires the accurate prediction of empirical consequences, which is the very undertaking called into question by fallibilism. Every policy proposal may very well entail unknown, unforeseen, and unrecognized outcomes; it could turn out to be quite difficult to predict the ways in which all the consequences promote or inhibit virtue. Policy A may have negative outcomes that are not identified or identifiable until twenty years into

implementation; Policy B could have ambiguous results that current technology, metrics, and theories cannot capture. Advising policy makers to screen new proposals according to philosophical principles – eliminating proposals that run against a shared understanding of education and the human person – ignores their potential inability to project in detail how a given policy will influence a school's ecosystem.

Since this objection can also be raised against the current method of basing decisions on the best science available, it is not a particularly effective one. Research or evidence-based policy also relies on current tools, predictions, and best estimates, so the new method should at least not fare any worse. What the philosophical counter-balance offers that the current system does not is an evaluative tool not solely dependent on empirical evidence, but additionally supplemented by traditional wisdom and value-enriched reasoning. While one could critique both the scientific and philosophical methods for their dependence on induction-based predictions, the latter method removes policy decisions from a realm strictly limited by statistical analyses of data points.

Instead, the philosophical principles applied contribute to a more robust educational theory against which the evidence can be checked, which would facilitate policy makers' evaluation of the picture of the human person and educational process represented in the policy proposal. When looking at the policy itself, interested parties could determine from its justification, proposed method, and aims whether or not a desirable view of human nature is presumed. A policy justified by its enhancement of administrative efficiency, enacted by doubling standardized testing requirements, and aimed at improving a district's ranking, for example, would deserve further attention as

misunderstanding the purpose of education and what is good for the beings involved. A policy aimed at enhancing the reading abilities of toddlers through replacing classroom teachers with individualized literacy software programs justified by reference to the program's success with adult learners should likewise be revised as misunderstanding developmental stages and the relational nature of people. At the level of the theory underlying the policy, the fleshed out theoretical framework provided by the philosophical principles recommended would enable policy makers to determine whether the theory's auxiliary assumptions reflect a view of human nature compatible with virtue ethics. If the theory applied treats education as the open-ended molding of a formless lump of clay, for example, informed policy makers would question the resulting policy as lacking in understanding of the common trajectory and pre-existing tendencies of human beings. Finally, when theories are underdetermined by evidence, virtue ethics can help guide interpretation and implementation. If one of the ways a series of studies' results can be interpreted suggests that focusing on one aspect of temperament leads to greatest educational gains, and another that only short term gains are in fact evidenced while a more holistic approach to character yields more desirable results, virtue ethics would recommend the latter.

On a related note, one might object that the traits described in this set of recommendations as the most important outcomes of the educational process are ones that are not easy to assess – for example, wisdom and charity. These are internal, dispositional, enduring qualities, not discoverable by standardized tests, difficult to observe, and possible to feign. This objection could be interpreted as an argument for

rather than a criticism of the proposed method, however. Policy decisions must be frontloaded with a robust and reliable philosophy of education, given the limitations on back-end assessment and program evaluation. Because educators cannot count on classroom data to reveal students' character and dispositions, they must institute policies established through other means – tradition, folk wisdom, personal experience, philosophical evaluation – to be favorable to the development of virtue.

Finally, it might be objected that these recommendations are too general to provide real guidance: policies may significantly promote some virtues while slightly inhibiting others, could respect human fallibility but ignore the recommendations of subsidiarity, might foster the orientation to flourishing of students while inhibiting that of the teacher, or any other iteration of grey area solutions. It is not clear if compromises are acceptable, and if so, in what scenarios. A matrix for decision-making specific enough that the recommendations do not conflict, but general enough to avoid resemblance with the American tax code would be desirable. A framework too general could result in inaction or perceived permission for action according to subjective whims; a framework covering every possible circumstance would be impossible to construct and too cumbersome to regularly consult.

Like virtue ethics itself, however, one of the virtues of this solution is its moderate flexibility. Aristotle's ideal man is equipped with training in a certain set of principles that prepare him to exercise virtue in an infinity of possible scenarios. He is not equipped with a categorical imperative fit for every occasion; he is guided uniquely in each situation by a lifetime of carefully constructed habits and intellectual virtues.

Because it is impossible to prescribe a rule for every potential situation, a framework prioritizing certain values essential to the educational process is outlined, and it is left to the discretion of those at the most appropriate level of decision-making of how to interpret them. Granted, the flexibility of the model leaves it open for potential abuse by ineffective teachers and administrators, but this flaw mars every system, even those with an extreme degree of oversight, as discussed with the Head Start examples. The method proposed is not fool-proof, but it is an improvement over the current process in a number of ways. The purpose of education is recognized, the humanity and autonomy of local actors is restored, the potential for future revision is respected, and the nature of developing humans is appreciated. Autarchic reliance on unstable scientific findings is replaced with a more varied toolkit, and the resulting system of checks and balances is designed to enhance future education policy decision making.

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