Work's Role in Learning How

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Abstract: An influential version of intellectualism about knowledge how holds that acquiring facts is necessary and sufficient for learning how to do things. I argue that such a view is incompatible with learning to do things through effort and practice, which suggests that intellectualists dont have a coherent way to explain the role of work in our acquisition of knowledge how. By way of an alternative, I argue that work serves to establish patterns of thinking that coordinate propositional truths with powers of action.

1 Introduction

After Gilbert Ryle's *The Concept of Mind*, it was generally assumed that two kinds of knowing would be needed to explain knowing how to do things.[1] The first, *knowing-that*, is had in the apprehension of true propositions.[2] The second, *knowing-how*, is had in the possession of one or another dispositional capacity, ability, or power.[3] Recently, however, intellectualists have argued that this assumption is mistaken, believing instead that knowledge-how is a species of knowledge-that and that grasping the content of true propositions is necessary and

[1]The familiar distinction between knowledge-that and knowledge-how is made and defended by Ryle in Ryle (2009) and chapter 2 of Ryle (1949). The distinction, as well as the (mostly) current state of play, is illuminatingly discussed in the introductory chapter of Bengson and Moffet (2011).

[2]What is meant by 'proposition' or 'fact' isn't always clear. I'm assuming that facts are true propositions, and propositions are the objects believed or asserted when an agent believes or asserts, for example, that snow is white. I take this to be a fair characterization on either a Russellian or Fregean approach. For recent discussion of the nature of propositions, see the collection of essays in *Canadian Journal of Philosophy* (43, 2013).

[3]I'm not going to try to tease apart dispositions, capacities, abilities, or know how. For exegetical consistency, I'm going to use 'ability' or 'power' to capture the shared meaning of these terms. An agent possesses an ability (or power), then, when she is able to latently or manifestly do something of her own accord: birds have the ability to fly, ants the ability to tunnel, and rational agents the ability to act for reasons. Further, the ability to walk and to infer are abilities possessed by most human beings, but I will not distinguish between broad classes of ability (see Hornsby (2011, 83-84). Even so, I shouldn't be read as assuming that there are not uses to be made of distinguishing many of these closely allied terms (see, for example, the distinction between capacities and abilities in Pavese (2015b, 9-10)), only that the distinctions are not needed for my purposes.

sufficient to explain what an agent knows when she knows how to ϕ.[4] If correct, "knowing how to do something is the same as knowing a fact ... [and] ... learning how to do something is learning a fact" (Stanley, 2011a, vii). It is this version of intellectualism that I want to use as foil, arguing instead for an alternative that explains learning how to do things by appealing to formal mechanisms of thinking[5] acquired through effort and practice ('work' for short).[6] If I'm right, current debates between intellectualists and anti-intellectualists, which tend to emphasize *either* dispositions to act *or* propositional truths, overlook an important third ingredient for a more complete understanding of knowledge how.

I begin in Section 2 by framing a problem for intellectualism, one that arises out of its commitment to an entailment relation between grasping facts about how to ϕ and knowing how to ϕ. In its most general form, this entailment is the result of a functional mechanism of thinking whose input is truths about how to ϕ and whose output is the ability to ϕ.[7]

[4]Jason Stanley and Carlotta Pavese, for example, have argued that an agent knows how to F if and only if she knows that "for some way w of F-ing, [the agent] knows that w is a way to F" (Stanley, 2011a; Pavese and Stanley, 2011, 71), where knowing a way is knowing a proposition that truly answers the practical question, "How could one F?" Other prominent examples of the view I have in mind include (Stanley and Williamson, 2001; Pavese and Stanley, 2011; Stanley, 2011a,b; Pavese, 2015b, 2017), and (Stanley and Williamson, 2016). I should note, however, that not all varieties of intellectualism carry the same commitments. For intellectualist alternatives, see Bengson and Moffet (2011, 3-55). I don't engage those alternatives here.

[5]Acts of thinking follow patterns that we often represent mechanistically. For example, the patterns of thinking characteristic of, say, an Aristotelian syllogism, modus ponens, or means-end deliberation are distinctive and can be represented by steps that when followed determine an outcome irrespective of content. In this sense, such acts of thinking are formally distinct. They are each simple patterns for combining propositional truths to arrive at further truths, which might be implemented by something like a Turing machine. (See MacFarlane (2002, 2000) for discussion of different senses of 'formal'.) In this essay, when I speak of the formal mechanisms of thinking, I mean the distinctive patterns of thinking presupposed in the mind's movement from one state to another. The movement, for example, that eventuates in new beliefs when prior beliefs are combined in the right sort of way. In this sense, the view I'm proposing can be stated this way: there are certain patterns of thinking that begin with thought's propositional content and eventuate in actions we know how to perform. The latter (actions we know how to perform) are explained by both of the former (thought's propositional content and patterns of thinking).

[6]The role practice plays in learning how to do things has been explored both inside and outside of philosophy. These discussions largely fall outside the scope of this paper. The following, however, are good initial sources for further exploration: J.R. Anderson (1982), S.E. Dreyfus and H.L. Dreyfus (1980), Ericsson et al. (1993), Ericsson (2008), Fridland (2019), Fridland (2018), K.G. Hall and R.A. Magill (1995), Montero (2016), R.A. Schmidt and R.A. Bjork (1992), and Stichter (2007).

[7]The functional mechanism of thinking is supposed to be practical: it's a mechanism by which grasping propositional truths about how to ϕ serves as the input to produce the ability to ϕ as output. See, for example, Stanley's (2011a, 124-125) discussion of the role of practical ways of thinking. And, according to Stanley, it's appropriate to envision this mechanism as automatic and perfectly general (2011a, 184).

The result is the view that acquiring truths about ϕ-ing and thinking them in that way entails knowing how to ϕ. I argue in Section 3 that this view is mistaken because it cannot coherently account for the role of work in learning how to do things. Section 4 shows the intuitive plausibility of the idea that the mechanisms of thinking I emphasize throughout the essay are cognitively significant. I conclude by gesturing (roughly and metaphorically) at an alternative model for thinking about how we learn to do things.

2 The Role of Work In Learning How

It seems obvious that thinking about ϕ-ing and the ability to ϕ are not necessarily tied together. I can, for example, entertain truths about skateboarding without thereby possessing the ability to skateboard. How, then, does thinking truths about ϕ-ing come to be bound up with the ability to ϕ? What must be learned to establish that connection? According to intellectualists, the answer is more propositional truths (or facts), which are both necessary and sufficient to explain what is known (or learned) when an agent knows (or learns) how to ϕ. This strikes me (and others) as counterintuitive, since propositional truths seem easy to acquire and since lots of creatures seem to learn how to do things without an obvious grasp of propositions.[8] Indeed, if binding thoughts about ϕ-ing to the ability to ϕ were merely a matter of learning new facts, it seems that a connection between entertaining truths about, say, skateboarding and the ability to skateboard could be established by simply reading some books. But surely one doesn't learn a large variety of things (how to skateboard, ski, play the fiddle, dance, paint, write papers, etc.) in such a way. How do intellectualists avoid this seemingly counterintuitive consequence of their view?

Generally, it's avoided by denying that it's a result of their view. Some facts, intellectualists maintain, require work to be learned (Stanley, 2011a, especially 182–185). An example will serve to flesh out the idea. Keeping with our example, suppose I want to learn to skateboard. On the intellectualist view that is my target, it is necessary and sufficient for doing so to learn facts about how to skateboard. Some of these facts (call them *descriptive*)

[8]These counterintuitive features of intellectualism have been expressed by many, many others. A short list would include Audi (2017); Carr (1981, 1979); Carroll (1895); Hornsby (2011); Koethe (2002); Ryle (2009); Schiffer (2002); Setiya (2008); Snowdon (2003), and Wallis (2008).

may be acquired by reading books or listening to friends describe how to skate. But other facts (call them *executive*) will not be like this. Instead, they may be difficult to acquire, demanding effort and practice to learn.[9] What is the nature of such facts? According to the most fleshed out answer (Pavese, 2015b) to this question, they are algorithm-like instructions (or methods) embedded as conceptual components in practical propositions. By grasping them, agents are endowed with corresponding abilities.[10] So, by acquiring the algorithm-like instructions for executing a skateboarding maneuver, an agent who grasps them is endowed (as a matter of entailment) with the ability to execute the maneuver. Here, then, is the intellectualist response to the supposedly counterintuitive consequence of their view: You simply cannot learn some of the facts entailing an ability to perform a tricky skateboarding maneuver (or whatever) without work, because it is by performing the movements involved in the action that you learn the algorithm-like instructions (or methods) necessary to execute it. Consequently, the truths you've acquired are not behaviorally inert: bringing the facts you've learned to mind entails an ability (or disposition) to execute them in action.[11]

Now, I don't believe this view can be coherently maintained by intellectualists because their broader view relies on assumptions incompatible with substantiating the distinction between kinds of facts. If I'm right, intellectualists don't actually have a coherent way to explain the role of work in learning how to do things. In other words, their view really does have the counterintuitive consequence they seek to avoid. Of course, it's not obvious that intellectualist commitments entail the tension I began this paragraph by pressing. As a result, I want to show how it develops out of their view. In particular, I want to show that it

[9]I'm happy to concede that we learn to do some things entirely by learning descriptive facts about how to do them. I might, for example, learn to play Scrabble by hearing the propositional truths about how to play described by a friend. This concession, however, doesn't help intellectualists escape the problem I'm pressing, since they acknowledge that some significant portion of what we learn requires more than merely receiving instruction.

[10]These endowed abilities are a matter of entailment and this entailment is an important feature of the intellectualist view I'm targeting. Pavese, for example, is explicit that grasping a mode of presentation (in her words, 'practical sense') endows an agent with certain sets of abilities (Pavese, 2015b, 10). Stanley is more guarded, though still committed. He writes, "the view that the contents of thought include ways of thinking ... entails that propositional knowledge is not behaviorally inert (Stanley, 2011a, 98). See also Stanley and Williamson (2001). On this family of views, knowledge-how is a species of knowledge-that because grasping propositional content about ϕ-ing entails knowing how to ϕ.

[11]Stanley's (Stanley, 2011a, ch.3-4) discussion is especially relevant here.

arises when practical ways of thinking are modeled after first person ways of thinking. The incoherence I hope to demonstrate can be presented in the form of a dilemma: if practical thinking is analogous to first person thinking, work should play no substantive role in learning how to do things; if work does play a substantive role in our learning how to do things, it's on account of an asymmetry between modes of thinking, the upshot of which reveals the inadequacy of propositional truths to wholly account for what is learned when one learns how to ϕ.

3 First Person and Practical Ways of Thinking

The idea that learning facts about how to ϕ entails the ability to ϕ has been supported using the notion of a practical way of thinking.[12] The idea is simple: if bringing certain facts to mind is bound up with executive dispositions, you'll not be able to entertain those facts without knowing how to execute them. But what's the basis for believing that such dispositions come bound up with facts we know? The idea, I believe, grows out of (and gets its plausibility from) the observation that some dispositions must be presupposed if we are to understand first person thinking. As Stanley notes:

> What one contemplates when one entertains a proposition is often something that requires one to have certain kinds of dispositions towards objects. ... This is particularly obvious in the case of first-person thought. When it comes to thoughts about oneself, there is simply no possibility of contemplation without the disposition to execute. (Stanley, 2011a, 110)

The view Stanley advocates here is that first person content is inherently linked to the way of thinking of one who thinks that content. You can't bring facts before your consciousness as

[12] As Stanley notes, ways of thinking are "constituents of propositions that we know" (Stanley, 2011a, 106). This is a consequence of his preferred Fregean approach to propositional content, although he believes a non-Fregean approach to propositions, using contextually dependent modal parameters to govern the use of expressions about an individual's know how, could do the work he uses practical ways of thinking to do. (See Stanley (2011a, 122-130) and Stanley and Williamson (2001) for discussion of this issue.) Pavese (2015b) develops a Fregean view of ways of thinking, where they are a type of sense, which means they "are conceptual components of the propositional content that is putatively known when one knows how to do something" (Pavese, 2015b, 2). As with Stanley's view, if Pavese is right, all an agent need learn in order to learn how to ϕ can be encoded in the content of a proposition (or set of propositions). (See also (Pavese, 2015b,a, 2017)). I don't believe any of my arguments depend on a particular analysis of propositional content, and since the Fregean approach seems favored Stanley (2011a) and is the most developed Pavese (2015b), it is the one to which my arguments are pinned.

facts about yourself if you're not possessed of certain dispositions. So, for example, thinking about the pain in my finger in a first person way entails the disposition to believe, desire, or do certain things. From Stanley again:

> To think of an object in the world as myself is to possess certain dispositions involving that object in the world. If that object in the world is cold, I will clothe it; if it is wet, I will dry it, etc. In general, I think of an object in the world as me if and only if I treat it in a first-person way. (Stanley, 2011a, 109)

If this is right, there's no obvious problem with the view that learning facts may entail a variety of executive dispositions. More particularly, there's no problem believing that facts about oneself come bound up with a way of thinking that entails certain abilities. And if this is true of facts about oneself, why not extend the idea to facts about how to do things? Indeed, Stanley gestures at the move when he writes:

> To think of an object in a first-person way is for that object to occupy a certain functional role—to be something towards which first-person dispositions are directed. Similarly, explaining what it is to think of a way of doing something in a practical way is ... a matter of spelling out the distinctive practical functional role that way occupies in the mental life of the speaker. (Stanley, 2011a, 124)[13]

An assumed symmetry between first person and practical ways of thinking is here used to support the idea that facts about doing ϕ come bound up with a way of thinking them that entails knowing how to ϕ. So what's the problem? It is this: the entailment from 'first person facts' *and* 'a first person way of thinking them' to 'abilities' is illegitimate, except in a sense entirely unhelpful to intellectualists. It simply doesn't follow from thinking 'I am hungry' in a first person way that I will eat, that I desire to eat, that I plan on eating, that I believe I should eat, that I am able to eat, that I have the capacity to eat, that I am disposed to eat, ... or so on. I may be on a hunger strike, I may be sick, I may find the idea of food disgusting, I may believe that the food available is poisonous, etc. Indeed, nothing seems

[13]Stanley is never explicit about what distinguishes ways of thinking from each other. He mentions visual ways of thinking, descriptive, demonstrative, practical, and first person. Other than the nominal difference (and the presumed functional differences, whatever they are), it's not clear what these distinctions come to. However, understanding the differences as well as what is presumed in distinguishing them is philosophically important, as I try to show below. For Stanley's defense of ways of thinking as (more or less) innocuous, see his discussion in (Stanley, 2011a, 98-109).

to follow from the fact that I am thinking ϕ in a first person way except the old Cartesian point that I am a thing able to think of ϕ-ing. But that's a pretty bare-bones entailment.

To even begin putting meat on those bones—that is, to substantiate an entailment from 'first person facts' and 'first person ways of thinking them' to 'abilities'—requires more philosophical work. At minimum, it seems to demand identifying different mental capacities. For example, it is only possible to get from thinking 'I am hungry' in a first person way to 'I plan on getting something to eat' if I am able to form intentions. Similarly, from thinking 'I am wet' in a first person way to 'I want to get dry' requires the capacity to desire. Or, again, thinking 'I am in pain' to 'I wish the pain would stop' requires the capacity to entertain subjunctives. But even if we identify these distinct capacities, none of them are *entailed* by the bare-bones fact of thinking oneself hungry, wet, or in pain. And notice, too, that these distinct capacities are formally very different: to desire food is formally distinct from intending to get it, believing that you need it, knowing that it is desirable, being disposed to consume it, or being able to get it. In other words, getting from a first person way of thinking of ϕ-ing to the ability to desire, intend, believe, or know how to ϕ requires formally distinct turns of thought, none of which are entailed by merely entertaining facts about oneself in a first person way.[14]

But perhaps I'm being too stingy. It certainly seems as though thinking 'I'm hungry' in a first person way entails more than the bare-bones entailment I concede. And in fact, that may be the case if we're willing to assume that a variety of formally distinct cognitive mechanisms are in place prior to ever thinking 'I'm hungry' in a first person way. Suppose, for example, that we (human agents) come hard-wired with a triggering mechanism associated with hunger such that when an individual thinks 'I'm hungry', he or she will seek to satiate

[14]For one way of understanding the difference between desires and intentions (and the latter's role in planning), see Bratman (1987). We can mark the formal difference developed in Bratman's view by noting that for him desires involve a more proximate commitment to act than do intentions (though both are defeasible). Furthermore, intentions play a role in the diachronic stability of agency not played by desires. These differences make the two things formally distinct in the sense I discuss in footnote 5. We can mark other formal differences between features of the mind as well. For example, Bernard Williams (1973, ch. 10-12) points out that beliefs agglomerate while desires do not. Believing A and believing B means I believe both A and B, but desiring C and desiring D does not mean I desire both C and D. Or again, the widely shared idea that knowing something involves believing it to be true while believing something involves merely aiming at its being true indicates a formal difference between belief and knowledge.

that hunger. With that assumption, entertaining the thought 'I'm hungry' may entail the disposition to satiate one's hunger. Similarly, if we assume that we come hard-wired with the cognitive mechanisms (whatever they might be) associated with desiring things, it may follow from first personally thinking 'I am in pain' that 'I desire to end the pain'. The most charitable rendering of the intellectualist idea, then, comes to this: if we assume that a variety of (formally distinct) cognitive mechanisms are already entirely in place, we can get from thinking of ϕ-ing in a first person way to the cognitive abilities (e.g., desiring, planning, believing, knowing, etc.) involving ϕ-ing.

The significance of this assumption becomes obvious using a technological analogue. Computers come equipped with functional mechanisms that give them (the computers) a variety of abilities. By giving these mechanisms appropriate input, the ability to produce certain output is entailed. For example: in the early-ish days of personal computers, starting one up required inputting a series of commands that the computer, given the mechanisms it came equipped with, would then proceed to execute. In this way, presenting it with information was ability entailing. When the computer was given information in the right way, its start-up abilities were entailed. Intellectualists envision the mechanisms of first person thinking functioning similarly: when information is given to mechanisms of the mind in the right way, certain abilities are entailed. But, and this is the critical point, this is only true if we assume that the (again, formally distinct) mechanisms that render that input into executive dispositions or abilities are already entirely in place. It is only true that thinking 'I am hungry' in a first person way entails the disposition or ability to want food if the formal mechanisms associated with wanting are assumed as part of the cognitive architecture of first person thought.

Such an assumption, however, is incompatible with the intellectualist view that some facts (the executive kind) require work to be learned. Let me explain. If computers get the facts necessary and sufficient to acquire new abilities by passively receiving instructions as input, and if our minds work in (more or less) the same way, why would we need to do anything more than receive instructions about how to ϕ in order to learn how to ϕ? Why would some facts require work to be learned? Intellectualists can't answer this question if executive facts, which are the difficult-to-acquire kind, are conceived as merely propositional

truths (i.e., algorithm-like instructions or methods) for doing something. There is simply no reason to believe that an algorithm (or method) for doing this, that, or the other thing requires work to be learned given the assumption that the functional mechanisms required for translating propositional truths about how to ϕ into the ability to ϕ are already in place. And let me emphasize: that assumption is required for the purported entailment relation at the very heart of intellectualism to go through.

To lend plausibility to their view, then, intellectualists offer a slightly different story to explain what's going on when someone acquires new abilities (or improves those already possessed). As Stanley writes:

> The novice who is just acquiring a skill learns a method by which she can accomplish that skill—this involves the acquisition of propositional knowledge. But in the novice, the automatic mechanisms that apply the propositional knowledge to specific situations are not in place. [...] The move from being a novice to being an expert involves bringing these automatic mechanisms to bear on the propositional knowledge that one has acquired.(Stanley, 2011a, 183–184)[15]

According to this story, executive facts are distinct in that in acquiring them an individual is putting in place (or restructuring) mechanisms that apply truths in action. This move, however, violates the assumption required to support the intellectualist idea that learning truths about ϕ-ing entails knowing how to ϕ. In other words, it is only true that learning truths about ϕ-ing entails the ability to ϕ if there is an assumed, hard-wired connection between the two. This assumption is violated if some truths are special in that in acquiring them, an individual is also acquiring (or restructuring) automatic mechanisms that apply

[15]As Ellen Fridland (2013, 883–884) points out, intellectualists make room in their view for nonpropositional mechanisms, but they are supposed to play no role in explaining intelligent action, since they are automatic, subpersonal triggers. In this sense, intellectualists agree with Fodor when he writes that "knowledge doesn't eventuate in behavior in virtue of its propositional content alone. It seems obvious that you need mechanisms to put what you know into action; mechanisms that function to bring the organization of behavior into conformity with the propositional structures that are cognized" (Fodor, 1983, 9). To put that differently, everyone can agree that dispositional mechanisms play *some* role in explaining the things we do, but for intellectualists, that role has nothing to do with what we know (or learn) when we know (or learn) how to ϕ. The mechanisms needed to put what one knows into action are automatic (they are mechanisms not under our control) and are thus not achievements one learns. As a result, such mechanisms could not count as something an agent knows when he knows how to ϕ. Stanley's defense of the schema that "for every s and F, s knows how to F iff for some way w of F-ing, s knows that w is a way to F" Stanley (2011a, 71) and belief that "learning how to do something is learning a fact" Stanley (2011a, 9) reveal this point. See also Stanley and Williamson (2001, 430) and Pavese and Stanley (2011). I disagree.

truths about ϕ-ing to its performance.[16] The upshot is that the intellectualist position we've been surveying faces a problem. On the one hand, if facts about how to ϕ are algorithm-like constituents of propositions that we know, and if learning them is disposition entailing, it is only because we are assuming a model wherein the mechanisms responsible for rendering propositional truths into abilities are assumed as part of the mind's cognitive architecture—that is, it is to model practical thought after first person thought. On such a model, it is not possible for intellectualists to make sense of the role work plays in our learning how to do things. After all, the automatic mechanisms that translate propositional truths into abilities (according to that model) are already assumed to be in place, which is to say that the only thing needed to acquire a new ability is the passive acquisition of propositional truths. On the other hand, if learning to ϕ requires securing new mechanisms (or restructuring already existing ones), then propositional content is not itself sufficient to explain what we learn when we learn how to ϕ. On this model, there is an asymmetry between the first person mode of thought and its practical counterpart. Accordingly, we must acquire or restructure the (formally distinct) mechanisms of mind required to execute propositional truths in action. Ultimately, this seems to be the move intellectualists want to make, but in making it, the assumption needed to sustain the entailment at the very heart of their view is abandoned.

Let me conclude this section by putting a bit more flesh on the bones of the argument I've just made. Suppose I possess all of the physical capacities needed to skateboard. Capable though I may be, I don't know how to perform some tricky maneuver. What do I need to learn to acquire the ability? Intellectualists have two possible answers. Assuming that the practical functional mechanisms required for translating propositional truths into abilities are entirely in place, the intellectualist answer can be nothing more than propositional truths. Once these truths are learned, the ability to perform the maneuver is entailed. But with that assumption, intellectualists have no basis for distinguishing hard-to-acquire facts, which are the executive kind, from normal, easy-to-acquire facts, which are the descriptive kind. In

[16]The difficulty I'm pressing here might not be problematic for intellectualists if these mechanisms were themselves "stupid, noncognitive, general-purpose processes" (Fridland, 2013, 6-7). As Ellen Fridland (2013) has demonstrated, however, they are not. As she shows, "the ... mechanisms that are responsible for triggering propositional states, are sensitive to significance, responsive to meaning, under the control of the agent, and subject to learning and improvement. As such, skilled action [is only] possible when these purportedly dumb mechanisms do very smart kinds of things" (Fridland, 2013, 7).

the face of this consequence, intellectualists might respond by insisting that there really is a distinction between the kinds of facts we learn. The executive kind can only be learned through effort and practice. Why? Because it is through effort and practice that we learn the algorithm-like instructions for executing our abilities, and acquiring these algorithm-like instructions means reconfiguring (or acquiring) the mechanism(s) of mind that translates propositional truths into abilities. But now, by insisting on the distinction between kinds of facts, intellectualists are forced to abandon the purported entailment relation (the one between acquiring propositional truths and abilities) at the heart of their view. If we have to reconfigure (or acquire) the practical functional mechanism(s) required for translating truths into abilities, it's simply not true that learning propositional truths about ϕ-ing entails the ability to ϕ.

But of course, intellectualists will want to resist that conclusion, insisting instead that there is a "perfectly general," practical functional mechanism built into our cognitive framework. Effort and practice are required to massage the workings of that mechanism, but the hard wiring necessary to guarantee the entailment relation between learning facts about ϕ-ing and the ability to ϕ are already in place. I find this deeply implausible. As we've seen, the turns of thought required to translate propositional truths into cognitive abilities involve formally distinct patterns, depending on whether an individual is desiring, intending, believing, or whatever. So, too, the mechanisms of mind that translate propositional truths into performative abilities are formally distinct. Teaching someone to ϕ is a formally different process from ϕ-ing. There are different turns of thought involved with the activities, even if the content characteristic of ϕ-ing is identical between teaching and doing. And there is nothing to justify the assumption that the mechanisms of mind required for these distinct turns of thought are already part of our cognitive architecture. A similar point applies to other abilities that seem categorically different—like say, playing chess, riding a bike, teaching a child to read, socializing with strangers, etc. The ability to do each of these things seems built around formally distinct turns of thought and I see no reason, and I've seen no argument, that warrants assuming they are mere components of a broader, perfectly general, practical functional mechanism that translates truths about how to ϕ into an ability to ϕ. Intuitively, different turns of thought are involved in the different things we do.

Finally, it's worth noting that I haven't directly argued for the cognitive significance of the mechanisms that translate propositional truths into abilities. The point has already been sufficiently demonstrated elsewhere (see Fridland (2013)), but let me begin to wrap things up by briefly addressing that issue.

4 A Cognitive Achievement

Intellectualists believe that the achievement evidenced in learning how is factual. It's learning to grasp truths one didn't previously grasp. I've argued that such a view is inadequate, that the achievement evidenced in learning how to do a variety of things is more appropriately considered both factual and formal. In addition to new truths, we must also acquire the formal mechanisms of thought that apply truths to powers of action, which is to say that we learn patterns of thinking that serve to coordinate truths about ϕ-ing with powers to ϕ.[17] In what sense are these formal mechanisms cognitively significant?

The question has been addressed elsewhere (see Fridland (2013)), but I'd like to offer two quick examples as support. There is a well-known asymmetry between making deductions in the manner of modus ponens and making them in the manner of modus tollens. Typically, we are naturally more adept at modus ponens style deductions. In fact, the performative asymmetry is observed in individuals even after they have been taught each style of deduction and shown their logical equivalence. You can teach people a bunch of facts about modus ponens and modus tollens, but their capacity to reason symmetrically with the different patterns will not immediately improve. However, the performative asymmetry tends to diminish as individuals practice solving problems using modus tollens. (This should be a familiar fact to philosophers who, if nothing else, have had to learn—and teach students—to perform formal deductions using these patterns of inference.)[18] So what is being learned when

[17]The idea that there is a role for mechanisms of thought to play in coordinating truths with abilities has implications for the intellectualist view about skill acquisition. See especially Stanley and Williamson (2016) and Stanley and Krakauer (2013) for that view. I don't engage those issues in this essay, but I believe what I've said straightforwardly implies that the intellectualist view developed there is much too simplistic.

[18]For discussion of the asymmetry between modus ponens and modus tollens style inference, see Oaksford and Chater (2008). Psychological work detailing the influence of education on reasoning capacities is widespread, but a good place to begin is with Nisbett (1993), Lehman and Nisbett (1990).

individuals learn to execute modus tollens on par with modus ponens? On an intellectualist view, the answer is simply new facts. Individuals might, for example, be learning that 'denying the consequent of a conditional statement entails the negation of the antecedent'. But if it were mere facts being acquired, we'd expect to see performative parity immediately, since the mechanisms required for entertaining the thought would be assumed to be in place. That we don't see performative parity is (I believe) evidence that formally distinct patterns of thought must be forged anew in our cognitive architecture. In addition to facts about the differences between modus ponens and modus tollens, the formal mechanisms of thought characteristic of the distinctive styles of deduction must be forged in the individual's mind. This is accomplished by practicing the unfamiliar inference pattern with pen and paper. It's done through work. Now, if you believe that learning to make formally distinct yet logically equivalent inferences is significant to cognition, then acquiring the mechanisms that apply truths about modus tollens to its execution should be considered so too.

Another example: Individuals may learn facts about fiddle playing, possess the power to perform all of the particular movements necessary for doing so, and still lack the coordination to apply what they know to their performative powers. What is needed to acquire the coordination? Work. Only by going through the hard knocks of failure and correction will the mechanisms of thinking needed to apply truths to powers of action be forged. Only in this way will the novice move from knowing a bunch of facts about how to play the fiddle to applying those facts in actions that produce something other than noise. If that is correct, the mechanisms of thought that tie factual content to an agent's powers of movement play an essential role in the cognitive processes that amount to knowing how to play the fiddle. Consequently, the formal mechanisms acquired through work should be considered cognitively significant.

5 The Architecture of Thought

I've argued that intellectualists cannot coherently maintain the position that learning facts about ϕ-ing is sufficient for learning to ϕ. In addition to those facts, learning to ϕ requires securing mechanisms of thought that translates those truths to performative abilities. My

sense is that the tension in the view is the result of conceiving of these mechanisms on the model of a computer, one where those mechanisms are cognitively insignificant, general, and already in place.[19] But such a model is unhelpful when trying to understand how we learn to do things. A better model will be sensitive to the patterns of thinking we acquire through work. What does learning how to do things look like on such a model? Let me conclude with a quick, rather metaphorical, sketch. As I see things, it is through work that the formal mechanisms of thinking that apply truths to powers of movement are acquired, and it is thereby that our powers of movement are brought under (or coordinated with) thought's content. As we exert ourselves, the movements we make are coordinated with truths we know through the acquisition of mechanisms that are entirely formal. Metaphorically, acquiring formal mechanisms of thought is similar to how the first apathetic trickles of streams become rivers. Patterns of thinking that coordinate truths with powers of movement find their pathway, take hold, grow, and become canalized through effort. This slow patterning of the mind through practice and effort gives thought's content a formal pathway, thereby coordinating what one thinks with the powers one possesses. And it does so as the product of one's own labor.

[19]The assumptions behind such a computational model of practical thought are fleshed out in Mosdell (2018).

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