

Understanding as a component of knowledge: rethinking the pedagogical implication of epistemology

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"The mind is not a vessel to be filled but a fire to be kindled."--Plutarch

Introduction

The standard JTB [justified, true belief] model of knowledge meets difficulties in Gettier cases. The usual response is to strengthen or alter the justification requirement. In this paper I'll analyze instances where knowledge is understood to be an *understood* true belief, and where understanding justifies the belief. I give several examples where a justified true belief is not understood, and is therefore not knowledge, and show that when the belief is understood, it becomes knowledge. The following case is paradigmatic: A student hears a physics professor say that fermions have half-integral spin, and reads the same claim in a textbook. The student adopts this as a belief, and is justified by the authority of the sources. However, she does not know what "fermion" means, nor what it would mean to have "half-integral spin." Thus, her justified true belief is not understood, and, I argue, would not be taken as knowledge. Looking at cases then where the belief is better and better understood, we see a spectrum of knowledge arising, from cases where a belief is not understood, to where it is poorly understood, on to "full" understanding. By accepting that knowledge has degrees, we complexify it, and open up an interesting pedagogical possibility: the point of education is not to instill knowledge, in the sense of justified, true beliefs. That would not admit of degrees of knowing of any individual proposition, and education would then be the mere accretion of individual true propositional beliefs.

Instead, the goal is to increase understanding, altering one's state of knowledge even of the same proposition. The either/or of knowing/not knowing is paralleled in the idea that students either do or do not grasp the material at hand. Vygotsky suggest (and backs his suggestion up with empirical research) that while some do not grasp, and some do, there is a large middle ground, what he calls "the zone of proximal development."¹ This mid-range shows an area where skills are semi-formed, and knowledge semi-possessed. Similarly, Skinner's "operant conditioning" is about the decomposability of knowledge². Instead of teaching something all at once, operant conditioning breaks it down into parts, and rewards partial completion until larger steps are taken. Both Skinner's and Vygotsky's views on education track neatly with *understanding*, that aspect of knowing that ties knowledge to the capacity to use that knowledge, and to connections to other pieces of knowledge. The more connections, the more skills, the more understanding. Pedagogically, we might liken that to the difference between answering a question correctly on a multiple choice exam, the more difficult task of answering a short answer,

¹ Lev Vygotsky, *Mind in Society*, p. 86, Harvard University Press, 1978

² Cf Skinner, B.F. (1950). Are theories of learning necessary? *Psychological Review*, 57(4), 193-216; Skinner, B.F. (1954). The science of learning and the art of teaching. *Harvard Educational Review*, 24(2), 86-97.; Skinner, B.F. (1968). *The Technology of Teaching*. New York: Appleton-Century-Crofts.

and the harder task of answering a counterfactual about that same topic or “piece” of knowledge.

Thus I’ll take issue with Stephen Grimm and Wayne Riggs, who each claim that knowledge is fully distinguishable from understanding, and propose a more eclectic account of knowledge where the concept frequently entails understanding. I’ll also follow Jonathan Kvanvig in claiming that understanding is the source of epistemic value but, contra Kvanvig, will claim that this is still part of knowledge.

I.

Understanding needs to be taken into account in analyses of knowledge. Whereas we tend to think of knowledge as a justified, true belief, plus some anti-Gettier/anti-luck component, in some cases knowledge is understood to be an *understood*, true belief, where understanding replaces justification as an essential component. In other cases, it’s an understood, justified true belief. But in no case can it be a non-understood, justified true belief. This conceptualization provides a good way for moving forward with a richer understanding of knowledge, and one that is, I hope, helpful to us pedagogically. That is, when we teach, we certainly want to impart knowledge, but we’d also, and I think more importantly, like to impart understanding. This latter is harder to do; it involves *skills* and *non-propositional knowledge*, but without it, we as educators have only given our students disconnected elements of trivia. Critical thinking, for example, is about helping students understand, and giving them tools for understanding, much more than it is about imparting knowledge.

II A Gettier Type Problem for Understanding

Zagzebski, Riggs, Grimm and others have noted that understanding could be an important focus for epistemology, but most writers on this topic would claim that we can have understanding without knowledge and knowledge without understanding. I agree that the terms name distinct concepts, but I want to point out that at the limit, it is impossible to have knowledge without at least some degree of understanding. I’d argue, further, that many epistemologists tacitly agree, and that going back to Plato, understanding was often seen as a component (indeed, Plato’s “true belief with a *logos* is ambiguous between “justified true belief” and “understood true belief,” which is why, i think, *logos* is often translated as “account.”) But to prove the point, I’ve produced the following Gettier-esque case wherein justified, true beliefs without understanding occur, and which, I think, we would not take as knowledge.

a. The Case of Ms. Testimony and “Fermions have half-integral spin.”

Ms. Testimony, a student in a physics class, reads in a physics textbook, “Fermions have half integral spin; bosons have integral spin.” She asks her professor, a noted physicist, if it’s true. He tells her that it is. Knowing that even two corroborating testimonies could be mistaken, she then phones the 100 leading physicists of the day and ask them, “is it true that fermions have half integral spin, and that bosons have integral spin?” Yes, they all

tell her, it's true. "How do you know that?" she asks. They all say that it's been repeatedly verified in empirical experiments.

She consults dozens of physics textbooks. They all hold the same answer. All sources she consults agree. So she decides that it must be true, to the greatest reasonable degree, that fermions have half integral spin and bosons have integral spin. From then on, she will assent to the claim "fermions have half integral spin," and dissent from the claim "fermions do not have half integral spin."

The claim is true, it is justified, and she believes it to be true. But, she has no idea what "fermion," or "boson" mean, and is unclear what "half-integral spin" could possibly be. Is it knowledge?

She is holding as a belief the same claim (if it is a claim in her hands; if she has no idea what it means, then it may lack the semantic element needed to be a claim) that the physicists she consulted held. However, she does not have the ability to deduce other claims from this claim that use its semantic components, nor does she have a grasp of the connection between this claim and other claims. In the physicists' case, there are many claims entailed by this claim, and the physicist understands the relation between this claim and other claims. Is this knowledge?

Perhaps it is not knowledge if it is not understood. If so, knowledge and understanding are commingled, and knowing-that is inextricably tied to knowing-how (to use these terms, for example.)

b. Knowledge as having degrees

Suppose we reject the claim that Ms. Testimony know "fermions have half integral spin," since she doesn't understand what that means. But let's say she knows it to this extent: she knows that fermions are some sort or class of subatomic particles, and she knows what an atom is, to the extent that she learned about it in high school chemistry. And she knows that spin has something to do with angular momentum (the spin of a subatomic particle is a bit different, but it's something like that) and she knows that "half integral" means something in the series "1/2, 3/2, 5/2," etc. She doesn't know what "fermions have half integral spin" means to the same extent that a physicist does. She couldn't say which particles are fermions (except that they are those particles with half integral spin,) she can't say precisely what spin is in this case, and she doesn't know why this claim *matters*, or how it relates to other claims about subatomic particles (except that she knows bosons, which must be some other sort of subatomic particle, have integral spin.) Now, does she know the claim? Certainly she does not understand it the way a physicist does. But does she know it, in the sense of "episteme" that pertains to sentential knowledge (assuming all the conditions discussed in 1 above still apply)?

Again, the physicists understand it better than her. But let's line up a group of physicists. Some clearly understand the claim better than others. They know many other claims that correlate with, derive from, lead to, define, explicate, show applications of, etc., this

claim. There are clearly degrees of understanding the claim. At what point does a minimal amount of understanding amount to not knowing?

We accept that certain kinds of knowledge admit of degrees: the extent to which I know algebra, or Kantian philosophy, for example. This can be (and has been) conceptualized as relating to the number of true propositions (or claims) that I know within these subject fields. But the assumption is that propositions are things that I either know or don't know. However, it seems that even individual claims admit of degrees of knowledge, and it's hard to hold that knowledge can be fully atomic. If, indeed, I know "fermions have half integral spin" to a greater or lesser degree, then knowledge is not an either/or.

III: Understanding Knowledge as Including Some Degree of Understanding

Iris Murdoch claimed (in *Idea of Perfection*) that understanding was poorly understood by contemporary philosophers, and that knowledge couldn't be understood without the concept of understanding. I think she's correct, as I've tried to show above. The examples she gives in that essay pertain more to the understanding that passes between people, but, given the Ms. Testimony case, I think it applies as well to simple cases of propositional knowledge.

If that's so, then episteme cannot be understood without understanding, and knowledge as such is not simply justified true belief, unless we accept that Ms. Testimony knows that fermions have half integral spin; maybe she does (this would depend on what we mean by "knowledge," and might be settled by experimental philosophy, or it might be that the philosophers *episteme* is different from the common understanding of "knowledge," in which case we'd have to think carefully about whether an experiment on intuitions would help.) But then knowledge isn't so interesting, it seems. If, indeed, that's all that knowledge is, then our pedagogy and philosophy should probably be concerned with something else. If it is a triviality, it's not what interested Plato, and it's not the topic that causes naïve young philosophers to wonder "what is knowledge?"

As noted above, understanding admits of degrees. We then need to ask what degree of understanding is needed for knowledge, and this is going to be highly dependent on the context and specifics of the knowledge claim, which means we may not be able to set precise limits, for all cases, on what level of understanding is required. It's not even clear that "knowing what a word means" is simply understandable. Again, I can know to varying degrees what "fermion" or "intestine" or "electricity" mean.

Rough criterion for the understanding component of knowledge:

So to provide a criterion, let us assume that some baseline is crossed in knowing that P when I have a justified true belief that P, and I can at least rephrase P, or say what P means. I know P far better when I can show how it connects to more propositions. And I know it even better if it's part of a system or theory from which I can produce novel claims that are coherent with the existing system or theory, drawn from it, and true.

I think here knowledge bleeds into understanding, and I'll get on to how these intersect after a brief detour where I show what happens if we accept the claim that the person who doesn't know the meaning of the terms "fermion" "half-integral" and "spin" still can know that fermions have half integral spin based on hearing the sentence uttered by a reliable source.

IV Knowing-how, Understanding and the Value of Knowledge

While most attempts at defining knowledge have focused on simple propositional knowledge or perceptual knowledge, the latter is (often) trivial, and the former is poorly explicated in terms of the difference between "knowing that P is true," and "knowing that P." What I've been claiming is that "knowing that P is true," is possible without actually knowing that P, and in the understanding-based Gettier cases above, that's what's going on, and that's why we don't know that P in such cases.

There are important ramifications for this: knowing that P is true, in the absence of knowing that P, eliminates the epistemic good that obtains from knowing that P. This is because knowing that P involves not having a justification for believing that P is true, but also understanding P. So, in the case where one knows by testimony and authority that "fermions have half integral spin," [is true] without understanding, but with warrant for making the assertion "fermions have half-integral spin," and where one believes the assertion to be true (and it is in fact true) one has acquired little to no epistemic good. There may be some situations in which this "knowing that P [is true]" could be a good³, but they're far more constrained than the good that comes from really knowing that P. Really knowing, which includes understanding, will involve, first, an awareness of (some reasonable set of) the implications of any claim P, and an awareness of (some reasonable set of) the claims that imply P. Thus, knowing that P admits of degrees, from simply being able to repeat the sentence with conviction that it's true, to knowing the meaning of individual terms, to understanding the relation between those terms, to understanding the relation between this claim and other claims such that one could *explain* the claim, on to being able to explain the claim more fully and in light of a greater body of knowledge. These degrees are degrees of understanding. These necessarily include a form of knowing-how, i.e. an awareness of what can be *done* with this knowledge. It's not only that without this know-how, the knowledge that P is merely "pure" or theoretical knowledge without practical implication; it's that without some sort of know-how, the knowledge that P is *not* knowledge that P, but merely knowledge that P is true. Purely theoretical knowledge *also* involves understanding; even if there is no current application for a theory, the good is greater, I'll claim, for the one who understands it than the one who has memorized its key utterances. I cannot be said to know, say, higher-dimensional math, unless I understand it, have the skills to manipulate the various propositions, see their relations, and generate new propositions. I can know it a little, or know something about it, but until I can take the first steps of producing a proposition, combining propositions, or even translating a proposition into other terms (and all of these involve *knowing how*), I can't really be said to know it, because I don't understand it.

³ For example, this might be sufficient for answering a question on a quiz, or winning a bet.

The know-how of knowing that minimally involves some skill with manipulating the terms in the known proposition, and, at least, the capacity to produce new, true sentences that are equivalent to P (i.e. roughly synonymous sentences.)

Beyond that minimal set, some minimal ability to apply the knowledge will be needed, at least for knowing that in certain cases (I would hold that there is an eclecticism of knowings, and I don't want to say universally that they all involve application criteria, though they might.) For example, if I know that fire engines are red, then I should be able to tell, upon seeing something blue, that it is not a fire engine. (We can imagine a color blind person pulling this off with a spectrometer.) If I can't do that, it would be odd to say that I know that fire engines are red.

At least part of the value of knowing-that P comes from this ability to apply the knowledge, and, I would argue, this ability to apply is tied to our understanding. In general, the consequential good of knowing⁴ is directly related to depth of understanding, and there is almost no instance of knowing that is good in the absence of understanding. Obviously, to simply know that Sally is depressed is not helpful unless one understands how it is to be depressed, and how one responds to those who are depressed. But even such simple knowledge as "the cat is on the roof," or "I am having a sensation of red," are extremely limited in goodness if I understand nothing about cats and roofs, or nothing about what seeing red in this situation means.

V: Different ways of understanding the same proposition

To illustrate the addition of value provided by (greater degrees of) understanding, here are two examples of understanding the same proposition, each involving knowledge, and perhaps illustrative of both the way in which knowing admits of degrees, and in which two different forms of knowing can be complementary.

a. Touch, Geo and the Quartz

A prospector says to two people, "There's a lot of quartz on that cliff side." Person A, Mr. Touch, has seen quartz many times. He collects particularly nice pieces of it and keeps them on his mantle. Person B, Mr. Geo is a geologist who knows how quartz forms, but he has never seen quartz. Both are told, "there's a lot of quartz on that cliff side," while standing in front of the same cliff, but, I would assume, both understand it in different ways. If Mr. Touch learned of quartz's chemical properties, and if Mr. Geo were to touch some quartz, they'd probably each have a greater understanding. Further, it's hard to imagine that the value of their knowledge wouldn't increase. Mr. Geo would be able to identify quartz by sight, for example, and Mr. Touch might gain greater insight into where he might find quartz.

b. Green, Light and the Painting

⁴ I would hold that there is some intrinsic good in knowing as well, and that this too is related to understanding

Mr. Green is a painter, and paints a great many pieces with chromatic colors in order to create optical effects, such as the famous red/green jumping effect. Mr. Light is a physicist who is well acquainted with the optical properties of colored light, but only from a mathematical/physical perspective. He is color blind. Now imagine each of them discussing one of Mr. Green's paintings. They might say the same things about it, but, I would hold, they have different, complementary understandings. If Mr. Light suddenly acquired color vision, I imagine that his first look at one of Mr. Green's paintings would be startling. "So that's what I've been talking about!" he might say. If Mr. Green studied physical optics, he would add a great deal of depth (or perhaps simply breadth) to what he could say about his work.

VI: Criteria for Understanding

A. 4 conditions for understanding.

I'd propose that understanding involves

1. The capacity to relate a proposition to other propositions.
2. The ability to use a word or term in more contexts (the more contexts, the greater, on at least one axis, the understanding).
3. The ability to explain what I know (here I'll avoid the controversy between the various theories of explanation put forward in philosophy of science, and say that one can explain a proposition if one can teach another to use it such that that other person would be taken, by those who knew the proposition, to also know it; that is, be able to answer questions concerning it).
4. The ability to produce new utterances or sentences (or expressions, see below) that are roughly synonymous with the understood proposition. In other words, if I understand P, I can say P in a new way, whether it's rearranging the words, or translating it to another language, or uttering a roughly synonymous sentence. For example, if I know I know that fermions have half integral spin, I know that half integral spin is a property that fermions have, and that the sub-atomic particle known as a fermion has a spin number that is not an integer, but is half-way between two integers, etc.
5. The ability to apply or enact the knowledge I have to produce some intended effect related to the content of that knowledge. If I understand physics, I can predict the behavior of certain entities. If I understand John, I can tell you things about him that no one has mentioned before. I can draw conclusions.

The fifth condition would include the ability to make true conditional claims, such as, "Believe me, I understand cars. If you tighten that fan belt, the squeaking noise will go away."

The fourth condition might include, instead of standard utterances or sentences, other depictions, something like diagrams or depictions. Let's say I understand some higher level geometry; I can create images, forms and figures, maybe charts and graphs. These

will be new works even if someone else already has made them. They'll be new insofar as I didn't hold them as propositions or in memory or some such prior to their making. I was able to make them because I understand the field. Similarly, if I understand perspective drawing, I should be able to produce at least simple vanishing-point illustrations, even barring my ability to draw very well.

While I think these criteria for understanding (or for the use of the word "understand") represent standard use of the term⁵, to some extent, the ordinary language use of the words "know" and "understand" overlaps. Still, I think they're distinguishable conceptually. In general, if someone says "do you know X?" where X is a subject matter, they probably mean "understand" (though not always.) For example If someone says, "do you know calculus?" they're asking me about the extent to which I understand the various propositions that can be generated by calculus, my ability to perform operations in calculus, and my ability to explain what is occurring in calculus operations and propositions. They're asking, in short, if I *understand* calculus, if it is something for which I have a network of knowledge and a set of skills.

They might, however, be asking if I'm *acquainted* with some topic; there, the question is about knowledge (i.e. knowledge that there exists some topic named X), and not understanding.

B. Coherentist aspects of understanding.

In some ways, understanding refers to the coherentist aspect of knowledge. To what extent can I relate this proposition or term to others? Or, given a subject, to what extent do I have available a network of connecting and coherent propositions (or potential propositions, or the ability to produce claims) about this topic? And when I say "about this topic" we could also say "within this topic." The extent to which my knowledge of a topic is (a) coherent and (b) broad is the extent to which I understand it.

I understand physics, for example, to the extent that I can produce claims that are true of/in the discipline and which cohere with each other and with other claims in the discipline. So, if I produce a new claim (or at least new to me) I would show a lack of understanding if my claim did not cohere with standardly accepted claims in the field, *unless I knew this and was expressly challenging their claims*. In other words, understanding will include knowledge of coherence, and, when a claim doesn't cohere, knowledge of that non-coherence.

Understanding, then, is non-atomistic. It involves greater wholes. This may raise an interesting question: can I understand something that is not true? If so, it points to an important disconnect between knowledge and understanding (and I don't hold that they're the same, only that understanding is a necessary component for knowledge in most standard uses of the term "knowledge" or "to know.") For example, on a coherentist

⁵ See also Riggs and Kvanvig on some intuitions regarding the use of understanding. Kvanvig has noted that these intuitions are easily polluted by intuitions about knowledge, and might need to be empirically tested. See Kvanvig's analysis at http://el-prod.baylor.edu/certain_doubts/?p=106

model, I could have a strong capacity to make claims that cohere with other claims *within* the field of astrology. But, I would argue, if I believed astrology to be true, I would have understanding *in* astrology, but not a lot of understanding *about* astrology. I think I could legitimately say of someone who knew nothing about astrology but dismissed it as bunk that she did not understand astrology. I could also say the same of someone who knew a great deal about astrology but was unaware of the tests which have shown that astrology consistently fails to be predictive. She might, in a sense, know a lot about astrology, in the form of claims like “astrologers hold that...” but I think we would claim she did not understand astrology. Still, this is a matter of usage, and I could be wrong! Nonetheless, philosophers such as Grimm and Riggs have associated understanding with coherence, and I think this intuition is based on the reasonable observation that if I understand X, I can *explain* X, make use of X, and show how X relates to other claims. (See Grimm, “Understanding,” unpublished, as well as Riggs, “Understanding Virtue”)

Now, if we take the claim that Joe doesn’t understand astrology if he thinks it’s true, (or doesn’t *really* understand it...it’s notable that in experimental philosophy studies done in epistemology, that respondents give different answers to “does S know” and “does S really know”) then understanding also ties whatever topic I am discussing in with a greater view of knowledge. Let’s say Joe is an experienced astrologer, well knowing all the tables and charts and corresponding predictions about character traits, and further believes astrology to be true, never having seen the empirical studies to the contrary. Now we show him those studies, and he pores over them, and learns that astrology is non-predictive. Now he might say, “I knew a lot of astrology, but I didn’t know anything *about* astrology!” Or “know I understand what my mistake was!”

Here understanding comes about when a relationship to other knowledge occurs. It’s not that he didn’t understand astrology, but there was something important about it he didn’t know, and knowing that, he understands it much better. But: if understanding is (partly) about connecting knowledge, it’s not simply that Joe didn’t understand astrology before, but that he now understands it better. He had connections within astrology, now he can connect astrology to further facts about the world.

VII: Understanding, Pedagogy and Critical Thinking: Why We Value Skills Over Knowledge

What this leads to is the value of knowledge: knowing that “astrologers hold that P” is less valuable than knowing “astrologers hold that P but P is false.” As instructors, we certainly impart information, maybe even knowledge. But it is far more valuable, I think, to impart it with understanding. And that should be especially what skills-based instruction emphasizes. This is notably the case for us in philosophy when we teach critical thinking, which is about tying knowledge together, learning to test propositions of all kinds, finding truth by proper methods and skills, and showing the ways in which sentences connect to each other; showing, importantly, how inference works, and when it is well founded.

One thing we often include in Critical Thinking is discussion of conspiracy theories. And one thing we show is that radical coherence doesn't guarantee truth. Rather, we teach a set of skills that shows that *understanding* the theory involves not just (1) knowing it's parts (or propositions or claims) and (2) *understanding* how they fit together (and I think that can legitimately be called a kind of understanding). It also involves understanding how the claims of the theory hook onto the world, how they relate to other claims outside the closed set of the theory.

The understanding component of knowledge includes skills, notably a capacity to compare atomic facts against each other and find connections; the ability to consistently make inferences, especially inductive inferences, and the ability to put that knowledge and those skills to use such that, upon encountering some set of propositions that a student did not previously know, the student will have some idea about how to make a judgment concerning those claims, or whether (and this is important) that student is yet in a position to make a judgment. Knowing that we don't know involves understanding ourselves; in other words, knowing our limits and having the skill of being able to make new, true claims about what we do and do not know. Knowing when to accept, reject and suspend judgment involves understanding ourselves, our capacities, and the extent to which the knowledge we have connects to what we're examining.

We've all had students who will gather facts, but never acquire understanding. What is it they can't do? Part of it is *apply* those facts, except under such conditions as test-taking ("I know the answer" is an interesting knowledge claim, because sometimes it doesn't involve knowing that P where P is the answer, but rather *knowing that P is the answer*, which is *not* the same as knowing that P!)

Understanding isn't simply making the connections; it's making the right connections. Understanding involve the ability to make do with the info, like in the case of the car mechanic who understands how to fix a car. Memorizing the manual won't give you this power. If he *understands* cars, then he has a greater capacity to hear a sound and make the connection between that sound and a set of potential problems.

So my point, in conclusion, is this: if we have an epistemology that stresses atomic propositional knowledge, we don't have an epistemology that neatly describes the kind of knowing that we (1) value and (2) wish to teach. But, if we can develop our epistemology towards understanding, we might, with proper work and elaboration, develop models also for teaching and learning. That understanding is part of knowledge has been something I've tried to show; that understanding hold some of knowledge's value is something that Jonathan Kvanvig, for example, has stressed. But showing the relation between knowledge and understanding, as I tried to do, might, I hope, make clear why it is that understanding holds value in knowing, and, going somewhat beyond the claims of Kvanvig and Riggs, show that without understanding, knowledge may lack almost all value.

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