EDUCATION AND THE TRANSMISSION OF UNDERSTANDING

John Greco*

1. Introduction

How should we understand the nature and possibility of transmitting understanding, especially in an educational setting? Answering this question is especially problematic for the traditional (Aristotelian) account of understanding as a systematic knowledge of causes.[1] There is a problem because, on the one hand, there is a widespread intuition that understanding *cannot* be transmitted, or at least not by mere testimony. Roughly, the idea is that understanding involves grasping or seeing something "for oneself", and this is precisely what believing on testimony fails to achieve.[2] On the other hand, teaching can at least sometimes be understood as a kind of extended testimony. Think of a series of history lectures, for example, or a biology course without a lab component. And so immediately we have a problem regarding how understanding, in history or biology, for example, can be transmitted via that kind of standard teaching.

To this extent, understanding the transmission of understanding is a problem on every account. But the problem is worse for the traditional account of understanding as a knowledge of causes. For there is a widespread consensus that knowledge *can* be transmitted by mere testimony.[3] So why not by the

* Saint Louis University, Department of Philosophy, Adorjan Hall 306, Saint Louis, USA. E-mail: john.greco@slu.edu

[1] I defend a broadly Aristotelian account of understanding in *Episteme: Knowledge and Understanding*, in K. Timpe, C. Boyd (eds.), *Virtues and Their Vices*, Oxford University Press, Oxford 2013. See also S. Grimm, *Is Understanding a Species of Knowledge?*, «British Journal of Philosophy of Science», 57 (2006), pp. 515-535. As Grimm points out, the claim that understanding amounts to knowledge of causes is commonplace in philosophy of science.

[2] For example, see L. Zagzebski, *Recovering Understanding*, in M. Steup (ed.), *Knowledge, Truth, and Duty: Essays on Epistemic Justification, Responsibility, and Virtue*, Oxford University Press, New York 2001.

[3] As Jennifer Lacky points out, the assumption that testimony transmits knowledge is commonplace in epistemology. See J. Lackey, *Testimonial Knowledge and Transmission*, «The Philosophical Quarterly», 49 (1999), pp. 471-490.

https://doi.org/10.19272/201800702003 · «acta philosophica» · ii, 27, 2018 · pp. 237-250

kind of extended testimony characteristic of an educational setting? That is, if understanding just is a kind of knowledge, and if knowledge can be transmitted by testimony, then why can't understanding be transmitted by testimony? Again, this is an additional problem for the Aristotelian account, and for any account that conceives of understanding as a kind of knowledge.

Here is one approach to our problems that is not available to the Aristotelian: Simply deny that understanding is a kind of knowledge. That would handily explain, or at least begin to explain, why understanding cannot be transmitted by testimony, extended or otherwise, even if knowledge can be. A different way to explain why understanding cannot be transmitted by testimony is to think of understanding as involving a special *kind* of knowledge, i.e. a kind that cannot be transmitted, even if other kinds of knowledge can be. There are two major candidates here. On the first view, understanding necessarily involves *knowledge by acquaintance*, and since knowledge by acquaintance cannot be transmitted by testimony, neither can understanding be.[4] On the second view, understanding necessarily involves *knowledge-how*, and knowledge-how cannot be transmitted by testimony.[5]

These latter two views, of course, are consistent with the view that understanding is a kind of knowledge – the explanation is now that understanding is, or at least involves, a special *kind* of knowledge, and one that cannot be transmitted. It is not clear that either of these views is consistent with the traditional view of understanding as a knowledge of causes, however, since it is not clear that a knowledge of causes, or even a systematic knowledge of causes, must necessarily involve either knowledge by acquaintance or knowledge-how. Let's think about that for a minute. On the Aristotelian view, it makes perfect sense to say that someone understands why there was an explosion because she knows its cause; for example, there was a fire, and the fire set off a combustible gas. This is understanding of a somewhat narrow scope, and so it might not yet count as Aristotelian understanding, which must be systematic. But now add more to the system. That is, expand one's knowledge of causes to include greater depth and/or breath. Why should this, necessarily, require adding knowledge by acquaintance or knowledge-how? It is not at all clear why it should.

In any case, in this paper I want to argue that, at least in principle, a systematic knowledge of causes *can* be transmitted by the kind of extended tes-

[4] I discuss several notions of acquaintance, and the idea that understanding involves knowledge by acquaintance, in J. Greco, *Satisfying Understanding*, in S. Grimm, C. Baumberger, S. Ammon (eds.), *Explaining Understanding: New Perspectives from Epistemology and the Philosophy of Science*, Routledge, New York 2017.

[5] For an overview of recent work on knowledge-how, see J. A. Carter, T. Poston, *A Critical Introduction to Knowledge-How*, Bloomsbury, London 2018.

timony that one finds in an educational setting – that one finds in a history lecture or a biology lecture, for example. But although this is in principle possible, and even sometimes actually happens, the best kind of teaching aims for more than this. Specifically, the best kind of teaching strives to teach students how to *generate* knowledge themselves, and not merely transmit knowledge from teacher to student. The intuition that understanding cannot be transmitted is therefore mistaken. The grain of truth behind the intuition is that *good* teaching does *more* than transmit understanding. To make this case, it will be necessary to get clearer on our key categories: understanding, knowledge transmission, and knowledge generation.

To that end, Part 2 explains and develops the traditional (and Aristotelian) idea that understanding is a knowledge of causes. Part 3 presents and defends a model for thinking about the generation and transmission of knowledge. According to the model, those two phenomena play distinct roles in an economy of knowledge, and each is irreducible to the other. With these resources in place, Part 4 argues that understanding can indeed be transmitted through the kind of extended testimony that is typical of formal educational settings. In fact, there is good reason to think of such settings as *designed* for the transmission of understanding. Nevertheless, the purposes of education are not limited to the transmission of understanding, and the best education does teach a kind of knowledge-how – specifically, it teaches how to *generate* knowledge oneself.

2. Understanding as Knowledge of Causes

According to Aristotle, *episteme* consists in knowledge of causes. To have *episteme* is to know the cause of a thing. This kind of knowledge, in turn, is closely associated with having an explanation and with being able to answer Why-questions. Thus, R. J. Hankinson writes, "to have [*episteme*] is to have explanatory understanding: not merely to 'know' a fact incidentally, to be able to assent to something which is true, but to know *why* it is a fact…"[6] This suggests that Aristotle's "*episteme*" is at least close to the English "understanding". In any case, in the remainder of this section I will defend a broadly Aristotelian account of understanding, modeled on Aristotle's own account of *episteme*.[7]

To better understand Aristotle's own account, it is necessary to consider his theory of causation, or of what it is to be a cause. Famously, Aristotle thought that there are four kinds of cause: efficient, material, formal, and final. Aristotle's notion of *efficient cause* is closest to our contemporary no-

[6] R. J. Hankinson, *Philosophy of Science*, in J. Barnes (ed.), *The Cambridge Companion to Aristotle*, Cambridge University Press, Cambridge 1995, p. 110.

[7] In Part 2 I draw from *Episteme: Knowledge and Understanding*, cit.

tion of cause. Roughly, an efficient cause is a source or agent of change. For example, fire is the efficient cause of the wood's burning. The explosion was the efficient cause of the house's catching fire. But Aristotle recognizes other kinds of cause as well. A *material cause* is, roughly, the material out of which a thing is made. For example, the material cause of the house's burning is that it is made out of wood. Here again, we note the close connection between Aristotle's four causes and the various answers we can give to Why-questions. For example, someone might ask, "Why is that house over there in ruins?". In some contexts, we will be inclined to cite the efficient cause – it was a fire, or an explosion. But in other contexts we might cite the material cause – the house was made out of wood, or of straw. For example, that is why the first two houses are in ruins, whereas the third (made out of brick) is still standing.

Aristotle's notion of *formal cause* is that of a thing's "nature" or "essence" or "what-it-is". For example, we might say that "the cause" of the dog's barking is *that it is a dog*. In other words, that's what dogs do – they bark! Notice that we are inclined to say such things in certain situations. For example, a guest sleeping at the farmhouse might be annoyed at the roosters crowing. The guest might ask, "Why do those roosters crow so early in the morning?". Here a natural answer might be, "Well, they're roosters! That is what roosters do!" Lastly, a *final cause* is an end or goal. It is "that for the sake of which a thing is done".[8] The easiest place to see what Aristotle has in mind is in the case of human action. Thus, we commonly answer "Why" questions by citing what a person is trying to do or trying to achieve. For example, "Why is she running down the road?". "Because she is trying to lose weight". Or: "Because she wants to get home in time for dinner".

Notice, finally, that we can answer the same "Why" question by citing any one of Aristotle's four causes. Why did the house burn down? There was an explosion (efficient cause). It was made of wood (material cause). The owner wanted to collect on the insurance (final cause). We might even cite a formal cause here: "Sometimes houses burn down", said in answer to the insurance agent, trying to understand why this happened, just now, in this economy.

What do these various kinds of answers have in common? Put differently, what do Aristotle's four causes have in common? One way to think of it is that they each cite some kind of "dependence relation". In other words, they each cite some way in which one thing can depend on another. Thus, the house's burning down depended on there being an explosion. But it also depended, in various ways, on the house's being made of wood, the owner wanting to collect insurance, and the fact that houses are the sort of thing that can burn

[8] A. Falcon, *Aristotle on Causality*, «The Stanford Encyclopedia of Philosophy», (2011). https://plato.stanford.edu/archives/fall2011/entries/aristotle-causality/ [accessed May 23, 2018].

down. Consider: not everything can burn down, and not everything that can burn down does burn down. To understand why this house burned down – to understand it fully – requires knowing how the house's burning down depended on these various factors.

Notice that Aristotle's account already entails tight relations between a) *episteme* (or understanding), b) knowing the cause, c) being able to cite the cause, d) having an account or explanation, and e) having the answer to Why-questions. Next, I suggest that we can fruitfully "update" the Aristotelian account in three ways. First, we can replace Aristotle's "four causes" with a notion of dependence relations in general. As we have seen, all of Aristotle's "causes" are dependence relations – they are various ways in which one thing (or process, or event) can depend on another. But there are other dependence relations as well. For example, there are a) part-whole or "mereological" relations, b) logical and mathematical relations, c) conceptual relations, and d) supervenience relations of varying strength. This list is meant to be neither exclusive nor exhaustive. Rather, the substantive point is that there are many and various dependence relations, and understanding centrally involves knowledge of these. Think of a complex net of many and various modally strong dependence relations. According to the present account, to have understanding regarding some thing is to know its location in such a net.

One nice feature of this updated account is that it makes causal explanation (in our more restricted sense of "cause") a species of explanation in general. To have an explanation is to be able to cite appropriate dependence relations. To have a causal explanation is to be able to cite causal relations. In similar fashion, the account makes scientific understanding and explanation a species of understanding and explanation in general, alongside mathematical understanding and explanation, philosophical understanding and explanation, and practical understanding and explanation.

Our second update to the Aristotelian account is to stress that understanding consists in a *systematic* knowledge of dependence relations. Put differently, understanding consists in knowledge *of a system* of dependence relations. This accommodates the plausible idea that understanding, unlike mere knowledge, cannot be isolated. It also accommodates the idea that understanding comes in degrees, in terms of both breadth and depth. Thus, we can think of "depth of understanding" in terms of "depth of knowledge", where the latter corresponds to knowledge of more fundamental dependence relations. Likewise, we can think of "breadth of understanding" in terms of "breath of knowledge", where the latter corresponds to knowledge of more diverse dependence relations.

Our third update is to allow that understanding can have diverse objects. In particular, it is plausible that understanding can have "non-propositional" objects, such as maps, graphs, pictures, and models, as well as "propositional"

objects such as theories, narratives and mathematical equations. All of these involve complex representations of dependence relations, or representations of complexes of dependence relations, and so sit comfortably with the idea that understanding involves a systematic knowledge of dependence relations.

Finally, an adequate account of understanding ought to explain the *value* of understanding. That is, it ought to explain why understanding is valuable, and why it is at least often more valuable than mere knowledge. Our broadly Aristotelian account does this straightforwardly. Specifically, it identifies understanding with a kind of knowledge, and so on the present account understanding inherits the value of knowledge in general. Moreover, understanding always involves a system of knowledge rather than mere isolated or episodic knowledge. But if more knowledge is (at least often) more valuable than less, then there is a straightforward sense in which understanding will be (at least often) often more valuable than mere knowledge. Finally, understanding involves knowledge of an especially valuable sort; that is, understanding involves knowledge *why* and knowledge *how*, including knowledge how to live. Plausibly, these kinds of knowledge are often more valuable than other kinds of knowledge, or at least some other kinds of knowledge.[9]

3. Knowledge Generation and Knowledge Transmission

We can understand the distinction between knowledge generation and knowledge transmission by invoking the notion of an *epistemic community*, understood as a group of persons cooperating together with regard to some set of information-dependent tasks.[10] For example, an epistemic community might be constituted by a medical research team, characterized by needs for acquiring and distributing information associated with its research agenda. Another example of an epistemic community is a business corporation, characterized by needs for acquiring and distributing information associated with conducting its business.

[9] For an over view of recent work on the value of knowledge, see J. Greco, *Epistemic Value*, in S. Bernecker, D. Pritchard (eds.), *Routledge Companion to Epistemology*, Routledge, New York 2010. A number of authors have claimed that the value of understanding exceeds that value of knowledge. For example, see L. Zagzebski, *Virtues of the Mind: An Inquiry into the Nature of Virtue and the Ethical Foundations of Knowledge*, Cambridge University Press, New York 1996; J. Kvanvig, *The Value of Knowledge and the Pursuit of Understanding*, Cambridge University Press, New York 2003; and D. Pritchard, *Knowledge and Understanding*, in D. Pritchard, A. Millar, A. Haddock (eds.), *The Nature and Value of Knowledge: Three Investigations*, Oxford University Press, Oxford 2010.

[10] Part 3 draws from J. Greco, *Testimonial Knowledge and the Flow of Information*, in D. Henderson, J. Greco (eds.), *Epistemic Evaluation*, Oxford University Press, Oxford 2015; and *The Transmission of Knowledge*, Cambridge University Press, Cambridge, forthcoming.

Epistemic communities, understood this way, will be engaged in two distinct kinds of activity. First, there will be activities concerned with *acquiring* or *gathering* quality information, i.e. with getting such information into the community in the first place. Second, there will be activities concerned with *distributing* information to those who need it, or at least potentially need it. That is, there will be mechanisms for distributing the quality information that is already in the social system. For example, teaching in the classroom, broadcasting the news, and reporting in the boardroom all serve this distribution function. Put differently, in any well-functioning epistemic community there will be activities that get quality information into the social system in the first place, and activities that keep the information flowing. Let's call the first *acquisition activities* and the second *distribution activities*.

The next thing to note is that the norms governing the acquisition of information serve a "gatekeeping" function; that is, their primary function is to insure quality control, so as to admit only high-quality information into the social system.[11] The norms governing distribution activities, on the other hand, answer to a distributing function – they allow high quality information already in the system to be distributed as needed. Insofar as testimony plays this distributing function, it serves to make information already in the system available to those who need it. Accordingly, it is reasonable that the norms governing the acquisition of information should be different from the norms governing the distribution of information. Suppose we were writing the norms, or setting the standards, for these two kinds of activity. We should make it harder to get information into the system than we make it to distribute that information, once in. Again, that is because the dominant concern governing the acquisition function is quality control, whereas the dominant concern governing the distributing function is providing access. Different norms or standards are appropriate to these distinct functions.

And now the present idea is this: We can understand the *generation of knowledge* in terms of the *acquisition of quality information* for an epistemic community. That is, we can think of generated knowledge as true belief that meets the standards or norms appropriate for information acquisition. Likewise, we can understand the *transmission of knowledge* in terms of the *distribution of quality information* within an epistemic community. That is, we can think of transmitted knowledge as true belief that meets the standards or norms appropriate to information distribution.[12]

[11] I adopt the phrase "gatekeeping" from David Henderson, who uses it to describe a similar function. See D. Henderson, *Motivated Contextualism*, «Philosophical Studies», 142 (2009), pp. 119-131.

[12] Notice that the norms governing information distribution apply to both speakers and hearers. For example, speakers should present themselves as knowing that p only if they do

Here we may think of scientific knowledge as an instance of this general picture. Any item of scientific knowledge must have its original source, presumably in reliable method. But eventually that knowledge spreads through a shared system of knowledge by means of various kinds of distribution mechanisms. Through record keeping, formal and informal teaching, journal articles, public lectures, media reports, and the like, what begins as knowledge for a few gets transmitted to many. Moreover, the norms and standards governing the first kind of activity are different from the norms and standards governing the second. A kind of quality control is exercised over both kinds of activity, to be sure, but in different ways. Hence the norms governing the exchange of information through journals, seminars, etc., are distinct from those governing experiment design, statistical analysis, theory choice, etc. In the case of scientific knowledge, then, various institutional and social practices are in place so as to bring high-quality information into the system (i.e. to generate knowledge), and others are in place to distribute that information throughout the system (i.e. to transmit knowledge). What holds for scientific knowledge in this regard plausibly holds for knowledge in general.

One more qualification is necessary, however. Suppose that S and H are members of the same epistemic community, and therefore cooperating with respect to some information-dependent task. The idea above is that testimonial exchanges between S and H will be governed by norms and standards associated with information distribution. And, to the extent that S and H satisfy those norms, their exchanges will underwrite a transmission of knowledge. The next point – and here is where the qualification comes in – is that not all testimonial exchanges are like that. That is, not all testimonial exchanges involve speakers and hearers cooperating with the purpose of sharing information. On the contrary, sometimes speaker and hearer do not share membership in an epistemic community and therefore are not cooperating in that sense. Suppose, for example, that S is a car salesman and H is a potential customer. S and H will be cooperating in a "common task" in some sense – they will be trying to complete a sale, for example – but they will not (or should not) be exchanging information in the same way as colleagues or coworkers should be. In particular, for the potential car buyer, the testimonial exchange should be governed by norms and standards associated with the *acquisition* of quality information, as opposed to the cooperative distribution of information. Likewise for a police offer interviewing a suspect, or for a personnel director interviewing a job applicant. What these examples show is that testimonial exchanges are not always in the service of knowledge *transmission*. Sometimes they are in the service of knowledge *generation*.

know that p. Likewise, hearers should not believe speakers who they know to be insincere or unreliable.

The overall proposal is now this: We can understand the knowledge generation/ knowledge transmission distinction in terms of the information acquisition/ information distribution distinction. Specifically, knowledge generation is to be understood in terms of the norms and standards associated with the acquisition of information, for an individual or for an epistemic community. Knowledge transmission is to be understood in terms of the norms and standards associated with the distribution of information within an epistemic community. But not all testimonial exchanges are at the service of knowledge transmission. That depends on the location of the speaker and hearer in an epistemic community, and especially on their cooperation in a community activity.

4. The Transmission of Understanding

On the present view, testimonial exchanges are governed by two sets of norms: those pertaining to the acquisition of high-quality information and those pertaining to its distribution. We may now note that the norms governing testimonial exchanges in the distribution role are themselves various, depending on additional factors regarding the social location of speaker and hearer. Here we may distinguish at least three kinds of relation that structure our social environment, and that enable successful testimonial exchanges in the distribution role. For lack of better labels, we may call them "interpersonal", "informal social", and "formal institutional".[13]

Interpersonal relations depend primarily on the kind of interpersonal experience and "mind reading" that is more or less independent of particular social or institutional roles. Rather, there is a person-to-person connection that underwrites personal trust to one degree or another. This kind of interaction can take place between parents and children, siblings or friends, but also between strangers meeting for the first time. For example, one might trust one stranger to tell the truth but not another, based on quite limited interactions with the two persons. This is because, at times, even limited interaction can be sufficient to mind-read for sincerity and competence, especially in restricted circumstances and for a particular domain.

In contrast to "bare" interpersonal relations, *informal social* relations depend more on well-defined social roles, for example parent-child, sibling-sibling, neighbor-neighbor, and various kinds of friendship. Interactions in these roles will be governed by interpersonal skills, as above, but also by the social norms governing these specific relationships.[14] For example, it is necessary to mind-read in order to cooperate with one's neighbors in some neighborhood

[13] For elaboration, see *The Transmission of Knowledge*, cit.

[14] For more on the epistemic significance of social norms, see P. Graham, *Epistemic Normativity and Social Norms*, in Henderson, Greco, cit.

task, but how one cooperates (what expectations one has, what one is willing to sacrifice, etc.) will also be influenced by the social norms structuring the neighbor-neighbor relationship.

Here is one example of how the norms structuring social relations might enable the reliable distribution of quality information. We may suppose that in many cultures it is considered a matter of love and respect to go to one's parents for advice regarding childcare. Norms structuring the relationship thereby create a channel of communication from experienced parent to new parent. The information carried by that channel will likely be of high quality, given that the parent of a parent has had some success in the childcare domain. The channel itself will likely be of high quality as well, given the norms governing the communication of this kind of information between parent and child. Thus, the experienced parent will be highly disposed to provide sincere and competent advice, the new parent will be highly disposed to take that advice seriously, and both parties will be motivated to take care against misinformation and/or misunderstanding.

The example shows how the interpersonal skills and social norms underwriting a successful testimonial exchange need not have an epistemic goal as their primary motivation. That is, neither the speaker nor the hearer need be motivated (at least not directly or primarily) by considerations about truth, knowledge, etc. On the contrary, the entire exchange might be explained in terms of the demands of the relationship, such as love and respect, or even guilt. Likewise, good neighbors might ask and give reliable information about bus routes, or other neighborhood practicalities, primarily motivated by the values of civility, helpfulness, and mutual cooperation that structure the neighbor-neighbor relationship.

Both interpersonal relations and informal social relations, then, have the effect of structuring exchanges of information between speaker and hearer. Moreover, both kinds of relation can contribute to the epistemic quality of such exchanges. In most testimonial exchanges, perhaps, both kinds of relations work together. For example, there are two reasons that one might trust a friend, one based on interpersonal interaction, and one based on the social relation. Thus, one might trust that a friend is telling the truth because "I know *her*". Alternatively, one might trust a friend because "That is how *friends* treat each other". And of course, one might trust for both reasons. Similarly for parent-child trust, neighbor-neighbor trust, etc.

Finally, some relations are defined by more *formal institutional* roles. For example, teacher-student, doctor-patient, lawyer-client, and employer-employee relationships are largely governed by relevant institutional rules. Here again, the rules in question function in addition to or "on top of" the interpersonal skills and informal social norms discussed above. And here again, institutional rules can contribute to the quality of testimonial exchanges. For example,

the doctor-patient relationship is underwritten by institutional rules that are designed to guarantee competency and honesty in practitioners. Likewise for the lawyer-client and the employer-employee relationships. Such rules might take the form of government regulations, legal contracts, professional standards, or professional ethics. Together they provide additional structure to the social environment, often in ways that contribute to the epistemic quality of testimonial exchanges. Finally, as in the case of interpersonal skills and informal social norms, institutional rules need not have epistemic goals as their direct or primary motivation. For example, a particular lawyer might have little regard for the truth as such, a particular doctor might place little value on knowledge for its own sake. But in each case, there are institutional mechanisms in place to insure honesty and competence in the relevant domains, thereby creating quality channels of information that can be exploited by patients and clients.

Here we may note an analogy to the flow of information in perceptual uptake. In cases of perception, a stable *physical* environment allows perception to exploit information-carrying signals. For example, a particular profile reliably signals *dog*, whereas a different profile reliably signals *cat*. This is not necessarily the case – the environment must be well suited to visual perception; that is, it must be enabling of the perceptual skills in play. A stable *social* environment plays the same role regarding the flow of information in testimonial exchanges. Just as natural laws construct a (more or less) stable physical environment, giving it the contours that it has, social norms construct a (more or less) stable social environment, giving it the contours that it has. Natural laws thereby underwrite regularities that can be exploited by perception. Social norms thereby underwrite regularities that can be exploited by testimony.

The case of small children is interesting here. Plausibly, small children have only limited skills for determining the sincerity and competence of speakers. That is, small children, left to themselves, can be somewhat gullible.[15] So how do children manage to learn from testimony as well as they do? The answer is that children are rarely left to themselves. On the contrary, we construct and monitor their social environments so as to keep them safe from insincere and incompetent speakers.[16] Put differently, we engineer environments that enable the transmission of knowledge that their informal education requires.

And now, clearly enough, we also engineer social environments to deliver a more formal education. In fact, formal educational institutions are designed

[15] The picture presented by empirical studies is mixed. For an overview of some relevant literature, see P. L. Harris, M. A. Koenig, *The Basis of Epistemic Trust: Reliable Testimony or Reliable Sources?*, «Episteme», 4/3 (2007).

[16] Cf. S. Goldberg, *Anti-Individualism: Mind and Language, Knowledge and Justification*, Cambridge University Press, Cambridge 2007.

to transmit knowledge as one of their primary motivations. And in fact, such institutions are designed to transmit *systematic* knowledge in various domains, such as physics, biology, history, economics, literature, philosophy, education, etc. Finally, in all of these educational domains, the point is to transmit systematic knowledge of relevant *dependence* relations. The sciences, for example, transmit knowledge of relevant causal structures and processes. The humanities, for their part, transmit knowledge of other kinds of dependence relations, including relevant causal relations, but also teleological, normative, and metaphysical relations. History, for example, teaches the motivations, mechanisms, and broader conditions responsible for various historical events. Economics, for example, teaches rational choice theory and other mechanisms that explain economic activity.

I suggested that formal educational institutions are *designed* to transmit understanding, i.e. systematic knowledge of relevant dependence relations. This is evident in various features of our educational institutions, including curriculums that allow for sustained and in-depth study of a subject matter, and pedagogical strategies that allow for sustained and systematic presentation, exploration, analysis and critique of relevant methodologies and content. Our formal educational institutions, moreover, are also imbedded in broader social structures involving licensing, accreditation, peer review, market pressures, and informal reputation markers, all of which play a role in maintaining and signaling quality control.

All of these considerations, then, make it clear that formal educational institutions such as colleges, universities and professional schools are designed for the transmission of understanding in relevant domains. But although that is one of the primary motivations of such institutions, it is not the only one. For such institutions are also in the business of *generating* knowledge, and at least as importantly, in the business teaching their students how to generate knowledge. Put differently, our educational institutions are in the business of training their students to become fully participating members of various epistemic communities. That sort of training requires the transmission of relevant knowledge, for sure, but it also requires that students be trained how to generate knowledge themselves. It requires that students become *practitioners* in their chosen fields. And that is why a quality education does not *merely* transmit relevant understanding.

This feature of a quality education also explains the importance of acquaintance knowledge and knowledge-how. Acquaintance knowledge is more or less knowledge gained by first-hand experience, as opposed to knowledge gained by description, via a second- or third-party observer. Acquaintance knowledge, therefore, necessarily involves *generating* knowledge "for oneself". Moreover, a central feature of practitioners in knowledge-how. And in the present context, that means knowledge-how concerning the generation

of knowledge. That is why a quality education involves components aimed at training for practice. Consider, for example, a chemistry course that includes a lab component. One might think that the purpose of running chemistry experiments is to "find out for oneself" or to "know for oneself" that particular chemical processes result in particular effects. But if that were the primary purpose of running such experiments, then the more the better, and failure to run other experiments would come with an associated cost in knowledge. But that is not what is going on in the lab component of a science course. The purpose of a lab component is not to learn the results of the experiments, but to learn *how to run* the experiments. That is, the purpose is to teach the kind of knowledge-how necessary to be a practitioner in the discipline.

5. Conclusion

We began with a problem or puzzle for the traditional account of understanding as a knowledge of causes; namely, that understanding seems not to be transmitted by mere testimony, and yet knowledge can be. So how is it that understanding could be merely a knowledge of causes, or even a systematic knowledge of causes? To resolve the problem, we further considered the Aristotelian account (Part 2) and defended a particular understanding of the generation-transmission distinction (Part 3). With these resources in hand, we defended the view (in Part 4) that understanding can indeed be transmitted via testimony, and especially the kind of sustained testimony characteristic of a formal educational setting. In fact, such settings are designed for exactly this purpose. Nevertheless, we argued, a quality education strives to do more than transmit understanding. Importantly, such an education teaches students how to generate knowledge as well.[17]

Abstract· Education and the Transmission of Understanding · *This paper sets out a problem for the traditional account of understanding as a systematic knowledge of causes. The problem is this: On the one hand, we have a strong intuition that understanding cannot be transmitted by mere testimony, even in an educational setting, where the testimony is in the context of teaching. On the other hand, it is widely assumed that knowledge can be transmitted by mere testimony. So how can this be, if understanding is just systematic knowledge? This paper tries to resolve the puzzle for the traditional account of understanding, and to some extent argues in favor of that account over some recent alternatives. The central claim is that, in principle, understanding can indeed be transmitted by teaching in an educational setting. However, good teaching strives to go beyond mere knowledge transmission, to include teaching students how to generate knowledge themselves.*

Keywords: *knowledge, understanding, generation, transmission, causes, epistemic.*

[17] Thanks to Jason Baehr, Stephen Grimm, Allan Hazlett, Kareem Khalifa, and Katherine Sweet for helpful comments.