

The Impossibility of Atheoretical Educational Science

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Atheoretical science is not merely difficult or undesirable — it's impossible. The reasons for this impossibility center on the *Meno* paradox of Plato. Briefly stated the paradox says that all inquiry is impossible because we either know what we seek, in which case why search for it, or we have no idea of what we seek, in which case how could we recognize it? The way out of this paradox, first suggested by Aristotle, is to say that we have at least partial foreknowledge of the objects of inquiry. In scientific inquiry this foreknowledge comes in the guise of theory. Science without theory stumbles along blindly. Atheoretical science is impossible. The attempt at atheoretical science is simply bad science — or worse.

La science non fondée sur une théorie n'est pas seulement difficile ou indésirable mais tout simplement impossible. Au coeur des raisons de cette impossibilité se trouve le paradoxe platonicien du *Menon* qui, en résumé, dit que toute recherche est impossible car, ou bien nous connaissons ce que nous cherchons (et dans ce cas, la recherche est inutile), ou bien nous n'avons aucune idée de ce que nous cherchons (et dans ce cas, comment le reconnaître?) Pour sortir de ce paradoxe, il faut dire avec Aristote (qui l'a suggéré le premier), que nous avons au moins une connaissance partielle de l'objet de notre recherche. Dans la recherche scientifique, cette connaissance préalable se présente sous forme de théorie. La science sans théorie n'avance qu'à tâtons. La science non fondée sur une théorie est impossible. Essayer de faire de la science non fondée sur une théorie n'est pas scientifique du tout - c'est le moins qu'on puisse dire.

Science is built up of facts, as a house is built of stones; but an accumulation of facts is no more a science than a heap of stones is a house. (Henri Poincaré, *La Science et l'Hypothèse*, Chap. IX)

Concept-free observation is impossible. To state the point in Kantian terms, precepts without concepts are blind. Atheoretical science is a false idol of the positivistic theater; its persistence is traceable, somewhat ironically, to an excessively Baconian view of science that has continued in educational research long after it has vanished in most other scientific disciplines.¹ Contemporary postpositivistic philosophy of science acknowledges this impossibility as the inevitable theory or concept-ladenness of all scientific inquiry. This inevitability rests upon the firmest

of epistemological foundations — the need somehow to escape the *Meno* paradox. The paradox may be stated somewhat elliptically this way: Those who would engage in inquiry cannot try to discover either what they know or what they don't know. They would not seek what they know, for since they already know it, there is no need of inquiry, nor what they don't know, for in that case they do not even know what to look for (Hamilton & Carriens, 1961, p. 363). Plato's way out of this paradox involves his theories of the Forms and anamnesis. Although it is not necessary to embrace any particular metaphysics or epistemology in order to get around the paradox, it is necessary to have some kind of conceptual structure, however obtained, in order to initiate and guide inquiry. Otherwise, we would not know what to "look for." Aristotle, himself no champion of idealist epistemology, dedicates the opening book of the *Posterior Analytics* to the "dilemmas of the *Meno*." Aristotle's own solution to the paradox has a pedagogical twist. The first sentence of the *Posterior Analytics* reads: "All instruction given or received by way of argument proceeds from pre-existent knowledge" (McKeon, 1941, pp. 110-111). Regardless of what epistemological view one might take, some form of pre-existent conceptual knowledge is necessary to guide all inquiry. Inquiry cannot proceed without some form of prior, even if mistaken, "knowledge," or, if one prefers a more pragmatic epistemology, a degree of "warranted assertability." The *Meno* paradox is so fundamental that its significance is unaffected by whether one assumes an idealist, pragmatist, or realist epistemology. For this reason, the paradox cuts through current debates on the correct or most appropriate epistemology for directing educational research.

Scientific inquiry is guided by theory and method. Together they provide the foreknowledge necessary to recognize that which is sought in scientific inquiry. I will have something to say about method later, but for now let us concentrate on the role of theory. As already indicated, postpositivistic philosophy of science acknowledges the necessity of theory for initiating, sustaining and guiding inquiry in a way that requires further comment. N.R. Hanson (1958) coined the term "theory-ladenness" to express the dependence of research observations, or facts, upon theory. Positivists, by stressing the explanatory role of theories, have overlooked the equally important role of theory in initiating and directing research and interpreting the results of observation in order to obtain "facts." Theories, as well as methods, are built out of concepts and their interrelations. So instead of theory-ladenness let us speak instead of the concept-ladenness of observation. Concept-ladenness contends that there are no concept -or theory-independent facts, observations, or O-reports, as the empirical base of science is sometimes referred to. In fine, there is no theory-fact distinction. Theory, or concept-ladenness, challenges the very meaningfulness of facts independent of theory.

Concepts organize and structure otherwise disconnected features of perceptual experience into meaningful perceptions, and meaningful perceptions into science. The distinction between perception and meaningful perception was drawn by Wittgenstein among others. Wittgenstein (1969), referring to the famous gestalt figure of the duck-rabbit, distinguished between merely "seeing" (perception)

and "seeing as" where "'Seeing as' is not part of perception. And for that reason it is like seeing and again unlike" (p. 197). What exactly is the difference? Wittgenstein answers hesitantly: "Is it a case of both seeing and thinking? or an amalgam of the two, as I should almost like to say" (p. 197). Hanson (1958), following up on this idea, contends that "seeing as," or "seeing that," as he sometimes calls it, "threads knowledge into our seeing; it saves us from re-identifying everything that meets our eyes" (p. 20). Referring to the same gestalt figure as Wittgenstein, Hanson writes: "But we can see the illustration [of the duck-rabbit] now as one thing, now as another. So we interpret it, and see it as we interpret it" (p. 14). In science, theories are the means of interpretation, of "seeing-as." Theories allow us to recognize that which we "don't know" in research.

For the practicing scientist the empirical world is the world of experiments. These experiments are constructed in accordance with, and interpreted by, the concepts of the theory presupposed by the researcher. Even if the theory is not explicitly stated, there are concepts present in research that make atheoretical (or aconceptual) inquiry impossible according to this view. Most philosophers who accept the concept-ladenness of experimental research acknowledge that experience is not totally structured by theory, but rather is at least partially structured independently of the researchers' conceptual framework. Thus the issue lies strictly this side of realism or idealism. The point is that experience, while not totally unstructured, is not sufficiently structured to yield *meaningful* perception, that is, facts.

In one way or another, concepts are necessary in order to have meaningful perception (facts) and the integration of concepts by theory is necessary in order to have a meaningful interconnection of perceptions — science. Nonetheless there are those who insist on the possibility of an atheoretical educational science. Take for instance the following statement by Nathaniel Gage (1984):

At the least, a scientific basis [for the art of teaching] consists of scientifically developed knowledge about relationships between variables . . . notice that I say nothing about theory, nomological networks, systems of postulates and axioms, or hypothetico-deductive relationships. In emphasizing the relationships between variables, I am not denying the desirability of systematic theory; I am merely saying that, however desirable, systematic theory is not indispensable to any valid conception of science. (p. 89)

The question remains: Just what are the minimum requirements of scientific knowledge? Facts, Gage seems to answer, facts in the form of correlations between variables. What are we to say then to those researchers who, in spite of the unavoidability of confronting the *Meno* paradox and the seeming inevitability of something at least resembling theory and concept-ladenness in overcoming it, insist that they are doing atheoretical research and can point to a mass of research facts to substantiate their claim?

Atheoretical research is impossible for reasons that should be apparent. What Gage probably has in mind here is a minimalistic view of theory, one that does not require "nomological networks, systems of postulates and axioms, or

hypothetico-deductive relationships." *But even if, in spite of the Meno paradox, atheoretical research were possible (it isn't), it would not be science.* As one prominent educational researcher (Anderson, 1984) has recently put it "knowledge is not a 'basket of facts'" (p. 5). A collection of relationships among variables is no more a science of education (e.g., teaching) than the following partial list of "Instances Agreeing in the Nature of Heat" is a science of thermodynamics:

The rays of the sun;

Fiery meteors;

A flame;

Animals;

Horse dung

"Nec Boreae frigus adurit" (Francis Bacon, *Novum Organum*. In Anderson, 1975)

This random, disorganized heap of facts is essentially meaningless and is certainly useless. The minimal theory used to collect these facts falls far short of providing them with any meaningful interpretation.

If there is humor in this atheoretical collection of everyday observations, there is something of pathos in its converse. High quality *experimental* facts (relations between variables) may be rendered meaningless when the "*interpretive theory*," to borrow a term from the philosopher of science Imre Lakatos (1970), that gave them meaning crumbles. This point is illustrated dramatically by the final destiny of the house of facts built up by that large number of nineteenth century chemists who worked outside the confines of the Proutian atomic hypothesis. Soddy, himself a student of Rutherford, expressed the situation this way:

There is something surely akin to if not transcending tragedy in the fate that has overtaken the life work of that distinguished galaxy of nineteenth-century chemists, rightly revered by their contemporaries as representing the crown and perfection of accurate scientific measurement. Their hard won results, for the moment at least, appear of as little interest and significance as the determination of the average weight of a collection of bottles, some of them full and some of them more or less empty.² (Lakatos, 1970, p. 140)

When the theoretical structure of a house of facts gives way, the house collapses into a heap of meaningless stones. This latter case is genuinely tragic for no one can always tell in advance which theory is the best choice. Certainly there were a great many counter instances to the atomic theory throughout most of the nineteenth century. In this example the house of science collapses with the theory: In admittedly atheoretical research there is no house to collapse.

Let us consider some of the other perils of attempting the impossible or, at best, ill advised. Theories and methods are, as we have said before, necessary in some form or another to conduct scientific inquiry. Those who claim to do research atheoretically actually do one or some combination of three other things:

- 1) They hold their theories tacitly, in which case they need to reflect upon them and state them explicitly;
- 2) They hold them explicitly but deliberately withhold them from public view;
- 3) They pack structural concepts that properly belong to theory into their methodology where they are hidden from their view as well as ours.

The function of method is to acquire experimental phenomena (perceptions), not to interpret the phenomena into meaningful perception or *meaningful* perception into science; that is the job of theory and only theory can do it. Methods are *formal*; they help us to collect subject *matter*, but they only provide the syntax, never the semantics.

The problem with all three of the above alternatives is that the hidden theory that must be present in order to conduct the experimental inquiry need never face the tribunal of sensory experience. These hidden theories most commonly expose themselves in *ex post facto* theorizing wherein the tacit, withheld, or methodologically compacted theory is revealed. When research findings are only interpreted after the fact, the interpretations are typically never tested. That's not science either.

Atheoretical researchers might make their last stand by saying that the conceptual power of their methodology in conjunction with a few, perhaps only one, independent variable(s) and an isolated hypothesis (dependent variable) is enough to overcome the *Meno* paradox and initiate and guide scientific inquiry; that, indeed, is precisely what is meant by low inference research. We suspect, as already indicated, that something very much like this is representative of Gage's actual position. We are willing to concede that *theoretical* research, however minimal the theory, may be possible, but, for the last time, the resulting isolated facts are no more a science than a heap of stones is a house.

The die-hard researcher may continue to insist that *science* requires very little or no theory. No one can argue with a convention as was "proven" by the famous nineteenth-century logician C.L. Dodgson (Lewis Carroll 1946): "'When I use a word,' Humpty Dumpty said, in rather a scornful tone, 'it means just what I choose it to mean — no more no less.'" We may chuckle, but as I have tried to show by example, tragedy lies behind the comic mask. To paraphrase Kant again: If theories without facts are empty, facts without theories are blind.

Notes

- ¹ Ernest Nagel, himself a well known positivistic philosopher of science, bemoans the fact that "the simplistic Baconian conception of science still seems to dominate much empirical research in this area [education] . . ." See Strain (1971, pp. 233-244).
- ² Regarding this passage, Lakatos (1970) comments "when an 'observational' or 'interpretive' theory finally gets eliminated, the 'precise' measurements carried out within the discarded frameworks may look — with hindsight — rather foolish" (p. 140).

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