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SCIENCE AND SCIENTISM IN SUPERVISION AND TEACHING

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In practice, science and poetry are inseparable. Enough illustrations can be found, for example, to suggest that good scientists are also poets and that quality poetry is informed by science. Accomplished professional practice in such fields as medicine, architecture, teaching, and administration is characterized by the union of science and poetry in action.

Science refers to systemized knowledge derived from observations and experiments in an effort to determine the nature or principles of what is being studied. In teaching and supervision, for example, scientific aspects of professional practice provide the theoretical constructs, models, and algorithms that help construct frames for thought and boundaries for action, the bases for informed professional judgments and practices. *Scientism,* by contrast, is science improperly conceived, understood, and practiced.

Poetry refers to a special arrangement of knowledge that expresses ideas and emotions in a more concentrated, imaginative, and powerful way. The poetic aspects of professional practice provide insights and frames that help us reach beyond the boundaries of our models and algorithms, resulting in new and better thought and action. As science informs poetry, poetry extends science. *Poetism,* by contrast, is poetry improperly conceived, understood, and practiced. Although both scientism and poetism represent threats to the development of a professional practice of teaching and supervision, scientism represents the greater threat now.

THE DANGER OF POETISM

In several papers, I have discussed the role of intuition in understanding and practicing teaching and supervision. Intuition is important because of the complexities of the context of practice. I have pointed out the importance of viewing teaching practice as a form of surfing—one rides the pattern of the wave as it unfolds—and have criticized highly refined views of teaching and supervision that resemble the delivery of instruction through a narrow pipeline into a highly focused target. Finally, I have criticized rationalistic concep-

tions of how teachers think about their teaching and make decisions. Much of the literature on teaching, for example, makes sequential assumptions about the relationships among the teachers' goals, curriculum, teaching, and outcomes. By contrast, I have pointed that any one of the four can drive the other three. Goals, for example, are selected as often as a result of materials available as materials are selected as a result of goals. Teaching styles and preferences determine objectives as often as objectives determine teaching styles and preferences. Outcomes become goals as often as goals determine outcomes.

Although recognizing the complex, dynamic world of teaching is important, some may dangerously assume that tacit knowledge alone, or perhaps tacit knowledge combined with a mysterious sixth sense, is the secret to successful practice. Teaching is then elevated to the mystical and moves beyond the limits of poetry to poetism. The mystical end of the continuum is characterized by beliefs that no formal knowledge is of use, that the world is hopelessly phenomenological, that everything is relative, that only personal knowledge counts, that all knowing is tacit, that teaching skill is a gift, and that intuition is the secret.

The world of schooling is messy, and tacit knowledge and intuitive actions are important. But neither of these qualities can be sufficiently developed if we assume a structureless world of teaching, a world devoid of deliberateness. It is true that you do not aim directly at a shifting target, but it is equally true that you will have a better chance at hitting the target if you try to calculate where it is likely to be next and aim for that spot instead of simply throwing whimsically or randomly.

Imagine teaching and supervision to be similar to a game of golf, where the distance of the hole shifts temporally but not spatially. You know the hole is straight ahead, but you can never be sure just how far away or how close it is. You have a pretty good understanding of the distances you can get from each club (club payoff), but you cannot choose a club based on where the hole is at the moment. You must guess where the hole will be after you swing. Knowledge of club payoff remains important, but it cannot be used directly. Instead, this knowledge becomes part of the conceptual framework for making an educated guess in choosing the right club for an assumed distance. In this game, laws exist that determine where the hole will be next, but they cannot be fully understood.

The better golfers develop an intuitive feel for past, current, and likely patterns of appearance of the hole as the game is played. Their play is neither whimsical nor random. Instead, they make mature, educated guesses (informed professional judgments). These guesses, combined with knowledge of club payoff, help them to win. Being familiar with the topographical features of each hole to be played, the play of the greens, the texture of the grass and the rough, and the idiosyncracies of each of the sand traps are other pieces of information that might or might not come in handy should a hole pop up here rather than there. Getting the topography and club payoff down pat are

not enough if you cannot develop a feel for the patterns that are likely to emerge. On the other hand, being pretty good at predicting the patterns but having little understanding of course topography or club payoff will not hold you in good stead as a player.

Professional practice, like the game of golf, is a form of reflective practice. Reflective practice is different from whim, chance, serendipity, or the application of mystical or transcendental experience. We cannot practice reflectively in golf, teaching, or supervision without first knowing in detail how the game should be played and the salient rules of thumb that help us make sound playing decisions. The poetic aspects of professional practice become poetistic when they are presumed to replace rather than extend scientific aspects. The danger of poetism is real, but the major danger we face now is not from excessive poetry but from excessive science.

THE DANGER OF SCIENTISM

Scientism is an attempt to extend the authority of science beyond its accepted bounds. Sometimes such attempts are fraudulent and at other times innocent. An example of fraudulent scientism would be the workshop provider who deliberately (albeit vaguely or selectively) appeals to the "research" to lend credence and marketability to her or his ideas and prescriptions. More innocent scientism results when we become enamored with the trappings of science to the point of fetish and thus wrongly view science as the only legitimate form of understanding. Innocent scientism stems in part from our worldview and in part from our personality profile. An ideological commitment to the values of positivism often results in research and practice being captured by mindscapes of explicitness, objectivity, order, and rationality. Personality characteristics such as a high need for order, a low tolerance of ambiguity, and a low level of cognitive complexity often result in a search for simplicity, definition, and certainty in practice.

SCIENTISM IN POLICY RESEARCH AND DEVELOPMENT

The dangers of scientism in teaching and supervision are real and widespread. Particularly susceptible is the area of policy analysis. Whether policy research constitutes science or scientism depends on two factors: the efficacy of findings and the pattern of selection among findings for use in practice. If findings do not materialize or if only the obvious is discovered from a particular line of research after substantial investment in time and money, then only the leg of scientific method becomes the justification for scientific claims. Physics stands on two legs—scientific method and efficacy of findings The claims to being scientific by such fields as parapsychology and generic teaching effectiveness, by contrast, may well be more in methods than in findings.[1]

[1]Generic teaching effectiveness as a field of inquiry and policy analysis is the search for a one-best-list of indicators of effective teaching or a one-best way to teach Context specific researchers, by contrast, link indicators and behaviors to specific goals, contexts, and student populations

Parapsychology uses rigorous scientific methods but after years of research has few findings to offer. Policy analysts who focus on generic teaching effectiveness also claim the use of rigorous scientific methods. But are the findings they offer efficacious, or are they for the most part affirmations of obvious or well-established craft knowledge? Do the findings offered for practice represent a technology of teaching applicable to general practice, or are the findings more a set of general principles and truisms?

Because most of this "newly discovered" knowledge about teaching seems to be already established in the literature, or known in the lore of craft, the importance of the knowledge is not diminished. Still, can the findings that claim to be universal and the appraisal instruments and teaching models they support claim to be scientific? I have my doubts.

Understood for what it is, this research has made a scientific contribution But its scientific validity can only be claimed on a case by-case basis The merit of the research is the rendering of the best conditions for particular teaching behaviors to lead or not lead to increased student achievement. These insights represent important scientific contributions. It is scientistic, on the other hand, to ignore contextual constraints and to assume instead that the research is intended to or has revealed universal teaching principles that constitute a best way to practice.

WHICH TURTLES COUNT?

Many teaching models being pushed or mandated by our state educa tional bureaucracies and other policy centers throughout the country repre sent a mix of research and politics. This revelation should not surprise anyone By definition, the policy process is political, choices are made among pref erences and ends held by various stakeholders. As the process unfolds, we often find bureaucrats and policy scientists who view the available research as something to "put on tap but not on top."[2] Research is on tap when it is viewed as a handy inventory through which one searches to find the "scien tific" evidence needed to legitimate preferences and political ends The alle gorical principle for this practice is to "heed only the turtles that swim in *your* side of the pond."

It is inevitable that scientific research be used selectively because all the available evidence cannot be presented. By choosing only some evidence, we can favor certain viewpoints, preferences, and conclusions. The selection problem is compounded by the reality that once the evidence is presented it must be interpreted. What evidence means depends on the context in which it is used, the concepts used to understand it, and the theoretical framework in which it is applied.[3] Thus, what research on teaching is selected, how it is

[2]Barry Barnes, *About Science* (Oxford, England Basil Blackwell, 1985), p 99

[3]Brian Martin, *The Bias of Science* (Canberra, Australia Society for Social Responsibility in Science, Australian Capitol Territory, 1979), p 31

interpreted, and the purposes for its use are the means by which policymakers and scientists can push certain scientific arguments on behalf of their preferences or political ends.

Among the essential values of science typically proposed are *universalism* (the belief that scientists have the duty to question all beliefs and accepted truths), *openness* (scientists are duty-bound to share findings openly and objectively), and *disinterestedness* (scientists need to be emotionally detached, having no personal stake in the outcomes of their research). Any practice that falls short of these standards would be considered scientistic. Although I accept universalism and openness, I believe that the standard of disinterestedness is inappropriate. In the human or cultural sciences, preferences and ideologies are linked with research evidence as are the woof and warf in a woven fabric. Instead of disinterestedness, I propose that blatant disregard for balance in selecting research findings for use, combined with the presentation of this evidence as if it were the objective and scientific basis for one's views and decisions, be the standard for scientism.

THE CREATION OF SCIENTIFIC EVIDENCE

In teaching, the discovery and presentation of evidence is always subjective. Researchers' preferences affect the decisions they make about what to study, how terms will be defined operationally, and what data will be collected and how. These decisions play a role in determining what will be discovered. Scientific evidence is in part an artifact of a researcher's decisions, it does not exist independently of human nature but is created by human nature.

The link between scientific evidence and human decision making is much more widely accepted in such firmly established fields as physics and in less established (but further ahead than teaching) fields such as psychology. The fledgling disciplines are most prone to scientism. The more secure the discipline, less is the need to adopt the pretenses of science. As Barnes points out, in borderline fields "scientific validation tends to be much more explicit and intense than it is, for example, in chemistry or physics. When one knows that one's field is genuinely scientific, there is much less call to ask what precisely that might imply."[4]

The now-famous two-hole experiment in physics is often used to illustrate the link between observer decisions and the nature of electrons. Are electrons particles or waves? Under bright lights that allow the electron to be detected, it is a particle. Dim the lights to make detection more difficult, and the electron assumes a wave pattern. Shoot the electron through a two-hole barrier with one closed, and it is a particle. Open both holes, and the electron assumes a wave pattern.

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[4]Barry Barnes, *About Science* (Oxford, England Basil Blackwell, 1985), p 94

Einstein's special theory of relativity affords another example of the link between person and evidence. He points out that the motion, space, and time location of the observer must be considered in determining measurements of different objects moving at great speeds. Change the location, and the measurements change. Further, observers at different locations observing the same object would arrive at equally valid but different computations of speed The speed of the object does not exist independently of the observer's location.

In psychology, the Gestalt experiment displaying the vase made from two profiles (or is it two profiles made from the vase?) is a further example of observer-created reality. You can see one or the other but not both at the same time. You have to decide which of the realities you are going to see

THE "TWO-HOLE" EXPERIMENT IN TEACHING

In teaching and supervision, we tend to equate scientific evidence with "truth" and thus are more prone to use this evidence as the basis for developing "one-best-way" models of practice. It is easy to claim the superiority of one array of teaching behaviors over others or of one model of teaching over others if one is allowed to set up the criteria for comparison. Imagine two youngsters on the verge of opening their lunch boxes at school. One says to the other, "I bet you a Coke that the fruit in my box is better than that in yours." The youngster then sets the criteria for *better* as follows. The redder the fruit and the rounder the fruit, the better. Unfortunately, the other youngster's lunch pail contains a banana. If the game were played the other way with the youngster toting the banana naming the rules, we would have a different winner.

So it is with models of teaching. Evaluation systems, for example, based on Rosenshine's direct-instruction teaching functions, the various state-mandated appraisal systems, and other models and systems each bring to teaching a unique theory and a distinct definition of effectiveness[5] Change the definition (from red and round to yellow and long), and a different teaching pattern is likely to emerge from research that would require an evaluation system substantially different. A teacher evaluated by both systems would be a winner with one and a loser with the other Winning and losing (teaching effectiveness) cannot be established independently but is a function of how effectiveness is defined and measured. Assumptions that ignore this reality are examples of scientism.

ACCEPT A MODEL AND YOU ACCEPT A THEORY

No teaching model can be understood as merely a collection of verified instrumental techniques or "generic teaching behaviors" on the assumption

[5]Barak V Rosenshine, *Teaching Functions in Successful Teaching Programs* (Urbana-Champaign University of Illinois Press, 1982)

that they are theory-value free. As Barnes points out, "Science is theoretical knowledge, and it is theoretical through and through, not just in part."[6] Every model contains a theory, whether it is recognized or not, and all models need to be accepted on the basis of the adequacy of that theory, not on just the results achieved This statement is true in the hard sciences, and it is especially true in teaching, where normative theories are interwoven with technical. In this light, evaluation instruments and systems are theory statements, and so their development is not a technical exercise but an exercise in the construction of a theory.

Therefore, we need to be as concerned with what an evaluation system does as we are with how it works.[7] How does the system alter the nature of teaching, the role of teacher and students, and the way curriculum is developed and used? Evaluation systems are mediums for creating and modifying teaching reality. As mediums, they act as metaphors that frame thought, shape meaning, and create reality. They influence what we see, what does and does not count, our language system, and finally our understanding of teaching. Ultimately, the theory determines in our minds what is and is not true. As the theory changes, statements thought to be true become false.

We have now come full circle in creating scientific reality. Isolated findings on teaching effectiveness are collected and attached to a model or instrument. The model or instrument represents a theory. The theory confirms the findings. Whoever controls the cycle creates the reality for the rest of us.

GOOD AND EFFECTIVE ARE DIFFERENT

No matter how technically adequate the research, what works can never be equated with what is right or what is good. In this sense, effective teaching and good teaching may not be the same. Further, the scientific means used to determine effectiveness becomes scientistic when used to determine goodness. As Taylor reminds us, "An argument whose conclusion is a valued judgment on a prescription is not valid if all its premises are empirically verifiable."[8] He continues:

> This brings to light what is perhaps the most striking difference between normative and factual assertions. The truth of normative assertions depends on human decisions, the truth of factual assertions does not. A factual assertion is true if it corresponds to the way the world is, regardless of whether we want the world to be that way. . . A normative assertion is true on the other hand only because we have decided to adopt a standard or rule as applicable to what we are making the assertion about. . Our adoption of a standard or rule on which the truth or falsity of our assertion depends

[6]Barry Barnes, *About Science* (Oxford, England· Basil Blackwell, 1985)

[7]See, for example, Terry Winograd and Fernando Flores, *Understanding Computers and Cognitives A New Foundation for Design* (Norwood, NJ· Ablex, 1986)

[8]Paul W Taylor, *Normative Discourse* (Englewood Cliffs, NJ· Prentice-Hall, 1961), p. 248

does not itself depend on the way things are. We must *decide* what ought to be the case. We cannot *discover* what ought to be the case by investigating what is the case.[9]

What is best can be and must be deliberately and systematically (or rationally) determined. Scientific discourse provides one important dimension to this determination. Beliefs and values, purposes and ends, and the relative weight on one's preferences over another are the other dimension. These latter issues are seldom part of the public debate as policy is developed. Unless we come to grips with issues of goodness as well as effectiveness, we let research tell us what to believe. Moreover, we let invisible colleges of researchers and powerful policymakers who decide which turtles count define for us what is true and create our reality.

A more scientific stance for using knowledge in teaching and supervision (to borrow a leaf from House's seminal argument for viewing evaluation as argument[10]) would be to consider all the research on teaching and all the models of teaching as representing an array of arguments designed to persuade, not as objective truths. We could then choose among the findings and models based on whether they are sufficiently persuasive given intents, preferences, values, predispositions, and other idiosyncratic concerns.

MISREPRESENTING THE EVIDENCE

Unfortunately, scientism in teaching can take more deliberate forms. Sometimes claims of scientific support simply misrepresent the cited evidence. Citation banks that include well-known names and works that are marginally or distantly related to the ideas they are supposed to support are one example. This use of citation banks is not unlike the actor in a television commercial who dons a white coat to better sell aspirin or toothpaste. As Cameron and Edge point out, "Scientism is present where people draw on widely shared images and notions about the scientific community and its beliefs and practices, to add weight to arguments which they are advancing, or to practices which they are promoting, or to values and policies whose adoption they are advocating."[11] Our culture respects the authority of science, and "scientistics" blatantly capitalize on this respect to advance their own agendas.

It is not uncommon for many of our research laboratories, policy institutes, professional organizations, state bureaucracies, and even university research centers to become overly committed to a course of action or line of inquiry with scientistic consequences. Not only are the funding stakes high, but political and academic careers often depend on the success of the line of inquiry. Further, the escalation of commitment to a course of inquiry is driven

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[9]Ibid.

[10]Ernest House, *The Logic of Evaluative Argument* (Los Angeles: Center for the Study of Evaluation, University of California at Los Angeles, 1977).

[11]Iain Cameron and David Edge, *Scientific Images and Their Social Uses* (London: Butterworth, 1979), p. 3.

by psychological factors that include one's internal competence needs and one's response to external demands for competence. These powerful forces provide the motivation for seeking justification of one's ideas, decisions, and actions.[12]

Matching an array of studies to a set of practices by using citation banks is now routine. Although these banks lend scientific trappings to the practices being prescribed, their use is questionable. The significance of scientific evidence depends on the context from which it emerged and in which it is used, and neither are readily transportable The problem is particularly compounded when an array of studies from different contexts and based on different premises are brought together. To assume that preferences and values do not have a place in advancing evidence, however, is also an example of scientism. The question, therefore, is not whether one believes in a certain position and uses scientific evidence selectively (bias itself is not scientistic, only human) but that one denies this practice is essentially normative and instead puts it off as if it were scientific.

WHERE THE BREAKDOWN OCCURS

If my assertion is correct that scientism is deep and widespread in supervision and teaching, should we conclude that process-product research or other lines of research on teaching are worthless? Should the findings revealed by these studies be dismissed? The answer is no We should not ignore the research, but we should avoid fetish allegiance to a single line of research We need to view research findings, however discovered, less as truths and more as insights and understandings. The purpose of research in our field is not to discover the right answer but to help better understand the conditions of our practice.

The danger of scientism is not so much in the research but in how research is used in practice. A framework developed by the University Council for Educational Administration helps to explain the link between research knowledge and knowledge use in practice.[13] The framework assumes that there are at least five ways of using knowledge to advance education:

- Knowledge can be used to create new knowledge to establish new generalizations and understandings (e.g., process-product studies of teaching behaviors and ethnographic studies of classroom life).
- Knowledge can be used to achieve new and better syntheses of knowledge to provide order and promote interrelatedness among existing findings,

[12]Barry M Staw and Jerry Ross, "Commitment to a Policy Decision A Multitheoretical Perspective," *Administrative Science Quarterly* 23 (March 1978) 40–64, Barry M Staw "Leadership and Persistence," in *Leadership and Organizational Culture*, ed Thomas J Sergiovanni and John E Corbally (Urbana-Champaign: University of Illinois Press, 1984)

[13]University Council for Educational Administration, *Toward the Development of a 1969–1974 UCEA Plan for Advancing Educational Administration* (Columbus, OH, undated)

concepts, and generalizations (e g., writing books and developing policy documents based on meta-analysis).

- Knowledge can be used to develop models of teaching or supervisory practice that help frame new understandings and suggest guidelines for use in practice.
- Knowledge can be used to design new programs and workshops to disseminate what is known and not known about teaching and supervision.
- Finally, knowledge can be used in practice as we decide what to do, how, and when.[14]

As we move from research through the other four uses of knowledge, the danger of scientism increases. In any synthesis of knowledge, for example, the synthesizer decides what to include and not to include and interprets knowledge that transforms it from "brute" to "sense" form.[15] The greatest threat of scientism is in the model-building use of knowledge: synthesizing an array of different studies on teaching effectiveness to develop a single list of effective teaching behaviors or translating these behaviors into appraisal instruments.

Few researchers working at the knowledge-to-create-new-knowledge end of the continuum would agree that accumulating their findings into synthesizing lists of teaching behaviors, translating these behaviors into models of teaching or appraisal instruments, disseminating these models in the form of training packages, and using them in practice constitutes a legitimate use of their research. Indeed, most researchers are careful to point out just what their findings do and do not mean. Brophy and Evertson, for example, point out that effective teaching behaviors are highly context-specific. Their research reveals that what is effective teaching varies for students with different socioeconomic, mental, and psychological characteristics and different grade levels:

> Two general points should be kept in mind in considering the results. First, as mentioned above, the data usually make more sense when considered separately by low and high SES [socioeconomic status] schools than they do for the total group, indicating that the kind of teaching associated with the best gains in low SES schools often was quite different from the kind associated with the best gains in high SES schools. There were many commonalities, but it was more typical for a given teacher behavior to be more important in one type of school than in the other than it was for it to be equally important in both types of schools. Second, the data came from the second and third grades, where children are still learning fundamental tool skills, and where the nature of teaching is considerably different from what it is later. We believe

[14] I use this framework loosely because it would be a mistake to assume that knowledge begins with research and ends with use The five uses of knowledge are interrelated and dynamic, with each affecting the other

[15] Charles Taylor, "Interpretation and the Sciences of Man," *Review of Metaphysics* 25 (September 1971) 3–51

that this is the biggest single reason for the discrepancies between some of our findings and those of previous studies which have been conducted at higher grade levels.[16]

In a recent Rand report, Wise and Darling-Hammond conclude that what is ethical in teaching, what constitutes best practice, and how specific classroom problems are to be handled cannot be reduced to a one-best-way but are highly context-specific: "Although this research strongly suggests that what teachers do in the classroom does affect students, claims that discrete sets of behaviors consistently lead to increased student performance have been countered by inconsistent and often contradictory findings that undermine faith in the outcomes of simple process-product research."[17] Wise and Darling-Hammond reach similar conclusions on the well-known Beginning Teacher Evaluation Study and the well-established and widely imitated Florida Performance Measurement System.[18] In their recent analysis, Lara and Medley have found that a number of the so-called teaching-effectiveness behaviors helped either high or low achievers but had no positive effect, and sometimes a negative effect, on the other group. For example, providing clear, explicit instruction helped low achievers but had no effect on high achievers. Praise and rewards that positively affected middle achievers negatively affected both low and high achievers.[19]

How research gets used in practice is the most important determiner, then, of whether practice itself is scientific or scientistic. The breakdown in the system of knowledge use begins at the synthesis level and becomes most serious at the model-development level. From that point forward, scientistic practice is often a foregone conclusion. Models of practice, for example, often become the basis of training programs and evaluation systems. Careers are made or broken on the basis of whether teachers' practice reflects the models.

THE NEED FOR A NEW METAPHOR

If we want to stem the tide of scientism in teaching and supervision, we need to re-evaluate our almost exclusive reliance on the applied-science metaphor. Applied science tends to frame the way we think about teaching in a fashion that does not fit either its presumed scientific base or the realities of professional practice. It encourages us to think about models as accurate representations, blueprints to be imitated and practiced.

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[16]Jere E Brophy and Carolyn M. Evertson, "Teacher Behavior and Student Learning in Second and Third Grades," in *The Appraisal of Teaching Concepts and Process*, ed. Gary Borich (Reading, MA: Addison-Wesley, 1977), pp. 83–84.

[17]Arthur E Wise and Linda Darling-Hammond, *Licensing Teachers Design for a Teaching Profession* (Santa Monica, CA. Center for the Study of the Teaching Profession, Rand Corporation, 1987), p 22.

[18]Ibid.

[19]Anunciacion V Lara and Donald M. Medley, "Effective Teacher Behavior as a Function of Learner Ability," *Professional School Psychology* 2 (Winter 1987). 15–23.

If we were to abandon the applied-science metaphor, other alternatives for viewing models of teaching and supervision would become legitimate Models would still be constructed as before, and the theory and research on which they are based would remain important, but their use in practice would be metaphorical rather than literal.[20] As metaphor, a model would enlarge our vision, enhance our understanding, and inform our professional judgment. It would help us make better decisions about practice but would not tell us what to do.

Art is often proposed as an alternate metaphor, but I do not consider it a good candidate. For many, art is too difficult a concept to get a handle on, and its qualities are presumed to be well beyond the ordinary. The metaphor often causes us to lapse into poetistic, mystical, and transcendental images of teaching.

I am persuaded by Tom, Mintzberg, and Blumberg that the metaphor of craft has the best possibility for helping us think about teaching and learning in a fashion that brings together both scientific and poetic dimensions while diminishing the dangers of lapsing into scientism or poetism.[21] The craft metaphor helps me to view accomplished teachers as highly skilled artisans whose work is prized for its beauty, technical qualities, and utility. Although virtually anyone can engage in a craft activity, the work of the artisan is quickly recognized as something special.

Teachers, like artisans, think and act, formulate and implement. Actions lead to ideas, and one idea leads to another. New patterns or strategies emerge. These strategies lead to new thinking. The two interact. Strategies emerge in response to evolving situations. Teachers do not think on one occasion and work on the other. Mind and hand are constantly moving in tandem. Teacher strategies are not either deliberate or emergent but both. Rarely do teachers wind up where they intend, but they always begin with some ideas on where to go.

Wisdom, dedication, experience, integration, intimate understanding, a sense of harmony, and a personal knowledge of the material and mastery of detail are all associated with craft.[22] Artisans, according to Blumberg, develop a special kind of know-how characterized by a refined nose for things, a sense of what constitutes an acceptable result in any difficult situation, an understanding of the nature of the materials they work with, a mastery of the basic technology undergirding the craft, the skill to employ the technology effec-

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[20]Thomas J Sergiovanni, "The Metaphorical Use of Theories and Models in Supervision Building a Science," *Journal of Curriculum and Supervision* 2 (Spring 1987). 221–233

[21]Alan R. Tom, "Teaching as a Moral Craft A Metaphor for Teaching and Teacher Education," *Curriculum Inquiry* 10 (Fall 1980). 317–323, Henry Mintzberg, "Crafting Strategy," *Harvard Business Review* 65 (July–August 1987): 66–75; Arthur Blumberg, *School Administration as Craft Foundations of Practice* (Boston: Allyn & Bacon, 1988)

[22]Henry Mintzberg, Crafting Strategy,' *Harvard Business Review* 65 (July–August 1987) 66–75.

tively, and the knowledge of what to do and when to do it. Artisans make pragmatic (and in our case, moral) decisions and can diagnose and interpret the meaning of what is occurring as they work in any situation.[23]

Skilled teachers practice as artisans by bringing together their deep knowledge of relevant techniques and competent application of tried and true rules of thumb with a nose for their practice and a penchant for reflecting on this practice as they create something of practical utility. Supervisors, too, are artisans. They have an extra measure of craft knowledge, are skilled at craft-talk (they can make implicit knowledge more explicit), and are accomplished in coaching craft work. The concept of craft represents the paradigm for integrating science and poetry in professional practice without the excesses that lead to scientism or poetism.

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[23]Arthur Blumberg, *School Administration as Craft: Foundations of Practice* (Boston: Allyn & Bacon, 1988).