Kant in the Culture Factory:
On Design, Study, and Technology in Education

A Working Draft[1]

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> It is the mark of an educated man to look for precision in each class of things just so far as the nature of the subject admits....
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> Aristotle. *Nichomachean Ethics*. 1094b24[2]

Notes toward the Definition of Study

Here are some definitions that may help clarify educational relations. I set them forth with attention to neither nuance nor amplification. Those will follow. The bare definitions make an ensemble. Part of the meaning of each arises from the set. Unfortunately, they must be written in some order. Indeed, their sequence has some meaning. You should read through them, once, to get the set; then you can read each again, critically assessing it as part of the set. Following this set, I amplify the key ideas to clarify the principles of study design.

These definitions are epistemic, not ontic. One tests epistemic definitions by using them to build up sound knowledge about phenomena. The purpose is not to define what education *is*. The purpose is to define how we think about

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1 A small note on usage: I randomly vary the gender of possessive pronouns and the like when actual gender is indeterminate. Please attach no significance to the usage beyond the attempt to write clearly without offending. I don't know whether this usage will prove satisfactory. If we take contemporary concern for gender equity in diction to a logical conclusion, it will lead to the resurrection of grammatical gender typing in English, e.g. "She's a beautiful ship but it's a big boat."

2 W.D. Ross, trans., *The Complete Works of Aristotle: The Revised Oxford Translation*. Jonathan Barnes, ed., Bollingen Series LXXI. Princeton: Princeton University Press, 1984, Vol. 2, p. 1720.

education. We have here a preliminary table of categories in a critique of educational thought, one done in the spirit, if not syntax, of Immanuel Kant.[3]

Culture	All capacities, skills, and acquirements that have not been given to the living through their strictly biological endowments.
Education	The processes by which people create and acquire culture.
Inquirer	The person who experiences education. *Learner* might serve as well here, especially for the acquisition of culture. *Inquirer*, however, stresses generality and includes place for education as the creation of culture.
Mentor	A person helping an inquirer in the acquisition of culture. *Teacher* might serve as well, but we need it for a more specialized meaning.
Domain	The given cultural resources directly involved in an educational process: the educational attainments available as grounds for current educational effort. Both the inquirer and the mentor have domains.
Universe	All possible cultural resources that an inquirer might master in the full course of her education.
Horizon	The portion of the inquirer's universe that her domain enables her to perceive. The horizon includes what the inquirer knows, her domain, plus what she knows she does not know, the part of her universe of which she is aware.
Perspective	The portion of the inquirer's universe that the mentor's domain enables him to perceive. Note the cross-over here: perspective involves the mentor's view of the inquirer's universe.
Objective	The particular capacities, skills, acquirements that an inquirer seeks to master through an educational process; the specific culture the inquirer seeks to create or acquire in an educational process. An inquirer can formulate an objective only about matters within her horizon.

3 In my use of Kant in this essay, I intend to be neither nostalgic nor anachronistic. For our purposes here, Kant should be taken as a living presence. Kant is to pedagogical design as Newton is to aeronautical design. Although physics has progressed far beyond Newton's version of it, his version is still the one appropriate for describing the flight of airplanes. In a similar way, although epistemology has progressed far beyond Kant's version of it, his critiques still give us tools appropriate for describing educational relationships.

Intention A general aim in an educational process arising from the inquirer's sense that all specific objectives evident within his horizon do not exhaust the possibilities of his universe.

Note: A common pedagogical difficulty arises when the perspective of the mentor leads him to define something as an objective when the horizon of the inquirer is such that she can only pursue it as an intention.

Development An educational process that extends the inquirer's domain further towards her horizon. Development can purposefully result from the pursuit of objectives and intentions.

Discovery An educational process that extends the inquirer's horizon further into his universe. Discovery can *purposefully* result from the pursuit of intentions, but not objectives. Serendipitous discovery can result from the pursuit of objectives when the unexpected happens and the inquirer responds intentionally to the possibilities it reveals.

We need several sub-definitions because the *domains* of the inquirer and the mentor overlap but do not coincide. How their domains overlap distinguishes between different ways people can participate in educational processes.

Teacher A mentor whose domain in an educational process includes and exceeds that of the inquirer, e.g., the teacher knows the subject better than the student.

Coach A mentor in an educational process in which the inquirer's domain includes and exceeds that of the mentor, e.g., the player can outperform the coach.

Pupil An inquirer who assumes that the domain of the mentor is the universe.

Student An inquirer who believes that the universe may exceed the domain and horizon of the mentor.

We also need several sub-definitions because the *objective* of an educational process may refer to the pertinent domain, or beyond the domain to the broader horizon. Where the objective stands in relation to domain, horizon, and universe distinguishes between different forms of education.

Education as the *acquisition* of culture.

Acculturation Mastering available capacities, skills, and acquirements that differ from those set by the objectives of the educational process.

Training An educational process in which the objective lies within the domain of both the inquirer and the mentor. A tool or procedure is a given for both trainee and trainer, and the latter must ensure that the former masters its use.

Instruction An educational process in which the mentor believes that the objective lies within his domain. The instructor must impart the skills and knowledge he possesses. Instruction can result in training or learning.

Learning An educational process in which the inquirer believes that the objective lies within her own horizon and within the domain of the mentor. Learning can result from training or instruction.

Education as the *creation* of culture

Research An educational process in which the inquirer pursues an objective within her horizon, but not within her domain, without direct help from a mentor.

Study An educational process that results as an inquirer pursues an intention in addition to the operative objectives, with or without the help of a mentor.

Note: An inquirer can engage in study during training, learning, and research, all of which derive their teleological structure from objectives. Study is a responsiveness to intentions in the midst of work towards objectives. Objectives point to specific goals within the horizon; intentions to unspecific possibilities beyond the horizon.

We turn now to reflect on principles that we can use to develop educational systems that meet the needs of people studying.

On the Principles of Design for Study

> Behind this shift from the imagination to the understanding is Kant's conception of our relation to the world as a cognitive or intelligent one and so to be sought for in the understanding, as opposed to Hume's conception of it as a causal or mechanical relation and so to be sought for in the imagination.
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> Arthur Melnick. *Kant's Analogies of Experience*. p. 164

What principles should guide the design of educational resources to improve the work of study? Study results when the inquirer pursues intentions in addition to the operative objectives. Intentions suggest to the inquirer that the universe harbors more possibilities than those charted by the operative objectives. Intentions arise because the inquirer intuits that interesting possibilities exist beyond the horizon. Study guided thus by intention is an openness to possibility, a readiness to respond to it. We need to understand how people respond to possibility, how they move from the known to the unknown.

Let us reflect on five ways of extending the cultural horizon into the universe -- *recognition*, *production*, *control*, *selection*, and *commitment*. I do not suggest that people use only these five capacities to respond to possibility. I do not

pretend to give an exhaustive account of the modes by which people can move beyond their horizons into the realm of unperceived possibilities. Likewise, I do not suggest that people use these five capacities exclusively in intentional activities. Quite the contrary, people may use these capacities also in learning, in pursuing objectives. Our interest here, however, is in understanding how people use them in pursuing intentions, possibilities beyond their horizon that they cannot define precisely as objectives. Reflection on these capacities will give important clues about the principles of study design.

Recognition. This is the "Ah ha!" experience, the sudden awareness that in the buzzing confusion something substantial, identifiable inheres. An objective may activate regognition. For instance, if you ask June to find Jim to tell him that you need his help, she will have the objective of recognizing Jim. But much more often recognition arises in response to a general intention. Thus, when I'm walking down the street thinking deep thoughts and I see a familiar face which I suddenly recognize as Jim's, I recognize Jim, not by objective, but by intention. Intention, a responsiveness to possibility, most deeply guides recognition of something new, something hitherto vague, murky, incoherent.

Production. This is the "Look, Ma!" experience, the activation of a causal sequence to the point of suddenly doing something one had not done before. Production also can be done by objective, as often occurs in offices and factories where managers have carefully planned the causal sequence to come to a well-specified conclusion. But frequently people produce works in response to an intention in which the precise outcome is fuzzy, the result creative. Simple speech gives us endless examples. Under certain circumstances, diplomats and lawyers may shape an utterance precisely according to a conscious objective. Most of us, most of the time, in contrast, produce our utterances more spontaneously in response to our intentions, sometimes surprising ourselves on discovering what it was that we really had to say. What is true of speech is true of most creative making: the maker has intentions and produces unexpected results through the sequence of causalities that translate the intention into a completed work. The sequence carries the maker beyond her horizon.

Control. This is the "I got it!" experience, the maintenance of complex interactions in a dynamic equilibrium that one can steer or guide in useful ways. Many examples of control involve objectives, like the simple thermostat that keeps room temperature close to the objective set for it. But many other examples of control equilibrate around intentional goals, states of mind and states of being -- curiosity, fun, health, happiness, fulfillment, influence, power, love. Control consists in the capacity to maintain approximations of these states. Efforts to maintain control are deeply, integrally intentional because one cannot limit the significant interactions to the predictable ground within one's horizon.

Control often overlaps with production, but they are conceptually distinct. Production results from a distinct sequence of causes and effects; control manages a complex of reciprocally interacting simultaneous influences.

Take riding a bicycle as a simple example. Peddling is a clear example of production. Most anyone can clearly explicate the sequence of causes and effects that move the bike forward. Balancing the bike is the example of control. Few people can clearly explain how they do it and it depends heavily on the cyclists' ability to coordinate multiple senses to register the reciprocal interaction of many forces, continually wielding those he can to shift the mass of the system towards the direction of fall.

Selection. This is the "It fits, it suits me!" experience, the formation of preferences through judgments about form and beauty. Selections can be managed according to objectives, otherwise major industries -- cosmetics, advertising, public relations -- would not exist. Yet selection more deeply offers individuals and groups the opportunity to express their intentions. We might say that people *choose* in response to their conscious objectives, but that very often they find that these do not suffice to effectively discriminate between the available alternatives. At that point, people *select* through judgments that reflect their intentions, their sense of possibility, an ineffable sense of form, fit, beauty, compatibility.

Commitment. This is the "Here I stand!" experience, the conviction that this or that course of action is worthy and right regardless of the immediate consequences that will come of it. One can form objectives while carrying out a commitment. But insofar as a commitment is a conviction that something is right independent of the specific results that come of it, commitment is an intentional act, one that does not reduce to a set of objectives. The person acting from commitment reaches beyond his horizon to take a stand in a world in which foreseen consequences cease to matter. The committed person acts simply because he knows the intention entailing his action is right.

Let us summarize the essentials as they have so far unfolded. Education is the process by which people create and acquire culture. At any particular time a person has a domain, consisting of previously mastered culture, and a horizon inside of which he perceives things that he knows he does not know. Cultural possibilities within his horizon can serve as his objectives for learning. In addition to his horizon, he has a more encompassing universe in which there are cultural possibilities that he does not perceive distinctly but that may nevertheless be very significant possibilities for him. Intentions are general aims that a person senses, suggesting that all his current objectives do not exhaust his possibilities and that, in addition to the objectives, those possibilities are worth pursuing. Intentions can be powerful motivators in the creation and acquisition of culture because the person intuits that it is worthwhile to be receptive to prospects that are significant yet indistinct. I define *study* as educational effort motivated by intentions, *learning* that driven by objectives. I further suggest that five significant forms of activity in which intentions, as distinct from objectives, can be highly significant are *recognition*, *production*, *control*, *selection*, and *commitment*. Educational systems designed to make study fruitful will challenge people to use their capacities fully to recognize things, to create works, to manage systems, to judge fitness, and to affirm principles. How?

One item that we have not yet defined is *design* itself. How should we think about design in order to make sense of the infinite particularities of it?

> **Design.** A process through which people use epistemic definitions, criteria, and models to shape the stuff of experience to accord more closely with their knowledge, principles, and preferences.

Design builds knowledge into the world we make. "Art is long, life short, judgment difficult, opportunity transient. To act is easy, to think is hard; to act according to our thought is troublesome."[4] Design is that troublesome effort to act according to our thought; it makes judgment easier and opportunity more stable.

Take any example of design. Central to it will be an effort to render the work knowable, understandable, predictable in one way or another. What drives the design of a tool, simple or complex? The user wants to *know* that the tool will work for the purpose which guided its design. The worker gets angry at his tool when it fails at the task for which it was designed and abashed when he breaks it trying to use it for some purpose for which it was not designed. Materials design serves to make the performance of materials knowable, predictable. Handbooks of specifications and standards give ready access to the knowledge built into such materials, clear statements of the stresses they will bear. Manufacturing design serves to make the outcome of production predictable, foretelling both the character and quality of the product and, even more, making its cost knowable, an essential component in designing its marketing.

Design, understood as action that embodies knowledge in the stuff of life and matter, holds a fundamental place in our culture. Hume and Kant destroyed metaphysics, ushering in the era in which epistemology has primacy over ontology. Increasingly, people recognize all the sciences to be cognitive sciences, describing the world that our knowing reveals, giving an account of how and why we know it, and adopting a principle of uncertainty about all the rest. The positive test, complementing the negative one of falsification, is not verification, but suitability as grounds for design, if not of practical applications then of further cognitive experiments and explorations.[5] Hegel laid down the ontology of the emergent universe-by-design that the human spirit makes as its habitat. "What is rational is actual and what is actual is rational."[6] This is absurd if said willfully about things in themselves, but it makes fine sense said, as Hegel said it, about a reasoning spirit that draws itself out of itself, that educates itself, to design itself as the actuality of the inchoate chaos. So too, Kant's claims about a synthetic a priori, in which propositions are at once prior to experience but

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4 J. W. von Goethe. *Wilhelm Meister's Apprenticeship*. Thomas Carlyle, trans. New York: Collier Books, 1962. p. 447.

5 For a useful discussion, see Robert J. Ackermann. *Data, Instruments, and Theory: A Dialectical Approach to Understanding Science*. Princeton: Princeton University Press, 1984.

6 G.W.F. Hegel. *Philosophy of Right*. T.M. Knox, trans., Oxford: Clarendon Press, 1952. p. 10. "Actual" translates *wirklich*, which relates etymologically to "working." One might almost translate Hegel as saying that the rational is effective and the effective is rational.

substantively informative about experience, make simple sense in the context of design. Categorical principles are prior to experience but informative about it because we can act with those principles to design the experience, to give it human form, substance, and significance.[7]

Through design for study, we will use our conception of study as intentional inquiry to shape the stuff of educational practice. We will not do that by pinioning study on the prongs of pedagogical objectives. Study occurs when students expand the apparent objectives with their own intentions. Study is something that students do; it happens when their intentions expand our objectives. Design for study will be a complement to instructional design, not an alternative to it. Educators can use instructional design to promote learning, but they can additionally design educational systems so that they will be responsive to study. As understanding of design for study develops, we will see that it serves as a significant resource in improving the cumulative *instructional* effectiveness of educational systems.

Through our definitions, we have identified two levels of study. One level we might call unconditional study. It is a level at which the student extends her horizon into hitherto unchartered possibilities, possibilities that not even the wisest mentor can then perceive. This is study as enshrined, say, in the Princeton Institute for Advanced Study. Educators cannot do much to provide directly for such study, except to furnish suitable opportunities, tools, and resources. All the same, the provision of such opportunities, tools, and resources makes a big difference to the person engaged in unconditional study. Furthermore, since conditional study, from the vantage of the person engaged in it, differs little from unconditional study, provision of such assistance proves to be the basic principle of design for study. Happily, however, mentors will find it easier to identify which opportunities, tools, and resources will be suitable for students engaged in conditional study.

Most often, study occurs conditionally. Here the student extends his horizon into possibilities that more accomplished mentors can plainly perceive. A teacher might define the outcome of conditional study clearly as an objective, but the student's achievements are such that he cannot yet firmly grasp it as such. Examples abound: all learning problems that turn on developmental discrepancies between the instruction offered and the readiness of pupils to absorb it. In such situations, which are frequent, a good educational system will provide both instruction and opportunities, tools, and resources for study. Provisions for study will complement programs of instruction. Indeed, we will show that good provisions for study will make instruction more effective by reducing the burden on instruction and by enhancing the students' readiness to learn.

Toward a Technology for Study

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7 Kant set the problem of synthetic *a priori* judgments in the introduction to the *Critique of Pure Reason*, Norman Kemp Smith, trans., New York: St. Martin's Press, 1965, pp. 41-62.

How should educators design provisions for study? What opportunities, tools, and resources should they develop? When studying, the student follows her intentions. Let us look again at the five modes of intention introduced above -- recognition, production, control, selection, and commitment. Each of these modes of intention correlates with types of knowledge and thinking. Good design for study will clarify what these are and then ensure that a rich selection of them surrounds the student.

Materials for Recognition

To begin, therefore, we need to provide students with opportunities, tools, and resources for spontaneously exercising their powers of recognition. How do we do this? We need to provide a rich surrounding of conceptual definitions and examples along with fields of activity where they are in significant use. The problem here is to create a cultural environment that will promote concept formation by students. The world confronts people with a flux of appearances, a buzzing cacophony of sounds, an ever-changing sequence of sensations. "Ah ha! Here is a thing, here is a word, here is a situation. I recognize it and I am beginning to understand how to use it." Recognition exploits the principle of permanence as Kant developed it in the first of his analogies of experience. We can reason about experience, whatever its sort, because we postulate that "in all change of appearances substance is permanent," some thing is there through changing states about which we can think.[8] Seeing that stability, that permanence of substance, the student recognizes it.

Recognition closely links to production and control, but for the moment let us concentrate on it alone. People can be instructed to recognize many things, to know the definitions of many words and concepts. But they can also generate the recognition through study. Powers of recognition acquired through instruction alone are powers liable to the limitations of rote learning, knowing definitions and when they apply without genuine recognition of their meaning. Learning without study will often culminate in a lamed mastery of material. There is an inwardness to recognition that makes it hard to discuss. What happens when the student suddenly sees a face or understand a word? Perhaps she suddenly recognizes it as a permanence, a stability, that has a place in her capacity for intentional life.

Let us leave this intriguing question. Here are some things that might be done to create an environment of study conducive to the recognition of objects and concepts. Design is, happily, an empirical endeavor that starts with practical postulates based on partial understanding and then leads through trial and reflection to strengthened understanding and to improved postulates. First off, make sure that the student's work environment has many potential objects of recognition in it. Present these clearly; exemplify them well; use them consistently. Be honest that many matters carry with them problems of recognition that need to be surmounted. It may be better to explain the difficulties of recognition that a student faces than to try to engender a premature recognition.

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8 Kant, *Critique of Pure Reason*. p. 212.

Note how certain books for infants center on the problem of recognition, presenting sample objects for tactile recognition, a piece of satin for smooth, sandpaper for rough, and so on. Infants begin acquiring their culture through study; adults do not instruct but situate all sorts of chosen objects in the infant's universe. This same practice carries over into the nursery school and the first few grades where the good teacher fills the environment with invitations to discovery, to awareness, to the posing of that wonderful question, "What's that?" This practice recedes in the later grades largely because the objects that require recognition become increasingly numerous and increasingly abstract. Yet it is the principle embodied in Hirsch's ideas about cultural literacy.

I do not think that cultural literacy makes a good objective for instruction, but then I'm no Henry Higgins of the humanities. As objectives for instruction, the provided as resources for engendering cultural literacy by Hirsch and his colleagues will not work. For instance, a reader cannot really get my reference here to Henry Higgins by consulting the *Dictionary of Cultural Literacy*.[9] One really needs to cultural experience -- seeing *Pygmalion* or *My Fair Lady*, or reading Shaw's script. Then one can recognize the implications of a reference. Hirsch puts things the other way around, trying to distill the recognition, providing that in a capsule entry. Unfortunately, it leaves out what is significant in this context in this reference. Higgins believed in his power to effect positively the most thorough-going transformations by setting clear instructional objectives and pursuing them singlemindedly. The charm of the play turns on the primacy of his underlying humane intentions, that lead him on despite his arrogance and objective snobbery. Eliza takes responsibility for her own transformation. As a reference that a reader may recognize, "Henry Higgins"

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9 You can get a sense of the problem by consulting *The Dictionary of Cultural Literacy* to clarify my reference here.

> *Pygmalion* A play by George Bernard SHAW, about a professor, Henry Higgins, who trains a poor, uneducated girl, Eliza Doolittle, to act and speak like a lady. Shaw based his story on a tale from Greek MYTHOLOGY about a sculptor who carves the statue of a woman and falls in love with it (*see* PYGMALION *under "Mythology and Folklore"*). Higgins and Eliza develop a strong bond, and he is furious when she announces her intention to marry someone else.
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> * The MUSICAL COMEDY MY FAIR LADY is an adaptation of *Pygmalion*.
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> E.D. Hirsch, Jr., Joseph F. Kett, and James Trefil. *The Dictionary of Cultural Literacy*. p. 130.
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> *My Fair Lady* An American stage MUSICAL of 1956, with words by Alan Jay Lerner and music by Frederick Loewe. *My Fair Lady* is based on the play PYGMALION, by George Bernard SHAW, about a professor in ENGLAND who teaches a low-born flower girl how to speak and act like the nobility. The songs "On the Street Where You Live" and "I Could Have Danced All Night" come from *My Fair Lady*.
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> E.D.. Hirsch, Jr., Joseph F. Kett, and James Trefil. *The Dictionary of Cultural Literacy*. p. 175.

The *Dictionary* doesn't really help identify Higgins as representative of the positivistic belief that everything can be reduced to instruction.

has, in the context of this essay, much to communicate, about both the substance of the argument and the tone I wish to evoke.

Experience precedes consciousness. Having students experience endless distillations of complex cultural works will not evoke cultural literacy. Students need an ever-widening range of cultural experience, direct contact with the works, undistilled, unexplained, mystifying and mystical. To this experience, they will respond bored, to another boorish, to many confused, to some wondering and enthusiastic, enchanted, star-struck, angry, sad, embarrassed, determined, and who-knows-how. What is important for the student's efforts to build her powers of recognition is less the immediate response, but her filling her coffers of experience, for the moment when something significant comes into her field of awareness and she can grasp it -- "Ah ha! I recognize what this means, how I can use it, where it fits. I see now."

Educational technology has great promise as a means to broaden access to the numerous, intense, diverse cultural experiences that people can use to recognize their world and their possibilities. Here I speak of educational technology in the broad sense, as the system of systems that people are developing through the current and the coming century. We face innumerable issues in extending this system of systems in such a way that it maximize people's access to materials of educative value to them. Suffice it here to lay down as the first of our formal design principles for supporting study with educational technology in formal educational settings.

> Design the system so it offers students a continual flow of new cultural experiences. The school, its classrooms, and especially its educational technologies should be a spectacular picture window on the world. Do not structure access to all these sources as a formal part of the program of instruction. Keep it free of objectives, free of assessment. Provide it as an opportunity for study, a resource for recognition.

Make no mistake; this design principle will not be easy to implement. But let us not trouble ourselves over the difficulties here -- they are the sort of difficulties it would be nice to have. Let us turn instead to the next principle of design for study.

Causal Alignment

Think of an everyday mechanism, a pair of scissors, a bicycle, an eggbeater, what-have-you. The proper alignment of its parts largely determines how well it performs. If the screw holding the blades of the scissors together is loose, the blades will not align smooth and flat to each other and the scissors will make a short and crooked cut. With causal production systems, good alignment is essential. This holds true for the intentional pursuit of possibilities in study: the means to cultural production should align well.

Production lends itself to instruction. Pull this; push that; rub it smooth; put the gear wheel on the axle; tighten the screw; label it; heat the wire then apply the solder.... Hence a lot of schooling involves instruction in how to do things. The pupil learns how to read and write, how to do basic mathematics, how to think critically, how to keep informed about public affairs. As alignment is

important in the everyday mechanism, so it is equally important in the instruction about causal processes. It is not too hard to teach production skills, but if the skills taught do not align well with the skills used, the effort is largely a waste.

Alignment of skills determines largely whether instruction for production will be useful. For production to become a domain of study, one in which the inquirer's intentions control the process, the means of production need even more to align effectively. Mastery of production culminates in a "Look! Ma!" experience, which differs significantly from the "Ah, ha!" experience of recognition, or the "I got it!" experience characteristic of control. We validate both of these inwardly, through what Polyani called "personal knowledge." Mastery of causal processes culminates in a demonstration to the external world, a first, a best, one for the record books. "Look, Ma!" is an appeal to the significant other for approval. Insofar as skills imparted through instruction do not align well, level to level, students will have great difficulty taking over and pursuing them according to their own intentions, for they will not find much by way of an arena of external validation.

Take a simple case, fairly late in education, where generally we would judge that the system works reasonably well. Students in the later years of college and in graduate school incessantly engage in production, writing papers for course after course. Usually, however, all this production thoroughly misaligns with the production processes of advanced scholarship. Functions, conventions, and standards derive from the grading system, not the system for advancing knowledge and understanding. Students write cautiously, *for their instructors*, who receive the mass of work as a gigantic chore, plowing through it knowing they will learn little from it. If writing were well aligned to the full academic production process, at this level publication would be the indicator of excellence. Students wouldwrite less and revise more; they would venture an ascending spiral of projects that carry their efforts to the threshold of creative production -- "Look, world! Here's what I've made!" The system does not align in this way, however.

Note that the case is different on the gridiron. From high-school through college, football aligns well with its professional version. Scouting talent can begin early. The better talents win scholarships to the most intensive programs where they get excellent coaching. But the whole system aligns well enough that the pros easily recruit excellent prospects from small schools in out-of-the-way places. As production systems, sports align better across the levels of formal education than do academic disciplines. As a result, sports have been more Jeffersonian than the mind, a better channel upward for those gifted with unusual talent.

Many educators presume that aligning productive efforts by students with the production processes of the world-at-large miseducates. Sports smack of professionalism. Aligning learning with the work of the world is banausic, as Aristotle stigmatized it, banal, tainted by vocationalism, the trade school. This prejudice should be reexamined. Were a lack of alignment in production skills good educational strategy, professional education would never have developed. To begin making sense of this problem, we should distinguish between the

problem of alignment, per se, and that of the complexity of skills to be aligned. Aristotle's critique can be saved, while espousing the principle of alignment, by recognizing that in aligning skills one should preserve their range and complexity. Try assembling a mechanism of many parts, each fitting together at close tolerances. Almost always it would be easier to get the thing together by leaving out one or two parts -- all the others would then easily snap tight in place. That is not a good way to assemble the mechanism, of course, and the educator who attends to the alignment of skills must avoid such shortcuts.

Let us not, however, leave our example of the complex mechanism quite yet. Given the parts, properly tooled to the specifications of the mechanism's design, we cannot leave any out during assembly. But in every area of activity, a great deal of design effort goes toward simplifying and improving the set of parts required to perform a given function. Design efforts of this type are changing the sets of skills important to production in numerous fields. Information technologies simplify and integrate complicated and disparate production systems. Educators know too little about these changes.

Suffice it here by way of summary to advance the following propositions.

> In general, design the instructional system so the skills it imparts align well with the skills that have real use in spheres of activity in which students will engage throughout their lives. If the alignment between skills imparted through instruction and those of use in everyday activity is accurate, then students will be more able to develop such skills through intentional study, in addition to learning in response to instructional objectives. If the instructional system misaligns the skills it teaches and does not give students palpable evidence of worthwhile achievement, many will drop out and seek on their own to develop skills that they can validate in their immediate surroundings. If it aligns the skills well and introduces students early to tools of real use in powerful production systems, students will study those systems, building their growing mastery of them into productive places in social and economic life.

This problem of causal alignment within educational processes relates closely to that of control and we need to examine control to deal with the problem of alignment further.

Locus of Control

Here we can state the basic design principle right at the outset.

> To improve the opportunities for study, design the system so that students are at the locus of control for as many significant decisions about their educations as possible.

A worried buzz arises. Students will drop out; they will take the course of least resistance, or they will do other foolish things that make it necessary for us to exercise sound judgment on their behalf, for their own good, you know. After the buzz subsides, a more sage dissent will resound with weighty words: to put the student at the locus of control will be to misalign the system in the most radical way possible. In virtually all things the student must learn to live and

work displaced from the locus of control. Perhaps. We live and function within complex hierarchies of control. We cannot be at the locus of control with all of them. With those matters, therefore, we must learn to live and work displaced from the locus of control. Having to do that is our condition, not our purpose. We can better understand this condition by referring back to Kant.

As Kant suggested in discussing the analogies of experience, we can think about a phenomenon, either according to the principle of production or according to that of community. *Production* lets us examine something according to the principle of succession in time by using the law of causality. "All alterations take place in conformity with the law of the connection of cause and effect." Interpretation of phenomena according to this according to cause and effect will start at an arbitrary beginning. One cannot work back endlessly through the succession in time to some first cause. Instead, one must be content to start the causal sequence somewhere. *Community* lets us examine phenomena according to the principle of coexistence by using the law of reciprocity. "All substances, so far as they coexist, stand in thorough-going community, that is in mutual interaction." When we stand in coexistence with things and in thorough interaction with them, to exercise our will we must try to control the system of which we are a part. As one cannot, with production, go back to a first cause, one cannot, with community, encompass everything in a complete system. These are elements outside the system of control and if they threaten to destabalize it, people will try hard to find ways to bring them within the system.

Students of information have made great advances in understanding the dynamics of control within a given system. The locus of control at any time is the vantage from which a person can use information about the past and current conditions of the system, along with hopes and expectations about its future states, to alter its operations. We should properly speak, I think, of loci of control, for in most systems numerous people find that they have such a vantage from which they can exert partial control within the system. Only the megalomaniacal villains of Bond films believe they are at *the* locus of control. Locus of control should refer thus a partial, constrained condition, a subjective state, but a most important one nevertheless. A scandal of educational theory is the paucity of work that has made good use of the concept of control. As a result, within the confines of this paper, we cannot clarify important aspects of the matter. Yet we can make clear a fundamental point about control by addressing several matters briefly.

One of these matters is the tendency that educators have to pay more attention to issues of organizational control than to those of educational control. Complex organizations display numerous structures of control. Precisely what we mean by "being at the locus of control" differs significantly for a passenger in a 747, a voter in a presidential election, a shopper at the suburban mall, an assembly worker on the line, a CEO receiving a take-over bid, and so on. Educational organizations have their control structures, totems that students tend to be at the bottom of.

[[[technology empowering students' control of their education.]]]

Alienation -- displacement from locus of control

Stake -- interest in the outcome of control

Power -- degree to which the over-all outcome of control is determined from one's locus

Responsibility -- degree to which control can be destabalized from one's locus

Increment -- portion of the control process managed from one's locus

Blinkers -- a deficiency of information needed for control to be exercised.

Whereas production lends itself to instruction, control does not. We have defined instruction in such a way that causal sequences will most often be adduced as instances of it.

Selective Identification

[[[Design the system so that students will find they have the oppotunity to identify themselves by making characteristic patters of selection. New technologies as arenas for self-definition.]]]

Thresholds of Commitment

[[[Design the system so that approporiate thresholds of commitment confront students, neither non-existent nor overwhelming. Technology as a means to modulate the threshold.]]]

Conclusion

[[[At the outset, I suggested that epistemic definitions have their value because they enable us to know phenomena better than we could without them. To test the value of the definitions of study developed here, we should look for ways in which they may help us understand outstanding questions. I think they help explain two puzzling yet significant educational phenomena. These are the persistence of class differences in educational achievement, and differences between siblings in educational achievement.]]]

[[[Younger siblings generally do not achieve as well educationally as the first-born in their family. Why is this? I hypothesize that the older sibling unwittingly disrupts conditions for study in the surroundings of her younger sibling. Thus, even though instructional opportunities would remain constant between the older and younger sibling, the conditions for study would favor the first-born. Examples.]]]

[[[Even where instructional opportunities have been relatively well equalized, class differences tend to reproduce with the middle and upper class children out performing working class children. My hypothesis is that the middle-class environment spontaneously provides conditions for study -- there is a richer selection of cultural materials for recognition, better alignment of production systems, a higher chance that the child will be at the locus of control for significant aspects of life, more opportunity to select a positive self-identity, and more manageable thresholds of commitment. Although the objective

correlates of middle-class life provide better conditions of study, the disadvantages of the underclass can be overcome because the conditions of study are partly in the eyes of the beholder. Dreams and anger -- Martin Luther King and Malcolm X.]]]