sustainability

MDPI

Article

Contextualizing Sustainable Development Metric Standards: Imagining New Entrepreneurial Possibilities

William P. Fisher, Jr.

BEAR Center, Graduate School of Education, University of California, Berkeley, CA 94704, USA; wfisher@berkeley.edu

Received: 15 September 2020; Accepted: 17 November 2020; Published: 19 November 2020

Abstract: Imagination is more important than knowledge, but if intellect does not provide the needed logical structures, capacities for envisioning new possibilities are overly constrained. The sustainability problems we face today cannot be solved with the same kind of thinking that created them, but clarity on what counts as a new kind of thinking is sorely lacking. This article proposes methodical, model-based ways of heeding Bateson's warning about the negative consequences for the ecology of mind that follow from ignoring the contexts of relationships. Informed by S. L. Star's sense of boundary objects, a sequence of increasingly complex logical types distinguishes and interconnects qualitatively different kinds of thinking in ways that liberate imaginative new possibilities for life. The economy of thought instantiated at each level of complexity is only as meaningful, useful, beautiful, ethical, and efficient as the standards informing local adaptive improvisations. Standards mediating the general and specific, global and local, universally transcendent and embodied particulars enable meaningful negotiations, agreements, and communications. Attending to the differences between levels of discourse sets up new possibilities for creative and imaginative entrepreneurial approaches to viable, feasible, and desirable goals for measuring and managing sustainable development.

Keywords: developmental theory; hierarchical complexity; modeling; measurement; imagination

1. Introduction

Einstein made a number of often-repeated remarks that provoke thoughtful responses [1]. He [2] famously spoke to the higher value imagination has relative to knowledge, referring to himself as enough of an artist to draw freely from a visionary wealth of possibilities. He also said that "The whole of science is nothing more than a refinement of everyday thinking" [3] (p. 290), and "A new type of thinking is essential if mankind is to survive and move toward higher levels" [4]. Combined, these comments lead one to wonder how previously inaccessible imaginative realms might be opened up by new ways of thinking refined from everyday thinking. This problem becomes especially salient when further constrained by a requirement demanding that the newly accessible imaginative possibilities be both globally distributed and individually tailored.

A step in this direction was suggested when, exploring possibilities suggested by Einstein's call for new kinds of thinking, Laininen [5] (pp. 168–171) distinguished three levels of learning, following Bateson. The goal in identifying the levels of learning and respecting their limits is to avoid the epistemological mistake Bateson [6] contends is commonly made in the modern worldview:

> "When you separate mind from the structure in which it is immanent, such as human relationship, the human society, or the ecosystem, you thereby embark, I believe, on fundamental error, which in the end will surely hurt you." (p. 490)

This error has played the starring role in creating today's problems of sustainability. It produces a complex form of pain that has proven extraordinarily difficult to diagnose and treat. It has so effectively eluded general understanding that every proposed solution seems only to become a part of the problem. Understanding how to systemically reconnect mental operations with their contextual structures in the routines of everyday life, with the effect of methodically avoiding the basic mistake, would be a signal event in defining new ways of thinking.

A careful and detailed exposition of the nature of the problem is essential to formulating plans for sustainable development that offer any hope for successful responses to the urgent demands of the day. In the contemporary context of complex global interdependencies, human suffering, social discontent, and environmental degradation seem almost literally mercurial: every effort to grasp them results only in their further splitting into yet more chaotic variations on the theme. This article lays out some of the issues involved in engaging effectively with this hermeneutic quality (Hermes being the Greek antecedent to the Roman Mercury) of reflexive and recursive phenomena.

After closely examining the nature of the kind of thinking causing today's sustainability problems, a path to new thinking is extrapolated from within the form of existing everyday thinking. Then, far from asserting only a new binary opposition between new and old, good and bad, correct and incorrect, the process by which cognitive development evolves is generalized into a sequence of increasingly complex ways of thinking. This hierarchical structure is not new in itself, but has instead been extensively documented and studied in developmental psychology for decades. Individuals all experience changes in the way they think over the course of their lifetimes; the goal here is only to adopt and adapt the form of these changes to the need for new systematic kinds of thinking in society at large.

Finally, a general example of how a social form of life methodically evolves across levels of complexity is described. Reasonable expectations are projected for the emergence and consequences of new thinking that coherently harmonizes relationships without limiting them to a single predefined tuning system. The original contribution made in this article is a synthesis of well-established but never before integrated ideas and methods concerning the form and function of the kinds of new thinking needed to solve problems created by existing thinking. This initial sketch must, of course, be far more extensively elaborated, explained, investigated, and demonstrated in a broad range of studies across the full range of fields. If it succeeds, this article will be nothing more than the planting of a seed containing the viral germ of imaginative new solutions to problems that cannot be solved with the kind of thinking that created them.

2. Background: The Biggest Challenge is Understanding the Complexity of the Problem

Upon making the point as to the danger involved in separating mind from the contexts in which it is immanent, Laininen then contrasts Sterling's [7] postmodern perspective on ecological interdependencies against the modern worldview's decontextual separations. Sterling's postmodern sense of transformational learning proceeds, however, on the basis of the self-contradictory assumption that learning takes place within the minds of separate, decontextualized individuals. Laininen and Sterling each focus on the integration of perspectives and parts into larger wholes, but they do not conceptualize or articulate how mind and mental operations are pragmatically, systemically, and operationally situated in the immanent structures of real and lived educational relationships, societies, and ecosystems. That is, the scaffolding of external cognitive supports for shared thinking (alphabets, grammars, dictionaries, semantics, the SI Units, and other standards) always remains in the background as an unstated assumption, never becoming an object of operations.

Edwards [8] also quotes Einstein on the need for new thinking in the sustainability context. Like Laininen and Sterling, Edwards also takes up a multilevel learning perspective, but augments it with an explicit developmental theory. Laininen and Sterling assume, contrary to the recommendation from Bateson they espouse, the kind of methodological perspective characterized by Hegel as "external reflection" [9,10]. This presupposition of an outside-in, top-down, command-and-control,

subject–object dualism is at the heart of the complex problems of sustainability. Edwards aims higher, articulating aspirations of a fuller integration of thinking and being, of mind and the relationships it is involved in, but does not specify a tangible methodology.

Hegel, however, offers an alternative sense of method that embodies the goal of being the intended change As stated by Gadamer [11] (p. 11), [9] (p. 474), authentic method is the activity of the things themselves experienced in thought. Here, language is the vehicle of thinking [12] (p. 329). Hegel's distinctive logic and sense of method provides "the crucial intellectual tool that can help us weave the elusive stories of our own present" [10] (p. 4). Method, for Hegel, accordingly is concerned with the ways in which thinking is structurally mediated in relationships embedded in and embodied by the distributed external scaffolding of technologies like alphabets, vocabularies, grammars, number systems, books, clocks, thermometers, unit standards, etc. This kind of perspective on language as the medium of thought can be seen as implicated in the works of philosophers taking markedly different positions, from the explicitly modern and positivist [13–15] to the explicitly postmodern and antipositivist [16] (p. 62), [9,12].

But the clearest definition and focus in this area is obtained via an unmodern, or amodern, perspective [17–19]. Latour [20,21], in particular, provides an amodern ecologizing perspective that effectively takes up Hegel's sense of method and Bateson's sense of not disconnecting mind from the structure in which it is immanent. Hegel points the way with a method and logic that approach

> "Change and transformation in their dynamic flux not by fixating movement in abstract static descriptions but by performing movement itself. By bringing change to bear directly on pure thinking, by making thinking one with the movement it accounts for, Hegel's logic does the very thing that it purports to understand." [10] (p. 5)

The goal here can be seen, then, as a contribution to a frame of reference for methodically conceptualizing, planning, executing, and benefitting from new possibilities for creatively imagining solutions to ever-more urgent demands for sustainable development. Current efforts are stymied and stonewalled by the way they struggle to solve problems using methods that themselves are inherently part of the difficulties being encountered. This is akin to the counterintuitive constraints of a Chinese finger puzzle—the harder we fight to free ourselves, the more enmeshed in the problems we become.

Entrapment in the modern and postmodern presuppositions of dualistic method, Hegel's "external reflection", and the "fundamental error" of decontextualization pointed at by Bateson define the crux of the problem. Every effort at initiating new sustainable solutions seem inevitably to assume no methodological options exist except modernizing ones. But actual demonstrations of respect for and valuation of ecological principles cannot be realized without instantiating them in lived processes embodying the desired change.

Ecologizing instead of modernizing proceeds by means of methods connecting thinking and being. Mental processes must not be separated from the external relationships in which they are embedded. On the one hand, this is commonly experienced in communication, as any language situates everyone sharing a fluent understanding of it within a community's system of relationships. On the other hand, communication can be compromised by breaks that disconnect local meanings from the larger context. Sometimes this is a normal situation of a local dialect or a technical jargon that characterizes typical kinds of variation in language. But right here in this normalization of special terminologies is the place where we can locate a source of what makes getting a methodical grip on sustainability problems so difficult. *What is of most intense concern are those instances in which disconnection is taken for granted as the norm, where the separation of words from the relational environment has been systematically incorporated into educational, government, market, and other institutions.*

With regard to sustainable development, the primary example of such methodical disconnection involves the number words adopted for use as metrics. We manage what we measure, so if our measures are not intimately integrated with the cognitive and social ecosystems we are trying to manage, all is lost. Everyone is well aware that the various scores and percentages treated as measurements in the

context of sustainable development mean something different depending on the contingent factors involved in any given situation. Everyone nonetheless proceeds with interpreting and analyzing these numbers as though they are meaningful, assuming mistakenly there is no alternative. The purpose of this article is to explain and demonstrate the larger structural context of alternatives, enacting the mind set and attitude needed for methodically accessing, imagining, and following through with them.

For a specific example of what it means for method to itself embody the activity of things themselves experienced in thought, consider formative assessment in education. Though the formative integration of assessment and instruction, like any method, can be used in ways imposing conformity and control, its strengths lie in facilitating diversely individualized student engagements with learning [22,23]. Effectively realizing this integration of language and the world, of what is measured and what is managed, demands the open architecture of mathematical models positing the heuristic fiction of infinite populations of unique individual persons, organizations, communities, challenges, indicators, and tools that project shared collective social forms of life at higher-order levels of complexity.

Assessment becomes formative when it is not just of learning, but for and as learning [24]. Educational assessments measure learning outcomes by means of instruments calibrated on the basis of invariant patterns in the likelihoods of correct responses observed across samples of persons and items. Consistent, reproducible, and predictable variation in the difficulty of responding correctly to questions delineates a continuum of increasingly challenging tasks termed a learning progression [25].

This continuum becomes the medium on which student learning is documented and facilitated in relation to the desired outcomes. Immediate feedback provides the student and teacher with clear indications of where the student is located on the learning progression in relation to the desired outcome, along with evidence of special strengths and weaknesses. Formative assessment is an instance of Hegel's logic of method because in it the movement of thought through the process of learning is documented in the structural invariance of the item difficulties, and this active, embodied union of thing and thought is then taken as the medium for instructional planning. A more detailed elaboration of the Hegelian sense of method in the context of this approach to measurement is available [26].

Developmentally, the problem is one of structuring the cultural environment with knowledge technologies supporting more complex, higher order thinking [27]. In the terms of institutional economics, the problem is one of extending the infrastructure of prosperity: scientific rationality, capital markets, property rights, and communications [28–30]. Historical precedents for this kind of evolutionary leap can be found in the simultaneous emergence of democracy, philosophy, and geometry in ancient Greece, and in the similar political, scientific, and economic revolutions occurring in the late 18th and early 19th centuries in Europe and North America. In these later events, the introduction of metrological standards was intimately implicated in public demands for fair trade practices, the introduction of new monetary currencies, and in the emergence of new forms of communication and levels of productivity in science [31,32].

These kinds of dialectically coproduced and analogously structured forms of social organization have historically emerged spontaneously, seemingly of their own accord, though they were of course enacted by agents seeking to fulfill their own interests [33]. But today, deliberately cultivating coordinated and aligned collective processes exhibiting this kind of spontaneous self-organization on broad scales requires new kinds of thinking, new temperaments, and new skills. The complexity of the task is magnified by the need to reconcile and integrate general universality with individual specificity. Autocratically imposed standards could make a sustainable society more easily controlled, but would come at the expense of personal freedoms that have come to be taken for granted as inviolable.

Scott [34] reviews the multiple failings in the history of modernist efforts to resolve this tension and improve the human condition. He concludes with the suggestion that taking language as a model may provide an as-yet untried alternative way of thinking about and designing solutions to the seemingly intractable opposition of the individual and society. Language, as Scott says, provides "a structure of meaning and continuity that is never still and ever open to the improvisations of its speakers" [34]

(p. 357). Scott is suggesting that the nature of language is an example of ways in which institutions could be made fluidly adaptable to local situations at the same time they retain a coherent structural form.

This same point is emphasized in social studies of science focused on boundary objects, and how some technologies simultaneously satisfy "the competing requirements of openness and malleability, coupled with structure and navigability" [35] (p. 132). Shortly after citing Scott's 1998 book, Jasanoff states that a "better balance needs to be struck between the theoretical poles of abstract idealism and deterministic materialism" [36] (pp. 31–32). As Galison [37] (p. 49) puts the matter at the conclusion of his extended ethnographic study of experimentalist, instrumentalist, and theoretical communities of physicists:

> "It seems to be a part of our general linguistic ability to set broader meanings aside while regularizing different lexical, syntactic, and phonological elements to serve a local communicative function. So too does it seem in the assembly of meanings, practices, and theories within physics."

The deep connection between language and technical standards is then of pointed relevance: "The development from the spoken language . . . through symbols and pictograms . . . to what we now understand as written language is a perfect standardization process" [38] (p. 11). Language itself is the prototype of all technical standards, and, conversely, " . . . the fundamental concepts of measurement can be extended to embrace any homomorphic representation by a symbol system" [39] (p. 223). Like language, metrological standards are structured in ways that allow them to be maintained even while they change. In addition, words and tools instrumentally deploying linguistic and metrological standards embody capacities for mediating the formal universals of ideals, concepts, and theories with the concrete realities of things and data.

Standardized words and instruments are media that embed relational structures across situations, solving the problems of relativism and universal transcendence at the same time [40] (pp. 439–440) [41]. "Practices of translation, replication, and metrology have taken the place of the universality that used to be assumed as an attribute of singular science" [42] (p. 35). Though we must reject Latour's [43] (pp. 228–229) claims as to the complete lack of uncertainty and discontinuities, and the full determination of costs, he correctly makes the point that:

> "Standards and metrology solve practically the question of relativity that seems to intimidate so many people: Can we obtain some sort of universal agreement? Of course we can! Provided you find a way to hook up your local instrument to one of the many metrological chains whose material network can be fully described, and whose cost can be fully determined. Provided there is also no interruption, no break, no gap, and no uncertainty along any point of the transmission. Indeed, traceability is precisely what the whole of metrology is about! No discontinuity allowed, which is just what ANT [Actor Network Theory] needs for tracing social topography. Ours is the social theory that has taken metrology as the paramount example of what it is to expand locally everywhere, all while bypassing the local as well as the universal. The practical conditions for the expansion of universality have been opened to empirical inquiries. It's not by accident that so much work has been done by historians of science into the situated and material extension of universals. Given how much modernizers have invested into universality, this is no small feat."

Language serves as the paradigmatic example of how a standardized communications medium distributed throughout a multilevel ecosystem embodies and embeds relationships between conceptual ideals and concrete things. References and representations are negotiated in the moment to accommodate locally situated individual needs. The unrealistic irrelevance of many aspects of the formally universal concept is ignored in favor of the immediate usage. The word disappears into its referent, such that even for something as everyday as a chair, the inapplicable aspects of many features of the composite ideal never come to bear.

The problem for methodically approaching sustainable development is how such mediating standards can be created and put to work, and how abstract media can be made adaptable to local circumstances while simultaneously connecting global communications. The remainder of this article will sketch out an initial map of the terrain that may prove useful in orienting thought and action. We will start by focusing on the general structure of the developmental sequence of increasingly complex contexts, and then will articulate an approach to sustainable development in that framework.

3. Materials and Methods: New Thinking Refined from Everyday Thinking

Difficulties in communication posed by the simultaneous presence of multiple levels of meaning in language have been a perennial topic of investigation for philosophers, logicians, anthropologists, and, more recently, theorists in the areas of complex adaptive systems, autopoiesis, organizational research, and knowledge infrastructures. The odd capacity for statements about statements to be meaningless even when they are grammatically correct (as in the viciously circular, "This statement is false") led Russell [14,44] (pp. 37–65) to develop a theory of logical types as a means of distinguishing levels of propositions. Bateson [6] (pp. 177–178) cites Russell along with Wittgenstein, Carnap, Whorf, and his own early work as examples of the need to avoid confusion by separating and balancing concrete denotative statements about observations, abstract metalinguistic statements about words, and formal metacommunicative statements about statements.

As Bateson explains, denotatively saying something about what is learned ("the cat is on the mat") is qualitatively discontinuous with a metalinguistic statement concerning learning about what was learned ("the word 'cat' cannot scratch"). Both of these, in turn, are classes separate from metacommunicative theories about learning ("my telling you where to find your cat was friendly"). Paradoxical sentences like "This statement is false" are possible because they mix an apparently denotative observation of fact with a metacommunicative self-referential statement about a statement.

Cross-level fallacies involve false generalizations from individual relations to an ecological level of collective group relations, or vice versa [45] (p. 79). Valid cross-level generalizations require the identification of isomorphic shared functional relationships existing in similar constructs across different levels [46] (p. 7). The importance of separating and balancing logical types has long been recognized and emphasized. "Every discussion should begin with an identification of the level of reference, and the discourse should not change to another level without a specific statement that this is occurring" [47] (p. 25). Star and Ruhleder [35] (p. 128) say "for systems that provide electronic support for computer-supported cooperative work, only those applications which simultaneously take into account both the formal, computational level and the informal, workplace/cultural level are successful." Subramanian, et al. [48] (p. 355) note that "Multilevel thinking, grounded in historical and spatiotemporal context, is thus a necessity, not an option."

The difficulty is one of perceiving and taking hold of a fundamental but implicit characteristic of the social environments in which we exist. Bateson [6] and others note that contextual frame shifts across levels of complexity are not usually made explicit in everyday discourse [49] (p. 326). Common usage simply moves words across levels without attending to the implicit shifts in meaning across frames.

Wittgenstein [50] (p. 88) was pointedly aware of how grammar itself rigidly sets up automatic and unquestioned associations, where "one thing somehow already is the other." Number words, for instance, are used for both concrete counts and abstract measures, causing a great deal of confusion between the very different concepts of number and quantity [51,52]. In grocery stores, produce sales are by weight because the abstract measure of quantity provides a fairer basis for trade than counts can, as these do not consistently express invariant amounts of constant value. But in other contexts, such as scores from tests or surveys, concrete counts are treated as abstract measures even though everyone knows that the meaning of the number words varies uncontrollably across instruments and samples. Thus, it happens that the epistemological error noted by Bateson as disconnecting mind from

the relational structures of its contexts not only can regularly occur, it has become embedded into the structures and processes of human cultural institutions.

Commons and Goodheart [27] expand on the problem. They point out that higher levels of cognitive operations are not best approached as matters of individual education, but can be made widely accessible to large portions of a society by embedding them in the tools and the structures of organizational environments. Measurement standards, for instance, are the products of cross-sector alliances systematically intended to reduce transaction costs as so support economies of scale. Economic growth, expanding markets, product innovations, and the emergence of the middle class were facilitated via legal, accounting, scientific, regulatory, financial, and other standards implemented across manufacturing, agricultural, managerial, accounting, and other working environments [53–55]. The creation and implementation of these standards across domains was not a function of individual insight, energy, creativity, and skills, contrary to the presumptions of what Hayek [56] termed the "fatal conceit:" the assumption that centralized design and control wins the day. Taking language as a model means systematically supporting higher level cognitive operations via socially distributed access to standards.

4. Results: Detailing the Hierarchical Structure of Increasing Complexity in Thought and Action

Developmentally, changes occur in the kind of thinking taking place when the hidden assumptions informing operations at one level themselves become the focal objects of operations [57–59]. Persons unable to function independently at higher order levels of complexity in thought are well able to make use of resources created at those higher orders, which contextualize and inform the lower levels. This cross-level simultaneous generality and specificity is characteristic of boundary objects, "which are both plastic enough to adapt to local needs and the constraints of several parties employing them, yet robust enough to maintain a common identity across sites" [60] (p. 392).

Figure 1 is adapted from Star and Griesemer's 1989 article [60] (p. 390), with acknowledged debts to previous work by Latour and others. The figure illustrates the structure of "the situated and material extension of universals" referred to by Latour [43] (p. 229). Levels of complexity in social organization and in conceptual development are implied by the alliances across domains facilitated by means of standards mediating interactions relative to formal ideals. These assemblages of concrete, abstract, and formal representations are themselves then contextualized at higher orders of systematic, metasystematic, paradigmatic, and cross-paradigmatic complexity, as shown in Table 1. Boundary objects of this kind will be essential to creating capacities for coherent communications across domains and complexity levels in new areas relating to sustainable development.

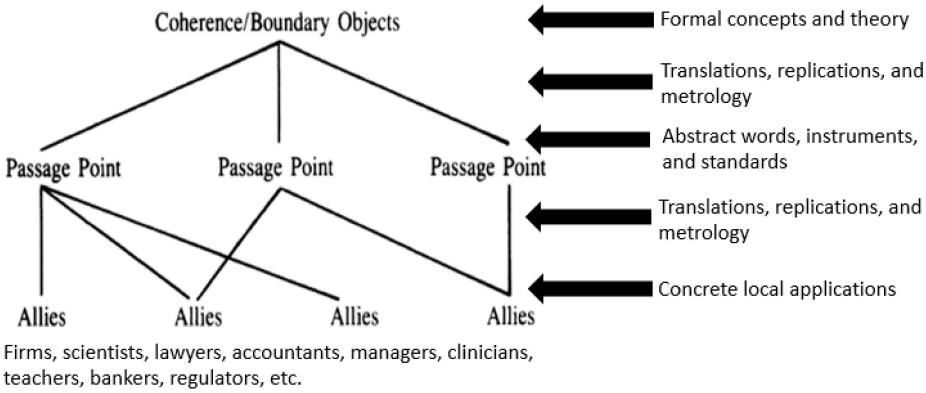

Figure 1. Networks of allies relative to obligatory passage points and boundary objects; adapted from [60].

For example, expanding on the measurement context, consider the various levels shown in Table 1, numbered from 8 to 14, following Commons [57] but omitting his lower seven levels. At the bottom rows in Figure 1 and Table 1, allies find that concrete data structured in the invariant patterns required

for measurement [61–70] inform an empirical calibration of an instrument gauged in abstract units, one level of complexity higher. The structural invariance of the interval unit across data sets qualitatively constitutes an abstract representation of varying local concrete observations. The instrument calibrated via this process can be used by persons who are unable to design and test it, as they lack the technical expertise represented at level nine in Table 1. They can, however, fairly easily learn to use the tool, as its primary function is to contextualize and simplify the use of the observations with which they are already familiar [71,72].

This technical level nine integration of abstract measuring units and concrete data use is followed by development of an explanatory model at level 10 successfully predicting the performances of the items included across varying instrument configurations [73–76]. Now a new formal level of validation and justification supports claims made on the basis of the data and its satisfaction of the requirements of measurement. Following Galison's [37] description of the various communities of physics researchers, in the same way that most end users of the tool at the concrete level have no interest in understanding its abstract calibration, so too are the instrumentalists relatively uninterested in the theoretical problems at the formal level.

With this intercalated periodization, as Galison [37] (p. 799) calls it, of formal, abstract, and concrete levels in hand, an array of equivalent instruments calibrated to a common metric and personalized for mass customization can be devised and deployed at the systematic level 11 (for example, see [24,77,78]. Participants in multiple systems of this kind of system may see that they are each dealing with the same construct in different terms. The synergistic potentials latent in the combination of their related but distinct purposes may motivate an entire industry, then, to metasystematically integrate their separate standards into a shared product definition at level 12. Finally, the same process might then also take place across industries and socioeconomic sectors, such that legal, financial, accounting, scientific, engineering, regulatory, product definition, and other standards are all aligned within the same paradigmatic level 13. The capacity to define this table and sustain these distinctions requires the level 14 cross-paradigmatic ability to contrast the existing level 13 paradigmatic organization of discourses against a new alternative integrating what has not yet been conceptualized at a yet higher order complexity.

Table 1 also includes the sustainable developmental learning levels described by Edwards [8] and the levels of citizen participation and empowerment cultivated by local governments [79]. The parallel sequence of transformations in sustainable behaviors could be supported and facilitated by means of the knowledge infrastructure providing the advanced levels of cognitive and social complexity needed for the integrative functioning sought. The structure of these levels implies a similar correspondence with the calibration hierarchy shown in Pendrill's [80] Figure 3.5, which proceeds from the greatest uncertainty at the bottom upward through working standards, control standards, secondary calibration laboratories, and national metrology institutes, to the SI Units (Systéme International d'Unités). Within this framework, measurement research programs focused on the production of new knowledge and its embodiment in the external scaffolding of standards can be designed with the intention of supporting the associated levels of sustainable development and citizen participation.

The methodical articulation of the activity of the thing itself experienced in thought is essentially a description of how individual subjective perspectives co-evolve in dialogue with each other and with the objectively reproducible measurement construct. In an article composed 2 years before he met Rasch, Wright [81] proposes that researchers should not seek to exclude their subjective perspectives from research, nor should they identify their subjective influences only to try to remove them from their methods or results.

Instead, Wright [81] suggests harnessing subjective experience to improve research in three ways, doing so first of all by means of "a special kind of inner act" involving the development, in educational research, of "a feeling for what moves the child" (p. 372). Such a feeling is suggested by the form of the learning progression documented in the results of formative assessments. Becoming attuned to children's experiences of learning by observing what they are good at and where they struggle is the

goal of acknowledging this subjectivity. Wright also suggests that, in addition to empathizing with the student, the researcher's subjective guesses as to the constitution of the object of research should be compared and contrasted with other researchers' subjective perspectives, and with the objectively reproducible evidence provided by the measured construct itself.

Wright's sense of the interplay of subjective feelings and objective evidence foreshadows more recent work calling for just such a "joint epistemic project" [82] (p. 293), with systematic acknowledgement of the role of subconscious bodily experience [83], and a sense of signification not reducible to subjectivity [84]. The dialogues of researchers' implicit subjectivities with themselves, each other, and the objects of investigation can be seen as unfolding across the levels of hierarchical complexity in Table 1. Throughout this process, the activity of the thing itself experienced in thought persistently asserts itself as an agent compelling recognition of its independent real existence, and is then transformed by the allied stakeholders' agreement as to that existence into a product of their agreement [43,85,86].

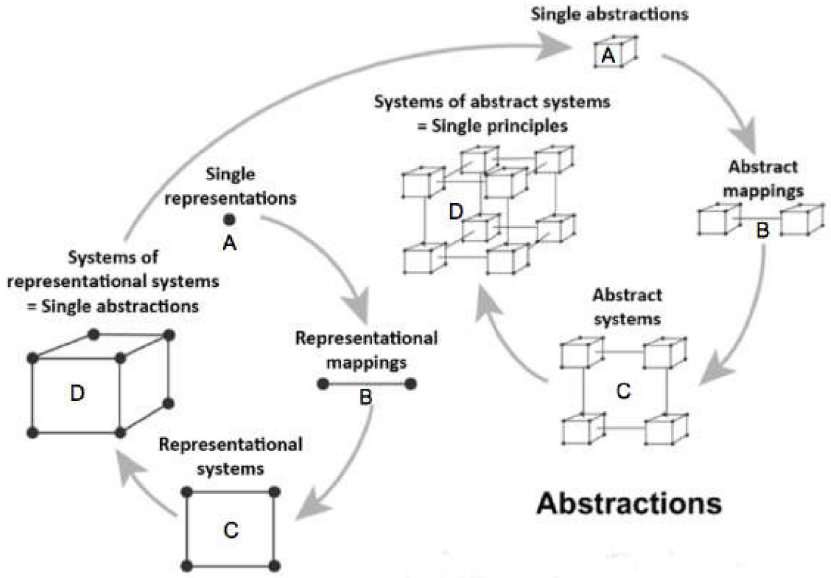

Figure 2. Fischer's Skill Theory [87,88] (p. 12), see https://dts.lectica.org/_about/hierarchical_complexity.php).

Table 1. Theoretical Sequence of Stakeholder Involvement Levels in Sustainable Development and Measurement.

Level	Hierarchical Complexity [57]	Skill Theory (see Figure 2) [87] [1]	Stages of Sustainability [8]	Approach to Sustainability Issues	Stakeholder Partnership and Empowerment [79]
14 [2]	Cross-Paradigmatic	Principle Systems		Leading edge innovator	Transformed inspires others
13	Paradigmatic	Principle Mappings	Sustaining II (Global and Local)	Model setting the pace	Empowered, assumes authority
12	Metasystematic	Single Principles (D)	Sustaining I (Local)	Exceeds requirements	Collaborates, contributes expertise
11	Systematic	Abstract Systems (C)	Committed	Diligent application to tasks	Involved, participates with direction
10	Formal	Abstract Mappings (B)	Efficient	Methodical integration of tasks	Consulted, gives feedback
9	Abstract	Single Abstractions (D/A)	Compliant	Conventional acceptance of need to attend to issues	Informed, accesses communications

Table 1. *Cont.*

Level	Hierarchical Complexity [57]	Skill Theory (see Figure 2) [87] [1]	Stages of Sustainability [8]	Approach to Sustainability Issues	Stakeholder Partnership and Empowerment [79]
8	Concrete	Representational Systems (C)	Avoidant	Burdensome imposition of avoidable costly tasks	Uninformed
Level	**Hierarchical Complexity [57]**	**Skill Theory (see Figure 2) [87] [1]**	**Generalizable comparability**	**Approach to measurement issues**	**Metrics Developmental Sequence**
14 [2]	Cross-Paradigmatic	Principle Systems	Evolutionary capacities for future planning	Nurturing ecosystems' emergent social forms of life	Open systems of informed inference
13	Paradigmatic	Principle Mappings	Global standards, background cultural assumptions	Public governance, universal education	Legislative, financial, economic laws and models
12	Metasystematic	Single Principles (D)	Industry-wide standards	Consensus standards processes	Competitive quality improvement
11	Systematic (Integrates data, instrument, theory)	Abstract Systems (C)	Within defined ecosystem	Metrological network alliances	Partnerships across stakeholder groups
10	Formal (Theory focused; integrates instrument and data)	Abstract Mappings (B)	Across studies using same method/scale/bank	Explanatory predictive theory	Interpretable sequence w/ unit/SE definition
9	Abstract (Instrument focused)	Single Abstractions (D/A)	Within individual studies	Logits, Rasch analysis	Interval units, SE, perhaps interpretable sequence
8	Concrete (Data focused)	Representational Systems (C)	Compromised even within individual studies	Counts, sum scores, descriptive statistics	Ordinal units, no SE, no interpretable sequence

[1] Levels 13 and 14 are not included in Figure 2. [2] Commons' numbering of the levels includes eight (0–7) typically experienced before the age of 8. SE: Standard Error.

5. Discussion: How the Mutual Implication of Subject and Object Unfolds across Levels

The progressive articulation of these products through the levels of hierarchical complexity creates the context for subjective, embodied experience at the levels below it. At each level, concrete experiences cohere in stochastic patterns that project an abstract mapping at the next level up. As will be laid out in detail, collectively crowd-sourced invariances observed in subjective experience coalesce into measured constructs that inform meaningful representations contextualizing communications. The external scaffolding of cognitive supports embedded in the environment prethinks the world, in the sense of making available the logical advance work that language has done, as Gadamer (pp. 429–430) puts it.

In Whitehead's [89] (p. 51) terms, which are echoed more recently by Commons and Goodheart [27], this externalized scaffolding advances civilization by extending the number of important operations that can be performed by persons unable, for reasons of time and resources as much as cognitive skill, to conduct those operations of thought for themselves. These qualitatively discontinuous order of magnitude differences in the intensity and depth of subjective experience become progressively more deeply embedded in language use with each increase in complexity. The multiple levels of nested contexts constitute tacit understanding, shared cultural presuppositions, and the way language seems to speak us more than we can intentionally control and manipulate it [9,90–93].

To illustrate the process, Figure 2 presents the sequence of integrations in the terms of Fischer's skill theory [87,88], which are structurally related to Commons' hierarchical complexity [57,58]. Figure 3 relates skill theory to hierarchical complexity and Star and Griesemer's [60] model of multilevel systems of stakeholder alliances, obligatory passage points, and boundary objects. Commons [57] utilizes Hegel's dialectical terms of negation and contradiction in describing the processes of transformation across levels, though he does not cite Hegel as a source. In total, 14 levels are described, but the process of evolving complexity is potentially infinite.

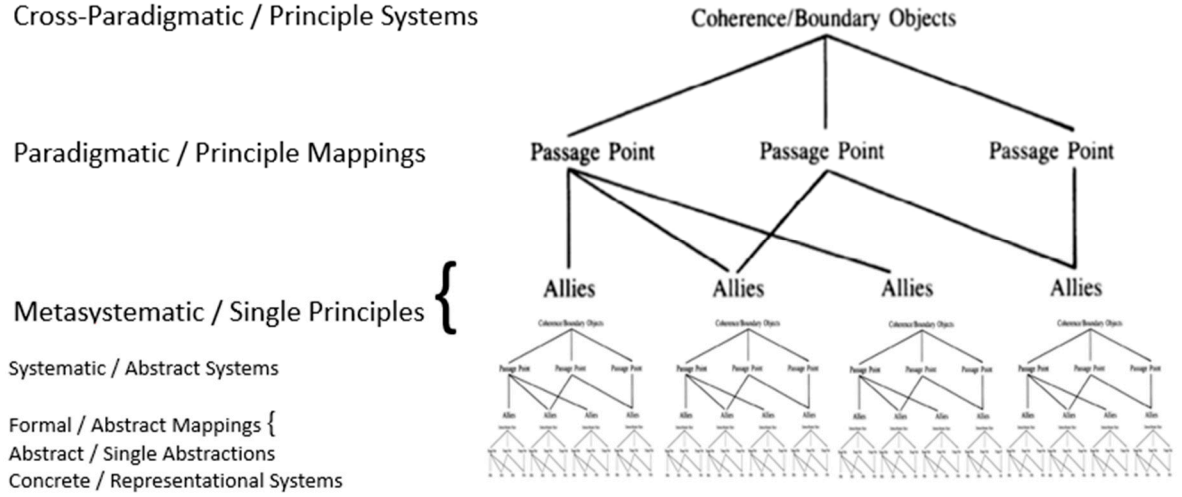

Figure 3. Hierarchical complexity and skill theory in relation to multilevel ecosystems of allies, obligatory passage points, and boundary objects.

The concrete level (8, the bottom row in Table 1 and in Figure 3) of representational systems is located in square C at the bottom left in Figure 2. Researchers' separate subjective experiences of the measured construct dominate and control its expression. Each independent approach to forming questions and scoring responses exists in a separate incommensurable universe. But the limited meaning available at concrete level 8 is possible only because of implicit assumptions concerning what abstract representations are and how they work. As the concrete forms are repeatedly manipulated, the potential for abstract representation is progressively articulated. The utility of functioning concretely at this level is negated in one way by the disconnected metrics' incommensurability. But more fundamentally, differences between researchers' subjective perspectives and potentially persistent and consistent assertions of the research participants' subjective experience of the measured construct, and by that construct itself, could be hidden from view.

A developmental leap and gestalt switch may occur in time, pushing into a new dimension in thinking at level 9, if and when researchers develop a feeling for what moves the research participants. Attending to that movement sets up a critique of the researcher's subjective perspective informed by the participants' perspectives, and the objective structural invariance of their responses to questions. In calibrating a tool useful to persons functioning cognitively at level 8, who do not understand the technical issues involved, the instrument and language embody the subjectivity of tacit and subconscious forms of collective knowledge. As it occurs at each transition between the levels of hierarchical complexity, what is accomplished here is a tangible instance of how technology embodies operations that can be performed without thinking about them. The level 9 creation of a cognitive scaffold in the external environment has accomplished a prethinking of the world and made it available for use by others in a more efficient, compact form than it was originally.

In Figure 2, the square plane of dots at C in the lower left expands into cube of dots at D, where systems of representational systems (single abstractions) take shape, marking the historical emergence of interval scaling models and methods. Dot cube D's single abstractions become the seed of a new cycle as small cube A in the upper right of Figure 2. Now comes a confrontation with

the redundant repetition and disconnection of multiple separately calibrated local instruments all measuring the same thing in different abstract units. Here, the value of the single abstractions is negated by the plethora of competing expressions of what are observably and demonstrably the same constructs. At level 9's single abstractions, the subjectivity of the researchers' perspectives on the constructs measured have continued to dominate its definition, though limited partnerships with the persistent consistency of the subjective experiences of the persons participating in the research, and with the construct itself, have been engaged.

This negation of the value of single abstractions provokes the emergence of abstract mappings (the linearly connected small cubes at the rightmost B in Figure 2). When coherent stochastic patterns abstracted from individual educational assessments, for instance, are compared similarities in the relative scale positions of items support the creation of banks of those items calibrated to a common unit [94–99]. These items are then selectively administered in parallel tests or in completely individualized tests, where items are chosen in computerized adaptive algorithms structured to target the ability of the examinee [64,100–103]. At this point, multiple independent researchers' subjective perspectives have been coordinated with those of the research participants and with the objectivity of the thing itself. The depth and density of subjective experience have then both been intensified, and a more thoroughly meaningful basis for shared communication has been embodied in a communicable representation.

Though the scope of outcome comparability is improved at this abstract mapping level (the B to the right in Figure 2), restrictions associated with the lack of explanatory theory were soon encountered. This occurred, for instance, in the results of the Anchor Test Study of reading comprehension in the 1970s [104,105]. An equating of seven major reading tests involving 350,000 students in all 50 U.S. states was obsolete as soon as it was finished because of changes to the test contents. The measured construct had not been modelled conceptually, but only empirically, so the implicit and unarticulated subjectivity of the researchers continued to exert an influential form of "external reflection". That is, though a massive collective expression of a carefully conducted dialogue between the subjective experience of reading comprehension and its empirical manifestation had been accomplished, the conceptual status of the object of the conversation was left undetermined.

The lack of theory created the unreasonable demand that new items could be calibrated only by means of time consuming and expensive empirical studies, leading to new research exploring explanatory models and automatic item generation [73–76,78]. Only with the completion of this level 10 work were the implicit abstract mappings hidden within the single abstractions of level nine articulated and acted on comprehensively. Now, the implicit assumptions as to how reading comprehension is a function of cognitive ability and text complexity are spelled out and made the objects of operations at a new level in the developmental hierarchy.

The terms of the collective subjective experience of reading empirically informing the reproducible objective invariances scaled in the assessments have here been spelled out at level 10's abstract mappings in formal, mathematical, and actionable theoretical terms. The density and intensity of concrete level 8 subjectivity is now compounded by the addition of another layer of contextualizing complexity. The boundary object has taken on a new dimension capable of augmenting the meaningfulness of the abstract level 9 instrument calibrations, within which are contextualized the level 9 observed responses. The consolidation of the formal theoretical level 10 (abstract mappings at the right of Figure 2B) sets the stage for a measurement science recognizable as such by metrologists [80,106–110]. In terms of the unfolding history, the stage was also now set for new challenges to be introduced by the next level of complexity's negations and contradictions.

The power of research validating an explanatory theory for reading comprehension met its contradictory negation in the 1980s and 1990s (Stenner, personal communications, 1985–2018) when testing agencies were uninterested in a common metric because children's book publishers did not express the difficulty of their texts in the metric, curriculum designers had not integrated the metric

into individualized instructional processes, and no school districts or state departments of education were reporting student measures in this unit. Each sector pointed at the others as needing to go first.

The negating challenge at this level concerned the fact that the subjective perspectives of multiple additional groups of potential allies had to be coordinated with those of the researchers and the research participants, in relation to the object of measurement. Finally, a publisher of both a reading curriculum and a reading assessment system got the ball rolling by adopting the metric for its products; others followed in due course [77,111,112].

This sequence of events describes the complex coordinations of social, financial, legal, and cognitive processes necessary for arriving at a level 11 systematic integration of formal theory, abstract instrumentation, and concrete data. What is accomplished via these processes is yet another instance of the way in which means for sharing subjective experience have been collectively organized and embodied in a portable, distributed communications technology. The socio-cognitive ecosystem of shared relationships has at this level attained new depth, breadth, and complexity in the way it simultaneously contextualizes shared subjective experience and has been structured by collective expressions of that experience.

The abstract systems square of cubes at C in Figure 2 stands for the integration of the consequences defining this level 11 of hierarchical complexity. At this point, a nascent metrological system has formed, but is restricted within the limits of a proprietary domain defined by pre-existing formal contractual agreements and obligations. The formal level of these agreements is stressed because they reside one level of complexity below the systematic level. The negation occurring at level 11 involves the contradictions involved in a privately owned and marketed product that is not a concretely unique and patentable form of art but which is actually a universally observable and documented structural feature of human linguistic capability. Any given reading assessment that actually measures the intended construct inherently must and does measure it in a unit linearly transformable into the proprietary unit. The unit itself is what is owned and controlled, as no one could purport to own and control the phenomenon of reading comprehension any more than anyone could claim sole title to the air. So how might this negation be resolved? Will it be possible to integrate the formal requirements of legal ownership with the products of systematically measured and managed human attributes?

These questions apply to any human quality measurable as an invariant quantity, not just reading comprehension. Transitioning from levels 11 to 12, from the systematic to the metasystematic, or from abstract systems to single principles (the square of cubes C to the cube of cubes D in Figure 2), will require creative new thinking across multiple domains. The complexity of the cross-sector quality assurance coordinations required for the level 11 systematic introduction of a metrological standard [80] for reading comprehension, or for any other new constructs, will be magnified by an order of magnitude in the transition to metasystematic level 12. Consensus standards will demand legislative initiatives and industry-wide negotiations, new accounting principles and methods, innovative economic models, scientific backing, and more, as whole new populations of subjective experience are brought into relation with the boundary object across ecosystem niches and levels.

Perhaps the primary contradictions encountered at this level involve a two-way function of costs. At level 12, marked efficiency improvements will follow simply from having, for the first time, valid precision measures expressed in common quantity values. The power of coordinating improvement efforts and quality management in common languages shared by everyone on the front line in education, health care, social services, and other areas will result in substantive outcome enhancements and cost reductions [24,113]. In the manner of the Toyota Production System's lean thinking and total quality management, brilliantly designed systems will enable superior results from typical people, where previous, poorly designed systems required brilliant people to produce mediocre results [114]. But as those returns diminish, the limits of the level 12 metasystematic integration of single principles will be reached and a new negation will emerge en route to a paradigmatic level 13 integration of principle mappings.

Huge investments will be needed to develop paradigm-defining precision measurement systems across the full range of the needed applications in education, human and natural resource management,

social services, health care, etc. These costs will be more than any one firm or industry can bear alone. Global societal-level resources will be required. In addition, increasingly painful social, human, and environmental costs will be incurred as a result of not being able to easily, efficiently, and universally coordinate and align the full range of sustainable development concerns that need to be managed.

But most importantly, widespread familiarity among individuals as to the now more tangible characteristics of their literacy, numeracy, health, social, and natural (environmental services) capital will convey a sense of ownership. The reliability with which people will see meaningful repetitions of patterns in their own and others' observations and measures will create a sense of responsibility for the outcomes produced in the work context. It will also create a sense of personal investment and value in association with the recognition of the returns generated from the application of one's skills and abilities in the relationships of one's life.

This problem has emerged in a preliminary form today in the form of the self-defeating inefficiencies of philanthropic capital markets [115], and more broadly in realizing the key economic role of property rights [28,116]. It comes into clearer focus, though, when social and environmental improvement projects are funded by philanthropists and nongovernmental service providers using social impact bonds, and the relationships of citizens to their governments are undercut by unelected and unaccountable organizations [117–119]. As development proceeds methodically through the levels of hierarchical complexity, awareness of the contradiction between the intended support for sustainable practices and the unsustainability of the political disenfranchisement will lead to the need for a new integration, shifting from the metasystematic level 12 to the paradigmatic level 13.

The level 13 integration required may likely then involve transforming the development costs into investments paying substantial returns. Just as linguistic standards are the media for the efficiencies obtained in the economy of thought [38,120,121], so, too, are measurement, product, regulatory, and other standards the media for the economic efficiencies of markets [54,55,122–124]. The returns on investments in improved precision obtained from metrological research are impressive and well-established [125,126].

Seen from this perspective, instead of bottomless pits of endless inflationary spirals and uncontrolled losses, externalities could become profit centers of authentic wealth aligned with financial gains. Profit ought to be defined and operationalized so as to genuinely fulfill its potential as value for life [127–131]. This transformation will follow the trajectory already experienced historically in the coordination of science, property rights, communications, and markets giving rise to the prosperity of the last 200 years [28,30].

Global systems, metasystems, and a relational ecological paradigm of individual-level measurement and property rights will be needed to substantiate ownership of shares in the collective stocks of human (literacy, numeracy, physical and mental health, trustworthiness), social (community, organizational), and natural (environmental services) capital [29,30,132,133]. Individual investments in self-improvement, and in the quality of local institutions and environments, are not currently accountable in the sense of being put on the books, with debits and credits tracked, and profits and losses reported. But this likely will be necessary, if humanity is to unleash the creative power of individual imaginations and energies as forces for innovatively addressing the problems of the day. Those sowing the seeds and cultivating the products of authentic prosperity certainly deserve to harvest their share in return. Providing the returns demands accounting for the investments.

6. Conclusions

The United Nations Resolution 70/1 "Transforming Our World: the 2030 Agenda for Sustainable Development" was unanimously adopted by the General Assembly in 2015. This 2030 Agenda, as it is known, sets out 17 Sustainability Development Goals (SDGs) in a comprehensive plan for sustainable prosperity, involving all people and the planet as a whole.

The SDGs specify where attention needs to be focused to counter today's unsustainable and incomplete economic practices. These practices stem from a too-exclusive focus on manufactured capital

and property, at the expense of the genuine wealth of fulfilled human potential, thriving communities, and environmental quality. Capitalism can be seen as an incomplete work in progress, where profits are disconnected from value creation and instead engage a linear process of resource usage and depletion. Income and expenditure reports do not account for all aspects and consequences of economic activities, production, and infrastructure. Unmeasured, unmanaged, and socially distributed returns on investment legally but immorally justify externalizing all possible human, social, and environmental costs. Worse, these externalizations are accomplished via methods that systematically crush the souls and lives of those involved.

Sustainable alternatives likely to move humanity toward a more complete expression of its positive potentials have to date, however, focused in largely unproductive ways on managing local situations, with no capacity for scaling up innovations, broadly coordinating efforts, rewarding innovators, or shifting the fundamental focus of the economic drivers at large. The SDGs themselves have been roundly criticized for their lack of clear lines of accountability and unenforceable provisions [134]. Calls for new thinking different from the kind of thinking that created today's problems, such as those offered by Laininen [5] and Edwards [8], among many others, so far have resulted only in changes to the content and not the form of thought.

The accomplishment of transformative goals requires fundamentally transformed thinking. No single shift in the qualitative structure of thought processes will be sufficient, as developmental theory shows, historically, the coordination and alignment of a sequence shifts. A model for proceeding exists in the horizontally distributed and vertically complex ecosystems incorporating multistakeholder information infrastructures that are already in place for manufactured capital and property. Interoperable sustainability mechanisms hinge on the metrological traceability of scientific units of measurement as a means by which financial, legal, entrepreneurial, etc. self-interests are coordinated to provide returns on investments to individuals and disseminate creative advances for the greater good. The formulation of the SDGs and the Agenda 2030 at the global level is solid evidence of the desire for sustainable change.

The opinion is sometimes expressed [135,136] that the people and leaders of the world lack the will to make the changes needed. What is argued here is that this assumption of a key role for force of will is precisely the problem. Willpower is irrelevant in a context lacking the systems of incentives and rewards capable of supporting and advancing the needed innovations. What are needed are contexts in which individuals inhabit and dwell within environments structured to support and inform imaginative innovations and entrepreneurial opportunities for sustainable development. Looking to individuals for leadership in making tough choices among competing expenditures in a zero-sum game completely misses the point. The problem, and the opportunity, is one of how to structure market, educational, and governance institutions to make sustainability an irresistible opportunity for fun and profit.

The people of the world are highly motivated but lack the means and opportunities for being the change they want to see happen. Hegel's sense of method, enacted systematically across a developmental sequence of increasingly complex embedded subjectivities, points the way. Evidence that this is the case is provided by Hawken [137], who, writing in 2007, described the global emergence of the largest mass movement of people in history, people searching for and personally investing themselves in devising solutions to the rampant problems of sustainable development. Human suffering, social discontent, and environmental degradation were then, as they still are, on an unstoppable juggernaut of ever-worsening conditions. Hawken worried that perhaps dictatorial control would become the only viable option for any kind of sustainable future. But he noted that the Austrian economist, Hayek, foresaw

> "A remedy for the basic expression of the totalitarian impulse: ensuring that information and the right to make decisions are co-located. To achieve this, one can either move the information to the decision makers, or move decision making rights to the information. The movement

> strives to do both. The earth's problems are everyone's problems, and what modern technology and the movement can achieve together is to distribute problem solving tools." [137] (pp. 21–22)

Hawken does not focus his attention on motivating people or on urging them to find the will to do what needs to be done. Instead, he focuses on distributing knowledge technologies to end users to help them make the right decisions of their own accord, without being coerced or acting out of a sense of moral duty. Doing this requires shaping the available information so as to align individual interests in self-advancement with the greater good. This is exactly what Hayek [56] was driving at. It is also what could conceivably be achieved by methodically keeping thinking connected with its larger relational contexts, following Hegel, Bateson, and others.

Moving the information to the decision makers is facilitated by existing social networks, but today's information quality is so low individuals become ever more disconnected from each other and from productive relationships in the larger world. Decontextualized and working in the dark, decision-making power is fatally compromised. Improving information quality and the effectiveness of individual decision-making power requires a new kind of thinking that is not complicit in creating the problems we face, but instead embodies in its simplicity the sophistication of a diverse array of untried potentials.

The result obtained by integrating the model of language's economy of thought with distinctions between levels of complexity is a nested hierarchy of contexts. What is sought is neither modern, nor postmodern, but unmodern. Where modernism homogenizes contexts in the name of formal conceptual universals, postmodernism localizes contexts in the name of concrete particulars. An unmodern recontextualization, in contrast, integrates formal theories and concrete particulars in the abstract standards of shared language. As an extension of everyday thinking and the existing economy of thought, unrealistic ideals and local lived reality are simultaneously embodied in terms whose specific meanings at that time and place are negotiated in dialogue at the point of use.

Engaging in the Hegelian methodological process of creating increasingly complex contexts for subjective experience is what is needed to make psychology and the social sciences fully scientific. Hegel's logic informs a rethinking of method that lives up to Latour's [83] (p. 217) call for a method in social science that "maximizes the recalcitrance" of the objects of study, "rendering talkative what was till then mute," and that meets the criteria of running the same risks as are encountered the natural sciences. By advancing methods integrating subjectivity with objectivity, and providing media for the propagation of meaningful construct representations across ecosystem niches, Wright substantiates his [66] (p. 44) claim that "Today there is no methodological reason why social science cannot become as stable, as reproducible, and hence as useful as physics." Ongoing investigations of Wright's assertion continue to add new support to his claim [106–112].

In the spirit of the saying, the more things change, the more they stay the same, a new kind of thinking rooted in existing everyday thinking could and should become the basis for creatively imagining new approaches to urgently needed sustainable development solutions. Given the pent-up demand in the world for viable paths forward, it may be that the hints suggested here as to possible structures and methods for guiding innovations will be taken up, refined, and applied in ways leading in positive directions.

Much more, of course, needs to be said and done to articulate and test these ideas. Ultimately, their validity and value will be determined not by any individual or group, and not even by humanity, but by their capacity to support life. The resonance of the multiple meanings of value [85] should become apparent as its various moral, social, numeric, financial, scientific, human, and aesthetic aspects come into clearer focus. Similarly, language prefigures the unfolding of our stories while also flexibly allowing us to figure in the present moment, and to refigure where we have been and what we see coming. This capacity for creating meaning as we go is essential to living out the variations on an invariant that comprise our identities as individuals and communities.

Not mentioned here but of equal, if not greater, importance (and in development) is an account of how beauty, joy, trust, and meaning come to bear in these hierarchical contexts of embodied

subjectivities extended via technology and language. Hegel's sense of joy as the capacity to recognize oneself in another is implicated in the methodical role of formative feedback in the coalescence of identity. As the reliable repetition of formative feedbacks supports confidence in the assessment media, the invariance of personalized patterns will resonate with the invariance of others' patterns. In contrast with today's incommensurable and incomparable failures of communication, and consequent feelings of alienation and fear, such commonalities will engender feelings of community, with dissonances contextualized in ways denoting creative and personal differences.

What is also of special interest is Diotoma's story in Plato's *Symposium* on the birth of Eros [138,139]. The offspring of the immortal god of wealth, Poros, and Penia, an impoverished mortal woman, Eros is suspended between the infinitely ideal and the concretely finite. No matter how full the possession of the beloved, desire remains, and no matter how great the distance from the beloved, the feeling of togetherness lingers. The mediating quality of desire for beauty teaches us how to understand meaning in language as simultaneously locally situated and globally communicable.

This erotic or pragmatic idealism informed Plato's distinction between name and concept at the birth of philosophy, as well as the Athenian conception of democracy, and the design of the Parthenon's unique pillars joined in common cause [140,141]. We have seen how boundary objects and the model of language could possibly structure new institutions methodically applying the lesson Eros offers to problems of sustainable development. "The path of love that Diotima teaches leads beyond beautiful bodies to beautiful souls, and from there to beautiful institutions, customs, and laws, and finally to the sciences" [9] (p. 478). Might there yet still be a basis for faith in human ingenuity and hope for a future inspired and powered by the energies of love [142] (p. 86)?

Funding: This research received no external funding.

Acknowledgments: The author would like to thank colleagues past and present for multiple conversations involving the issues explored in this article. All responsibility for the content of the article remains with the author, but grateful appreciation is extended to Benjamin Wright, A. Jackson Stenner, Theo Dawson, Mark Wilson, Leslie Pendrill, Angelica Lips da Cruz, Jeanette Melin, Robert Cavanagh, J. Michael Linacre, Donna Surges Tatum, Emily Pey-Tee Oon, Robert Massof, Matthew Barney and Jan Morrison for their input.

Conflicts of Interest: The author declares no conflict of interest.

References

1. Calaprice, A. (Ed.) *The New Quotable Einstein*; Princeton University: Princeton, NJ, USA, 2005.
2. Einstein, A. What life means to Einstein: An interview by George Sylvester Viereck. *Saturday Evening Post* **1929**, *202*, 17, 110–117. Available online: http://www.saturdayeveningpost.com/wp-content/uploads/satevepost/einstein.pdf (accessed on 18 November 2020).
3. Einstein, A. Physics and reality. In *Ideas and Opinions*; Seelig, C., Ed.; Bonanza Books: New York, NY, USA, 1936; pp. 290–323.
4. Einstein, A. Atomic Education Urged by Einstein. *New York Times*, 25 May 1946, p. 11. Available online: https://www.nytimes.com/1946/05/25/archives/atomic-education-urged-by-einstein-scientist-in-plea-for-200000-to.html (accessed on 24 November 2020).
5. Laininen, E. Transforming our worldview towards a sustainable future. In *Sustainability, Human Well-Being, and the Future of Education*; Cook, J.W., Ed.; Palgrave Macmillan: Cham, Switzerland, 2019; pp. 161–200.
6. Bateson, G. *Steps to an Ecology of Mind: Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology*; University of Chicago Press: Chicago, IL, USA, 1972.
7. Sterling, S. Transformative learning and sustainability: Sketching the conceptual ground. *Learn. Teach. High. Educ.* **2010**, *5*, 17–33.
8. Edwards, M.G. An integrative metatheory for organisational learning and sustainability in turbulent times. *Learn. Organ. Int. J.* **2009**, *16*, 189–207. [CrossRef]
9. Gadamer, H.-G. *Truth and Method*, 2nd ed.; Weinsheimer, J.; Marshall, D.G., Translators; Crossroad: New York, NY, USA, 1989.
10. Nuzzo, A. *Approaching Hegel's Logic, Obliquely: Melville, Moliere, Beckett*; SUNY Press: Albany, NY, USA, 2018.

11. Gadamer, H.-G. The idea of Hegel's Logic. In *Hegel's Dialectic: Five Hermeneutical Studies*; Smith, P.C., Ed.; Yale University Press: New Haven, CT, USA, 1976; pp. 75–99.
12. Wittgenstein, L. *Philosophical Investigations*; Anscombe, G.E.M., Translator; Macmillan: New York, NY, USA, 1953.
13. Mach, E. *The Science of Mechanics: A Critical and Historical Account of Its Development*, 4th ed.; McCormack, T.J., Translator; The Open Court Publishing Co.: Chicago, IL, USA, 1919.
14. Russell, B. Mathematical logic as based on the theory of types. *Am. J. Math.* **1908**, *30*, 222–262. [CrossRef]
15. Wittgenstein, L. *Tractatus Logico-Philosophicus*; Harcourt Brace: London, UK, 1922.
16. Derrida, J. Interview on writing. In *Critical Intellectuals on Writing*; Olson, G.A., Worsham, L., Eds.; State University of New York Press: Albany, NY, USA, 2003; pp. 61–69.
17. Dewey, J. *Unmodern Philosophy and Modern Philosophy*; Deen, P., Ed.; Southern Illinois University Press: Carbondale, IL, USA, 2012.
18. Latour, B. Postmodern? No, simply amodern: Steps towards an anthropology of science. *Stud. Hist. Philos. Sci.* **1990**, *21*, 145–171. [CrossRef]
19. Latour, B. *We have Never Been Modern*; Harvard University Press: Cambridge, MA, USA, 1993.
20. Latour, B. To modernize or to ecologize? That's the question. In *Remaking Reality: Nature at the Millennium*; Castree, N., Willems-Braun, B., Eds.; Routledge: New York, NY, USA, 1998; pp. 221–242.
21. Fisher, W.P., Jr.; Stenner, A.J. Ecologizing vs. modernizing in measurement and metrology. *J. Phys. Conf. Ser.* **2018**, *1044*, 012025. [CrossRef]
22. Duckor, B.; Holmberg, C. Exploring how to model formative assessment trajectories of posing-pausing-probing practices: Toward a teacher learning progressions framework for the study of novice teachers. *J. Educ. Meas.* **2019**, *56*, 836–890. [CrossRef]
23. Egelandsdal, K.; Riese, H. Never mind the gap: Formative assessment confronted with Dewey's and Gadamer's concept of experience. *Eur. J. Educ.* **2020**, *55*, 91–104. [CrossRef]
24. Fisher, W.P., Jr. Imagining education tailored to assessment as, for, and of learning: Theory, standards, and quality improvement. *Assess. Learn.* **2013**, *2*, 6–22.
25. Wilson, M.R. Measuring progressions: Assessment structures underlying a learning progression. *J. Res. Sci. Teach.* **2009**, *46*, 716–730. [CrossRef]
26. Fisher, W.P., Jr. Meaning and method in the social sciences. *Hum. Stud. J. Philos. Soc. Sci.* **2004**, *27*, 429–454.
27. Commons, M.L.; Goodheart, E.A. Cultural progress is the result of developmental level of support. *World Futures* **2008**, *64*, 406–415. [CrossRef]
28. Bernstein, W.J. *The Birth of Plenty: How the Prosperity of the Modern World Was Created*; McGraw-Hill: New York, NY, USA, 2004.
29. Fisher, W.P., Jr. Measure and manage: Intangible assets metric standards for sustainability. In *Business Administration Education: Changes in Management and Leadership Strategies*; Marques, J., Dhiman, S., Holt, S., Eds.; Palgrave Macmillan: New York, NY, USA, 2012; pp. 43–63.
30. Fisher, W.P., Jr. What the world needs now: A bold plan for new standards. *Stand. Eng.* **2012**, *64*, 1, 3–5.
31. Alder, K. *The Measure of All Things: The Seven-Year Odyssey and Hidden Error that Transformed the World*; The Free Press: New York, NY, USA, 2002.
32. Ashworth, W.J. Metrology and the state: Science, revenue, and commerce. *Science* **2004**, *306*, 1314–1317. [CrossRef] [PubMed]
33. Jasanoff, S. *States of Knowledge: The Co-Production of Science and Social Order*; International Library of Sociology; Routledge: New York, NY, USA, 2004.
34. Scott, J.C. *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*; Yale University Press: New Haven, CT, USA, 1998.
35. Star, S.L.; Ruhleder, K. Steps toward an ecology of infrastructure: Design and access for large information spaces. *Inf. Syst. Res.* **1996**, *7*, 111–134. [CrossRef]
36. Jasanoff, S. Future imperfect: Science, technology, and the imaginations of modernity. In *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*; Jasanoff, S., Kim, S.-H., Eds.; University of Chicago Press: Chicago, IL, USA, 2015; pp. 1–22.
37. Galison, P. *Image and Logic: A Material Culture of Microphysics*; University of Chicago Press: Chicago, IL, USA, 1997.
38. Weitzel, T. *Economics of Standards in Information Networks*; Physica-Verlag: New York, NY, USA, 2004.
39. Finkelstein, L. Representation by symbol systems as an extension of the concept of measurement. *Kybernetes* **1975**, *4*, 215–223. [CrossRef]

40. Haraway, D.J. *Modest witness: Feminist diffractions in science studies. The Disunity of Science: Boundaries, Contexts, and Power*; Galison, P., Stump, D.J., Eds.; Stanford University Press: Stanford, CA, USA, 1996; pp. 428–441.
41. O'Connell, J. Metrology: The creation of universality by the circulation of particulars. *Soc. Stud. Sci.* **1993**, *23*, 129–173. [CrossRef]
42. Golinski, J. Is it time to forget science? Reflections on singular science and its history. *Osiris* **2012**, *27*, 19–36. [CrossRef]
43. Latour, B. *Reassembling the Social: An Introduction to Actor-Network-Theory*; Clarendon Lectures in Management Studies; Oxford University Press: Oxford, UK, 2005.
44. Whitehead, A.N.; Russell, B. *Principia Mathematica*, 2nd ed.; Cambridge University Press: Cambridge, UK, 1925; Volume 3.
45. Alker, H.R. A typology of ecological fallacies. In *Quantitative Ecological Analysis in the Social Sciences*; Dogan, M., Rokkan, S., Eds.; MIT Press: Cambridge, MA, USA, 1969; pp. 69–86.
46. Rousseau, D.M. Issues of level in organizational research: Multi-level and cross-level perspectives. *Res. Organ. Behav.* **1985**, *7*, 1–37.
47. Miller, J.G. *Living Systems*; McGraw Hill: New York, NY, USA, 1978.
48. Subramanian, S.V.; Jones, K.; Kaddour, A.; Krieger, N. Revisiting Robinson: The perils of individualistic and ecologic fallacy. *Int. J. Epidemiol.* **2009**, *38*, 342–360. [CrossRef]
49. Maschler, Y. Metalanguaging and discourse markers in bilingual conversation. *Lang. Soc.* **1994**, *23*, 325–366. [CrossRef]
50. Wittgenstein, L. *Remarks on the Foundations of Mathematics*; Von Wright, G.H., Rhees, R., Anscombe, G.E.M., Eds.; Anscombe, G.E.M., Translator; MIT Press: Cambridge, MA, USA, 1983.
51. Bateson, G. Number is different from quantity. In *CoEvolution Quarterly*; 17 (Spring), 44–46 [Reprinted from pp. 53–58 in Bateson, G., 1979]; E. P. Dutton: New York, NY, USA, 1978.
52. Wright, B.D. Measuring and counting. *Rasch Meas. Trans.* **1994**, *8*, 371.
53. Chuah, S.-H.; Hoffman, R. *The Evolution of Measurement Standards*; Nottingham University Business School: Nottingham, UK, 2004; 11p.
54. Miller, P.; O'Leary, T. Mediating instruments and making markets: Capital budgeting, science and the economy. *Account. Organ. Soc.* **2007**, *32*, 701–734. [CrossRef]
55. Swann, G.M.P. *The Economics of Metrology and Measurement*; Report for the National Measurement Office and Department of Business, Innovation and Skills; Innovative Economics, Ltd.: London, UK, 2009.
56. Hayek, F.A. *The Fatal Conceit: The Errors of Socialism*; Bartley, W.W., III, Ed.; The Collected Works of Hayek, F.A.; University of Chicago Press: Chicago, IL, USA, 1988; Volume I.
57. Commons, M.L. Introduction to the model of hierarchical complexity and its relation to postformal structures. *World Futures* **2008**, *64*, 305–320. [CrossRef]
58. Dawson-Tunik, T.L.; Commons, M.; Wilson, M.; Fischer, K. The shape of development. *Eur. J. Dev. Psychol.* **2005**, *2*, 163–196. [CrossRef]
59. Fischer, K.W.; Farrar, M.J. Generalizations about generalization: How a theory of skill development explains both generality and specificity. *Int. J. Psychol.* **1987**, *22*, 643–677. [CrossRef]
60. Star, S.L.; Griesemer, J.R. Institutional ecology, 'translations,' and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Soc. Stud. Sci.* **1989**, *19*, 387–420. [CrossRef]
61. Rasch, G. *Probabilistic Models for Some Intelligence and Attainment Tests*; reprint, with Foreword and Afterword by Wright, B.D.; University of Chicago Press: Chicago, IL, USA, 1980; Danmarks Paedogogiske Institut: Copenhagen, Denmark, 1960.
62. Luce, R.D.; Tukey, J.W. Simultaneous conjoint measurement: A new kind of fundamental measurement. *J. Math. Psychol.* **1964**, *1*, 1–27. [CrossRef]
63. Wright, B.D. Sample-free test calibration and person measurement. In *Proceedings of the 1967 Invitational Conference on Testing Problems*; Educational Testing Service: Princeton, NJ, USA, 1968; pp. 85–101.
64. Wright, B.D. Solving measurement problems with the Rasch model. *J. Educ. Meas.* **1977**, *14*, 97–116. [CrossRef]
65. Fisher, W.P., Jr.; Wright, B.D. Introduction to probabilistic conjoint measurement theory and applications. *Int. J. Educ. Res.* **1994**, *21*, 559–568. [CrossRef]
66. Wright, B.D. A history of social science measurement. *Educ. Meas. Issues Pract.* **1997**, *16*, 33–45, 52. [CrossRef]
67. Wilson, M.R. *Constructing Measures: An Item Response Modeling Approach*; Lawrence Erlbaum Associates: Mahwah, NJ, USA, 2005.

68. Engelhard, G., Jr. *Invariant Measurement: Using Rasch Models in the Social, Behavioral, and Health Sciences*; Routledge Academic: New York, NY, USA, 2012.
69. Bond, T.; Fox, C. *Applying the Rasch Model: Fundamental Measurement in the Human Sciences*, 3rd ed.; Routledge: New York, NY, USA, 2015.
70. Andrich, D.; Marais, I. *A Course in Rasch Measurement Theory: Measuring in the Educational, Social, and Health Sciences*; Springer: Cham, Switzerland, 2019.
71. Chien, T.-W.; Linacre, J.M.; Wang, W.-C. Examining student ability using KIDMAP fit statistics of Rasch analysis in Excel. In *Communications in Computer and Information Science; Vol. 201, Advances in Information Technology and Education, CSE 2011 Qingdao, China Proceedings, Part I*; Tan, H., Zhou, M., Eds.; Springer: Berlin, Germany, 2011; pp. 578–585.
72. Wright, B.D.; Mead, R.J.; Ludlow, L.H. *KIDMAP: Person-By-Item Interaction Mapping*; MESA Memorandum #29; MESA Press: Chicago, IL, USA, 1980; p. 6. Available online: http://www.rasch.org/memo29.pdf (accessed on 18 November 2020).
73. Embretson, S.E. *Measuring Psychological Constructs: Advances in Model-Based Approaches*; American Psychological Association: Washington, DC, USA, 2010.
74. Fischer, G.H. The linear logistic test model as an instrument in educational research. *Acta Psychol.* **1973**, *37*, 359–374. [CrossRef]
75. Gierl, M.J.; Haladyna, T.M. *Automatic Item Generation: Theory and Practice*; Routledge: New York, NY, USA, 2012.
76. Stenner, A.J.; Smith, M., III. Testing construct theories. *Percept. Mot. Ski.* **1982**, *55*, 415–426. [CrossRef]
77. Fisher, W.P., Jr.; Stenner, A.J. Theory-based metrological traceability in education: A reading measurement network. *Measurement* **2016**, *92*, 489–496. [CrossRef] [PubMed]
78. Stenner, A.J.; Fisher, W.P., Jr.; Stone, M.H.; Burdick, D.S. Causal Rasch models. *Front. Psychol. Quant. Psychol. Meas.* **2013**, *4*, 536. [CrossRef]
79. Ortiz, D.; Huber-Heim, K. From information to empowerment: Teaching sustainable business development by enabling an experiential and participatory problem-solving process in the classroom. *Int. J. Manag. Educ.* **2017**, *15*, 318–331. [CrossRef]
80. Pendrill, L. *Quality Assured Measurement: Unification across Social and Physical Sciences*; Springer: Cham, Switzerland, 2019.
81. Wright, B.D. On behalf of a personal approach to learning. *Elem. Sch. J.* **1958**, *58*, 365–375, Reprinted in Psychological and Social Measurement: The Career and Contributions of Benjamin D. Wright; Wilson, M., Fisher, W.P., Jr., Eds.; Springer Nature: New York, NY, USA, 2017; pp. 221–232.. [CrossRef]
82. Galison, P. Image of self. In *Things that Talk: Object Lessons from Art and Science*; Daston, L., Ed.; Zone Books: New York, NY, USA, 2008; pp. 256–294.
83. Latour, B. How to talk about the body? The normative dimension of science studies. *Body Soc.* **2004**, *10*, 205–229. [CrossRef]
84. Ricoeur, P. The critique of subjectivity and cogito in the philosophy of Heidegger. In *Heidegger and the Quest for Truth*; Frings, M.S., Ed.; Quadrangle Books: Chicago, IL, USA, 1968; pp. 62–75.
85. Wise, M.N. (Ed.) *The Values of Precision*; Princeton University Press: Princeton, NJ, USA, 1995.
86. Latour, B. *Science in Action: How to Follow Scientists and Engineers through Society*; Harvard University Press: New York, NY, USA, 1987.
87. Fischer, K.W. A theory of cognitive development: The control and construction of hierarchies of skills. *Psychol. Rev.* **1980**, *87*, 477–531. [CrossRef]
88. Conning, A.S. How People Learn to Think Globally: Mapping and Measuring the Development of Internormative Cognition. Ph.D. Thesis, Graduate School of Education, Harvard University, Cambridge, MA, USA, 2018.
89. Whitehead, A.N. *An Introduction to Mathematics*; Henry Holt and Co.: New York, NY, USA, 1911.
90. Abram, D. *The Spell of the Sensuous: Perception and Language in a More-Than-Human World*; Vintage Books: New York, NY, USA, 1996.
91. Hall, W.P. Biological nature of knowledge in the learning organisation. *Learn. Organ.* **2005**, *12*, 169–188. [CrossRef]
92. Ihde, D. *Bodies in Technology*; Electronic Mediations; University of Minnesota Press: Minneapolis, MN, USA, 2002; Volume 5.

93. Polanyi, M. *The Tacit Dimension*; Doubleday & Co.: New York, NY, USA, 1966.
94. Wright, B.D.; Stone, M.H. *Best Test Design: Rasch Measurement*; MESA Press: Chicago, IL, USA, 1979.
95. Masters, G.N. *Rating Scale Analysis: Rasch Measurement*; MESA Press: Chicago, IL, USA, 1982.
96. Narens, L.; Luce, R.D. Measurement: The theory of numerical assignments. *Psychol. Bull.* **1986**, *99*, 166–180. [CrossRef]
97. Choppin, B. An item bank using sample-free calibration. *Nature* **1968**, *219*, 870–872. [CrossRef] [PubMed]
98. Recent developments in item banking. In *Advances in Psychological and Educational Measurement*; De Gruitjer, D.N.M.; Van der Kamp, L.J. (Eds.) Wiley: New York, NY, USA, 1976; pp. 233–245.
99. Wright, B.D.; Bell, S.R. Item banks: What, why, how. *J. Educ. Meas.* **1984**, *21*, 331–345. [CrossRef]
100. Barney, M.; Fisher, W.P., Jr. Adaptive measurement and assessment. *Annu. Rev. Organ. Psychol. Organ. Behav.* **2016**, *3*, 469–490. [CrossRef]
101. Bergstrom, B.A.; Lunz, M.E. CAT for certification and licensure. In *Innovations in Computerized Assessment*; Drasgow, F., Olson-Buchanan, J.B., Eds.; Lawrence Erlbaum Associates, Inc., Publishers: Mahwah, NJ, USA, 1999; pp. 67–91.
102. McArthur, D.L.; Choppin, B.H. Computerized diagnostic testing. *J. Educ. Meas.* **1984**, *21*, 391–397. [CrossRef]
103. Wright, B.D.; Douglas, G.A. *Best Test Design and Self-Tailored Testing*; Research Memorandum, no. 19; MESA Laboratory, Department of Education, University of Chicago: Chicago, IL, USA, 1975; Volume 19, Available online: http://www.rasch.org/memo19.pdf (accessed on 18 November 2020).
104. Jaeger, R.M. The national test equating study in reading (The Anchor Test Study). *Meas. Educ.* **1973**, *4*, 1–8.
105. Rentz, R.R.; Bashaw, W.L. The National Reference Scale for Reading: An application of the Rasch model. *J. Educ. Meas.* **1977**, *14*, 161–179. [CrossRef]
106. Cano, S.; Pendrill, L.; Melin, J.; Fisher, W.P., Jr. Towards consensus measurement standards for patient-centered outcomes. *Measurement* **2019**, *141*, 62–69. [CrossRef]
107. Mari, L.; Wilson, M. An introduction to the Rasch measurement approach for metrologists. *Measurement* **2014**, *51*, 315–327. [CrossRef]
108. Mari, L.; Wilson, M.; Maul, A. *Measurement across the Sciences*; Springer: Cham, Switzerland, 2020.
109. Pendrill, L. Man as a measurement instrument [Special Feature]. *NCSLi Meas. J. Meas. Sci.* **2014**, *9*, 22–33.
110. Pendrill, L.; Fisher, W.P., Jr. Counting and quantification: Comparing psychometric and metrological perspectives on visual perceptions of number. *Measurement* **2015**, *71*, 46–55. [CrossRef]
111. Williamson, G.L.; Fitzgerald, J.; Stenner, A.J. The Common Core State Standards' quantitative text complexity trajectory: Figuring out how much complexity is enough. *Educ. Res.* **2013**, *42*, 59–69. [CrossRef]
112. Williamson, G.L. Exploring reading and mathematics growth through psychometric innovations applied to longitudinal data. *Cogent Educ.* **2018**, *5*, 1464424. [CrossRef]
113. Heinemann, A.W.; Fisher, W.P., Jr.; Gershon, R. Improving health care quality with outcomes management. *J. Prosthet. Orthot.* **2006**, *18*, 46–50. [CrossRef]
114. Shore, D.A. *Launching and Leading Change Initiatives in Health Care Organizations: Managing Successful Projects*; Jossey-Bass: San Francisco, CA, USA, 2014; Volume 213.
115. Goldberg, S.H. *Billions of Drops in Millions of Buckets: Why Philanthropy Doesn't Advance Social Progress*; Wiley: New York, NY, USA, 2009.
116. De Soto, H. *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else*; Basic Books: New York, NY, USA, 2000.
117. McHugh, N.; Sinclair, S.; Roy, M.; Huckfield, L.; Donaldson, C. Social impact bonds: A wolf in sheep's clothing? *J. Poverty Soc. Justice* **2013**, *21*, 247–257. [CrossRef]
118. Sinclair, S.M.; Huckfield, N.L.; Roy, M.; Donaldson, C. Social Impact Bonds: Shifting the boundaries of citizenship. *Soc. Policy Rev.* **2014**, *26*, 119–136.
119. Tse, A.E.; Warner, M.E. A policy outcomes comparison: Does SIB market discipline narrow social rights? *J. Comp. Policy Anal. Res. Pract.* **2019**, *22*, 134–152. [CrossRef]
120. Banks, E. The philosophical roots of Ernst Mach's economy of thought. *Synthese* **2004**, *139*, 23–53. [CrossRef]
121. Franck, G. The scientific economy of attention: A novel approach to the collective rationality of science. *Scientometrics* **2002**, *55*, 3–26. [CrossRef]
122. Barber, J.M. Economic rationale for government funding of work on measurement standards. In *Review of DTI Work on Measurement Standards*; Dobbie, R., Darrell, J., Poulter, K., Hobbs, R., Eds.; Department of Trade and Industry, Annex 5: London, UK, 1987.

123. Barzel, Y. Measurement costs and the organization of markets. *J. Law Econ.* **1982**, *25*, 27–48. [CrossRef]
124. Benham, A.; Benham, L. Measuring the costs of exchange. In *Institutions, Contracts and Organizations: Perspectives from New Institutional Economics*; Ménard, C., Ed.; Edward Elgar: Cheltenham, UK, 2000; pp. 367–375.
125. Gallaher, M.P.; Rowe, B.R.; Rogozhin, A.V.; Houghton, S.A.; Davis, J.L.; Lamvik, M.K.; Geikler, J.S. *Economic Impact of Measurement in the Semiconductor Industry, 07-2*; National Institute for Standards and Technology: Gaithersburg, MD, USA, 2007; 191p.
126. Poposki, N.; Majcen, N.; Taylor, P. Assessing publically financed metrology expenditure against economic parameters. *Accredit. Qual. Assur. J. Qual. Comp. Reliab. Chem. Meas.* **2009**, *14*, 359–368. [CrossRef]
127. Anielski, M. *The Economics of Happiness: Building Genuine Wealth*; New Society Publishers: Gabriola, BC, Canada, 2007.
128. De Geus, A. *The Living Company: Habits for Survival in a Turbulent Business Environment*; Foreword by Peter M. Senge; Harvard Business School Press: Boston, MA, USA, 1997.
129. Ekins, P.; Hillman, M.; Hutchison, R. *The Gaia Atlas of Green Economics (Foreword by Robert Heilbroner)*; Anchor Books: New York, NY, USA, 1992.
130. Haskel, J.; Westlake, S. *Capitalism without Capital: The Rise of the Intangible Economy*; Princeton University Press: Princeton, NJ, USA, 2018.
131. Hawken, P.; Lovins, A.; Lovins, H.L. *Natural Capitalism: Creating the Next Industrial Revolution*; Little, Brown, and Co.: New York, NY, USA, 1999.
132. Fisher, W.P., Jr. The Mystery of Capital and the human sciences. *Rasch Meas. Trans.* **2002**, *15*, 854.
133. Fisher, W.P., Jr. Invariance and traceability for measures of human, social, and natural capital: Theory and application. *Measurement* **2009**, *42*, 1278–1287. [CrossRef]
134. Carter, C. Assimilation, blind spots and coproduced crises. *Environ. Values* **2018**, *27*, 1–7. [CrossRef]
135. Benson, M.; Craig, R. The end of sustainability. *Soc. Nat. Resour.* **2014**, *27*, 777–782. [CrossRef]
136. Foster, J. *After Sustainability*; Earthscan from Routledge: Abingdon, UK, 2015.
137. Hawken, P. *Blessed Unrest: How the Largest Movement in the World Came into Being and Why No One Saw It Coming*; Viking Penguin: New York, NY, USA, 2007.
138. Gelven, M. Eros and projection: Plato and Heidegger. In *Thinking about Being: Aspects of Heidegger's Thought*; Shahan, R.W., Mohanty, J.N., Eds.; Oklahoma University Press: Norman, OK, USA, 1984; pp. 125–136.
139. Irigaray, L.; Kuykendall, E.H. Sorcerer love: A reading of Plato's *Symposium*, Diotima's speech. *Hypatia* **1988**, *3*, 32–44. [CrossRef]
140. Bluecher, H. XIII. A Dialogue with Students. In *Senior Symposium*, Blücher Archive Lecture Transcripts, ed.; Bard College: Annandale-on-Hudson, NY, USA, 1 October 1968; Available online: http://www.bard.edu/blucher/lectures/dialogue/dialogue_pf.htm (accessed on 18 November 2020).
141. Fisher, W.P., Jr.; Stenner, A.J. On the complex geometry of individuality and growth: Cook's 1914 'Curves of Life' and reading measurement. *J. Phys. Conf. Ser.* **2018**, *1065*, 072040. [CrossRef]
142. De Chardin, P.T. *Toward the Future*; Collins: London, UK, 1975.