Opportunity:
High-Leverage Learning about Innovation & its Methods

Prepared initially 2014-2017 (updates where noted).

By Karen Gates
Contact: kgates734@gmail.com

> *"He taught me to look for the non-obvious ways to gain leverage times ten on an issue." [1]*
> – McKinsey & Company Manager, *About* Bill Drayton, founder of Ashoka

Introduction

The reason the feasibility of articulating a framework of Innovation's driving fundamentals matters is because of the hypothesized opportunity for *learning leverage*. This document elaborates upon, and associates with sources, that hypothesized new value:

> *Broad student access to high-leverage learning about innovation and its methods:*
>
> 1. *Support for successfully thinking about innovation's overall purpose and forces and for successfully using its methods*
> 2. *Support for accessing the following two experiences valued "for its sake alone," which fit naturally as an element of leverage for learning about Innovation and its methods and which are integral to a personal sense of direction:*
>   - *"Meaning" – Personal connection to a larger "purpose"*
>   - *"Engagement" – Of one's signature strengths.*

The document is divided into three parts:

- *Part One* provides an overview of *accumulating* levels of potential learning leverage:
  - Level 1: Leverage from a framework of fundamentals alone – A lens that aids students in seeing every innovation example as a variation on a small set of shared underlying fundamentals of Innovation and its methods, for seeing how much and in what ways examples do vary, for seeing how Innovation's purpose and methods relate to the same for Science and Invention, and more
  - Level 2: Leverage from innovation's particular framework of fundamentals – Featuring a set of complementary and mutually-reinforcing learning leverage points: *Intelligibility, Engagement, and Embedded Personalized Guidance*.
  - Level 3: Leverage from an Innovation learning *system* – Complementing the existing learning system for Science (K-16), an Innovation learning system provides for grounding and connecting each learner's experiences across time and place *and* facilitating student *trajectories* of learning and capability. For a methodology that is pertinent across the workforce, plus collaborative and interdisciplinary.
- *Part Two* reviews resources that speak to the special intrinsic value of personal purpose, including for students, which is central to the leverage point of "embedded personalized guidance" and which may represent innovation instruction's "secret sauce."
- *Part Three* provides a *more detailed look* at each of Level 2's mutually-reinforcing learning leverage points – *Intelligibility, Engagement, Embedded Personalized Guidance*.

Part One -- Overview of Accumulating Levels of Learning Leverage

> *"The curriculum of a subject should be determined by the most fundamental understanding of the underlying principles that give structure to the subject."[1.5]*
> -- Jerome Bruner, *The Process of Education*

The feasibility of articulating a framework of Innovation's fundamentals matters because of the hypothesized *value of learning leverage* associated with the potential public good of a developed, high-quality framework.

This overview speaks to potential for *accumulating levels* of learning leverage:

Level 1: Leverage from Fundamentals Alone

When education psychologist and cognitive learning theorist, Jerome Bruner, established the conceptualization of "structures of the discipline" he argued that "the curriculum of a subject should be determined by the most fundamental understanding of the underlying principles that give structure to the subject."[1.5]

A framework of structures, or fundamentals, could be considered equivalent to what cognitive scientist Daniel Willingham calls the "unifying concepts that come up again and again" -- "a limited number of ideas carried through a curriculum for years as different topics are taken up."[2] For Innovation, a framework's constancy could provide support for deepening understanding of its essential purpose, methods, and forces. For example, themes across thinkers and practitioners indicate that Innovation's fundamentals would include:

- It's a particular category of creativity: "*change by way of value.*"[3]
- Innovation "integrates and applies" widely-varying types of knowledge within hypotheses about the possibility for offering compelling new value to certain customers (both "what" and "how" hypotheses).[4]
- The hypotheses about "what" and "how" represent innovation's *essential creative structure* (within a practice that is collaborative and cross-functional).[5]
- It's sustained customer *adoption* of the new value that can catalyze innovation's change of societal benefits (linked to a new equilibrium's effect of resource leverage)[6]. Customers are the gatekeepers of innovation's change, and innovation practitioners are the agents of change.
- Innovation's wide variation of applications fits within both the commercial production system and the social production system. Moreover, the practice "pertains to all activities of human beings other than those one might term "existential" rather than 'social.'"[7]

Overall, Bruner's conceptualization of "structures of the discipline" seems tailor made for Innovation and its methods in that effective articulation of structures is to facilitate students' access to and engagement with a subject:

- Bruner argued that a discipline's structures represent "a minimum requirement for using knowledge, for bringing it to bear on problems and events one encounters."[8]
- And using Algebra as an example, Bruner held that understanding Algebra's structures allows students to recognize myriad problems as but "variations on a small set of themes."[9] For innovation, such a framework could allow students to recognize *its* small set of themes and its wide-ranging examples as variations on those themes, including how much innovation does vary and in what ways.

Of note, there is a possible *limiter* to the effect of such learning leverage from articulated structures for Innovation in that the reference of plentiful concrete examples of offerings is not readily available. In particular, there is not a ready supply of examples from the vantage point of practitioners and linked to a framework of Innovation's fundamentals. This limiter seems pertinent with respect to bringing knowledge "to bear on problems and events one encounters"[10] (e.g., by way of "what" and "how" hypotheses):

- The limiter seems especially relevant given how much Innovations' examples do vary. If not addressed, the gap could limit the leverage of the framework of Innovation's structures to clarify and bring the unifying concepts to life:

  > "The surest way to help students understand an abstraction is to expose them to many different versions of the abstraction."[11]

- To fill the gap, a bank of concrete examples of one type or another could provide students with important support for understanding the framework's unifying concepts, with examples as "but variations on" the concepts, including understanding the ways in which Innovation examples do vary.

- One approach to addressing the gap would be to develop a new supplemental tool, designed especially for learning. For example:
  - *A tool that provides a searchable online gallery of innovation offerings*
  - *Where each example is presented via a profile template that is based on the framework of fundamentals (e.g., including "what" and "how" hypotheses), plus tags that highlight its types of variations and support search (e.g., the nature of value offered to end customers)*
  - *Where the array of examples intentionally captures innovation's many types of variation, perhaps including filters that shine light on a variation taxonomy of sorts.*

  See more detail for this particular tool possibility at Part Three.

Bruner held, too, that articulating structures of a discipline "permits many other things to be related to the discipline meaningfully."[12] In Innovation's case, there are indeed many things to which it relates meaningfully, beginning with:

- Innovation is “the knowledge base of entrepreneurship.”[13]
- Innovation shares its *creative structure of hypotheses* with Science and Invention, with each methodology creating a distinctive type of change.[14]

It’s similarly meaningful to note an array of additional relations such as:

- Innovation’s practice *situates* artificial intelligence. Like all technology, artificial intelligence can provide a *resource* that an offering incorporates.
- Innovation is fundamentally *amoral* (it calls for “responsible” innovation)[15]
- Humanities study may support fruitful innovation hypotheses.[16]

Plus, Innovation’s ultimate relations may be deeply personal, involving personal connection to a particular type of purpose and/or to a personalized means of engagement (or “medium of expression”) – e.g., from communication to engineering.[17] Innovation instruction that is based on a framework of fundamentals might naturally provide students with support for discovering the types of larger *purpose* that are *personally compelling* and/or for discovering how their personal strengths and preferences can best be engaged to contribute to such a purpose.

Overall, Bruner held that a framework of structures provides support for taking in "an enormous amount of information," akin to the cognitive science notion of "chunking."[18] Also: “To be in command requires a continual deepening of one’s understanding of (the subject’s structures) that comes from learning to use them in progressively complex forms.”[19]

In a similar vein, Peter Drucker argued that it's a framework of "organizing principles" that permits "conversion of a skilled craft to a methodology or discipline" -- by making it "broadly teachable" -- as occurred in the past with engineering, the physician's differential diagnosis, and more (including the scientific method).[20] An effective framework of structures, or principles, could provide not only for an individual learner's efficient access to Innovation's fundamental and unifying concepts, it would allow too for *shared understanding* across learners for a practice that is fundamentally collaborative and cross-functional.

Drucker made this argument within the context of describing the crucial need to convert innovation and entrepreneurship from a skilled craft to a methodology:
He held into the early 21st century, up to his death, that a "post capitalist" society in which "knowledge is the only meaningful resource" means that: "Every organization … will have to learn how to innovate – and to learn that innovation can and should be organized as a systematic process" and "What we need is an entrepreneurial society."[21]

Within the 21st century, understanding innovation's creative expression could be considered a type of literacy that is relevant to all, especially as the technology of artificial intelligence becomes prominent.

The table on the following page provides a provisional basis for considering how Innovation's structures, or fundamentals, might be articulated, by speaking to the discipline's "what, when, why," etc., alongside the same for the disciplines of Science and Invention, which share Innovation's fundamental "how" of hypotheses.[22]

	Innovation	Science	Invention
WHAT is it?	The change of new/greater value put out into the world & adopted by customers. Change by way of “value.”	The change of new/greater knowledge.	The change of new/greater technical capability.
WHY does it matter?	Resource Leverage Improve: -Standard of living (GDP) -Human well-being -Sustainable planet	Understand the world Can be applied (e.g., as innovation).	Drive human progress. Can be applied (e.g., as innovation).
WHERE does it happen?	Mainly commercial & social production systems. All human activity but that which could be considered existential.	Mainly disciplinary fields of knowledge	Mainly disciplinary/technical fields of knowledge. Includes "appropriate technology."
HOW does it happen?	Integrate & Apply Knowledge	Scientific method.	Widely varying (including Engineering).
Rooted in Hypotheses	Combination of: "What could be as new value to customers." "How the new value could become an offering accessible to, and adopted by, customers."	"What is"	"What could be technically"
Medium of Expression	Offering	Argument	Technical Function
Knowledge Pertinent to Hypotheses	Typically integrates knowledge from core strands, such as: (i) industry/operations (ii) customers (iii) human, social & technological dynamics. *Can feature "ordinary" knowledge.* *Can incorporate advances in Science and/or Invention.*	Primarily disciplinary	Primarily disciplinary/technical
WHO generates & acts on the hypotheses?	Those who possess *pertinent* knowledge, purpose, skills. Typically involves a cross-functional team.	Typically masters of a field of knowledge	Typically master(s) of a technical field. Can include inventors, engineers.
WHO are gatekeepers of change?	Customers	Experts in field (peer review)	Varies (includes innovators who incorporate new technical capability within offering).
WHAT are gatekeeper criteria?	Forcefully positive new value compels sustained adoption	Argument is valid & reliable	Demonstration is reliable

Level 2: Leverage Points Associated with Innovation's Particular Fundamentals

Unpacking the particular *content* of innovation's framework of fundamentals, at least according to the provisional framework, reveals the notable inclusion of three complementary and mutually-reinforcing learning leverage points, as follows:

- ***Intelligibility –*** 
  Although the “Intelligibility” leverage point refers largely to the benefits described just above from a potentially articulated framework of Innovation’s structures of the discipline (“level 1”), its inclusion here is to emphasize the way that “Intelligibility” can interact with the other two leverage points that can be unpacked from the framework. And vice versa – how the three leverage points might facilitate an ongoing feedback loop.

  For example, with time, a feedback loop may provide for *deepening* understanding and deepening capability as: *Intelligibility supports personalized guidance, which supports engagement, which supports deepening understanding, personalized connection, and capability.*

- ***Engagement --***
  Three features of Innovation and its methods that are highlighted by the provisional fundamentals stand out with respect to potential for facilitating *learning from engagement,* including beginning engagement early:

  - *The power of small* - Innovation’s pertinence to “all activities of human beings other than those one might term “existential” rather than 'social.”[23]
  - *Hypotheses* - A familiar on-ramp for engaging with Innovation’s essential creative structure and an also familiar subject of “new value.”
  - *The power of student interest* – “The greatest source of inspiration but also the largest reservoir of tacit knowledge," which “relates most deeply to the associations and connections among various pieces of knowledge."[24]

  In particular, these three features support *scaffolded engagement*:

  - Engagement could begin with *mental* engagement (e.g., “unpacking” Innovation examples, especially favorite examples) and/or with engaging sample creativity practices (e.g., observation log) [25], plus generating and testing Innovation hypotheses, and generally progressing one step at a time.

    - Plus, bounded hands-on engagement could *combine* innovation's creative structure of hypotheses with the authenticity of small scale.

      For example, the forces of change-by-way-of-value do not require advanced knowledge; they only require *pertinent* knowledge.
      For the domain of a school, this might include knowledge of the operations of recess, the cafeteria, recycling practices, bullying, the role of students in fundraising efforts, etc., combined with knowledge about peers, the overall school community, and more.

      Change realized from implementing Innovation hypotheses at a small scale may not be of the size to be labeled "Innovation," but the experience of generating and/or acting upon a hypothesis about forcefully positive new value – one that catalyzes change (e.g., in the school) – would rightly be labeled engagement with Innovation's purpose and methods. Plus, with creativity there can be power in even quite small experiences:

        - "The creative process is ... one of the most powerful and intimate involvements with life."[26]
        - Even "brushes with purpose."[27]

    - As with Science, students could return repeatedly over a period of years to a framework of innovation's unifying concepts and progress in hands-on practice with methods as they incorporate parallel growth in overall knowledge, skills, and interests.

- ***Embedded Personalized Guidance --***

   As *Intelligibility* supports understanding Innovation's unifying concepts and the nature of its extensive variation, and *Engagement* supports experience-based learning, the combination can facilitate consciousness and development of personal connection to purpose and strengths engagement by posing questions such as:

  What types of change in the world do I think matter most? Which am I drawn to? In what context can I imagine myself being "inner-driven and other-focused"? What types of value would I like to see put out into the world? How can I best participate in creating value, as a catalyst for change?

  Students' unfolding answers to questions like these may help clarify personal leanings, either within Innovation's framework or leanings that complement that framework (e.g., Science or Invention). Either way, learners have the benefit of consciousness of the overarching context established by Innovation's fit within the 21st century.

In fact, the more that instruction can bring forward Innovation's intrinsically valued features of practitioner connection to larger purpose and engagement of personal strengths, the more likely it seems that learning can take hold:

- This hypothesis, or supposition, is based largely on well-being theory's inclusion of these features as two of only five experiences that humans *value* "*for its sake alone*" – no other incentive needed. The theory labels connection with a larger purpose as "meaning," and engagement of strengths as "engagement of personal signature strengths."[28]

- The hypothesis is also based on national-level research about the value of purpose *for students*, where connection to purpose is notable because it has been associated with an intrinsic force for *learning* as part of its intrinsic value.[29] The latter matters, in part, because developing a *mature* level of personal creative capability may call for developing a high level of thinking skills and more, and articulating innovation's fundamentals can support a blueprint for doing so.[30]

- Finally, it seems logical that a customer-focused methodology – where customer adoption of compelling new value catalyzes change – would be taught with customer focus (that is, with student focus).

With time and intentional use of a framework of Innovation's fundamentals, or underlying principles, the combination of these three leverage points may serve to train the student eye, cultivate innovation consciousness and its day-to-day impetus, develop discerning imagination associated with pertinent knowledge, cultivate personal purpose and signature strengths, and more.

Overall, a student is learning innovation's version of creativity, which includes understanding the present-day need for, and fit of, its expression as well as how personally one might best engage its creativity and make a difference.

Following "Level 3" of accumulating learning leverage, just below, Part Two of this document elaborates the special value of purpose for students. And Part Three, which features detail for each of "Level 2's" mutually-reinforcing leverage points, includes detail regarding the way that innovation instruction could map naturally to a process that has been associated with successful student discovery of purpose.

Level 3: Leverage from an Innovation Learning System

Although the feasibility of articulating a framework of Innovation's fundamentals presents the opportunity for high-leverage learning at any scale – as limited as one individual or one classroom – the greatest opportunity for leverage would almost certainly result from a K-16 **Innovation Learning System** as a complement to the existing learning system for methods of Science/Research.

The benefits of broad student access to deepening understanding about Innovation, including access to the embedded structure of support for exploring a personal sense of direction, seems especially important given that Innovation's methodology is broadly pertinent as a modifier of the vast majority of academic disciplines and the vast majority of 21st century workforce roles.

Moreover, as a methodology that's cross-functional and cross-disciplinary, shared roots of understanding are especially valuable.[31] Shared understanding and language could support individuals in nimbly "plugging into" innovation's instruction and practice across time and place, in effect establishing a "modular interface."[32]

An Innovation Learning System could facilitate the *harnessing* of the mutually-reinforcing leverage points discussed in the preceding section, which are illuminated by a framework of Innovation's fundamentals. Such a learning system would be naturally aligned with converting Innovation from "a skilled craft to a discipline or methodology." It might pose significant potential for both personal (student) and societal benefit.

In fact, the opportunity could be viewed as a response to John W. Gardner's early voice calling for such a learning system. In a book about "the individual and the innovative society," Gardner framed innovation's instructional challenge in a way that remains pertinent over fifty years later:

> "The classic question of [societal renewal] has been: How can we cure this or that specifiable ill? Now, another question: How can we design a system that will continuously reform (i.e., renew) itself, beginning with the present specifiable (ills) … (to the) ills (we) cannot foresee?" ... "Like a scientist in a lab, part of enduring tradition/system …"[33]

In the way that the scientific method has established an enduring tradition and system for over a century of broadly-accessible learning and practice toward the purpose of advancing what is known about our world, a framework of Innovation's organizing principles might make feasible such a tradition and system for the 21st century's urgently needed societal effects associated with innovation's function of resource leverage – especially with its *responsible* use.

Part Two -- The Special Value of Purpose

> "The capacity to learn and create emanates from genuine commitment to purpose. When we really care we are willing to fail our way to success. In this process, we see and do things no one else does. ... Purpose gives rise to learning ..." [34]
>
> — Robert Quinn

Heightened visibility of the subject of personal purpose -- larger than oneself and personally compelling – has been associated in part with the 21st century introduction of the field of positive psychology. For example, in co-founding the field, research psychologist and past president of the American Psychological Association Martin Seligman established a theory of "well-being," which speaks to what humans value most fundamentally (what free people will choose; "uncoerced choice"). "Meaning/Purpose" is included in the theory's set of five categories of experience, each of which is argued to be valued "for its sake alone":

- positive emotions
- engagement (of signature strengths)
- positive relations
- meaning (connecting to a purpose larger than oneself)
- achievement (for the sake of achievement alone) [35]

Meaning/purpose, in fact, within well-being theory, represents a type of pinnacle category: Seligman relates the category of positive emotions to the "pleasant life," the categories of engagement, relations, and achievement to the "good life," and the category of meaning/purpose to the "meaningful life." (Having all five elements is associated with the "full life.") [36]

Among Youth –

Support for purpose development among youth has become newly visible as an active quest, based in part on the research-based view that adolescence is "the proper period in life to begin such reflection."[37] This quest contrasts with a status quo in which purpose has been shown to be valued by most youth but largely elusive. Advocates argue that purpose is learnable -- indeed that developing or discovering it "has been a good deal harder than it should be."[38]

William Damon has provided a leading voice in youth-focused research regarding purpose and its effects, including leading the "Stanford Youth Purpose Project," with a nationally representative sample of U.S. high school students.

Consonant with Seligman's theory of well-being, Damon argues:

> "The disposition toward purpose has been bred into (humans).[39] ... There's a universal yearning for the meaning of a sense of positive, forward direction."[40]

Based on his research with youth, Damon notes that this personalized sense of direction "is not necessarily career, but it's deeper than grades and awards." It speaks to the "why" of schooling. Damon explains:

> "[Purpose] speaks to an ultimate concern, larger than the self, a deeper reason for immediate goals and behavior. It speaks intrinsically to:
>
> - Why am I doing this?
> - What does it matter?
> - Why is it important?"[41]

In providing a response to *schooling's* "why," Damon argues that purpose brings an energy and focus that *contextualizes* and *integrates* academic work:

- "Only when students discover personal meaning in their work do they apply their efforts with focus and imagination."[42]
- "Goals are integrative." [43]
- "It's not simply academic motivation in the conventional sense. Rather, purpose behind the requirements. Why strive to learn and use the work in a masterful and ethical way?" [44]
- "Only a long view fueled by energetic purpose can build and sustain capacities that will be needed."[45]

Similarly, from organizational psychologist Robert Quinn:

> "The capacity to learn and create emanates from genuine commitment to purpose. When we really care we are willing to fail our way to success. In this process, we see and do things no one else does. ... Purpose gives rise to learning ..." [46]

Contextualizing a student's academic work is further significant because, unlike student/human value for purpose, academic work generally is *not* valued for its sake alone. In *Why Students Don't Like School*, cognitive scientist Daniel Willingham explains: "We're naturally curious, but we're not naturally good thinkers."[47] Academic work may be good for you, but often is not experienced as "good." For example:

- In a 2017 national poll, teachers of middle and high school students reported that most students are not interested in science, math, and even space, despite years of concerted efforts to promote STEM subjects.[48]
- A separate 2013 Gallup poll reported student engagement dropping off throughout K-12 years. During elementary years, 76% were engaged versus 61% during middle school years, and 44% during high school years.[49]

If the purpose-related research bears out, effective support for students' purpose development could help avoid engagement drop-off after elementary school.

Largely Elusive --

Consistent with many other indicators, Damon's nationally representative sample of U.S. high school students indicated that only a small minority of students have been finding personal purpose:

- 20% associate a clear purpose with their studies
- 55% are dabblers, dreamers (without grounding)
- 25% have zero interest in a purpose [50]

Damon found that the youth who *had* developed purpose were generally quite normal; for example, they weren't prodigies. "What *is* special about these highly motivated young people is their exceptional clarity of purpose." [51]

Also, Damon concluded that applicability is indeed broad: "Anyone can find purpose and pursue it with rich benefit to themselves and others."[52]

> "It is the combination of normalcy and exceptional initiative that makes this group so informative to us. Their experiences offer lessons that are wholly relevant to all young people growing up today.[53]
>
> Developmentally, the proper period in life to begin such reflection is during adolescence when a youngster begins to make choices about what kind of person to become and what kind of life to lead." [54]

Elusiveness of purpose also extends to the level of higher education, including encompassing high academic achievers. For example:

- In a UCLA capstone course for honors students, the course's professor described students' greatest thesis challenge as identifying a passion.[55]
- At Stanford University, a course that features applying "design thinking" to one's life, "Designing Your Life," became so popular that a version of the course was developed for all freshmen ("Designing Your Stanford").[56]
- As a Princeton University senior, Teach for America founder Wendy Kopp recognized that her peers were taking Wall St. jobs "because they couldn't think of anything better to do."[57] Indeed at Princeton and many other selective colleges and universities, Teach for America became a perennial top campus recruiter for over a decade and continues to operate nationally.
- The founder of the Equal Justice Initiative, Bryan Stevenson, provides an example of both the energizing force of student purpose and the opportunity cost of its absence. Stevenson's eventual connection with purpose has included arguing successfully before the U.S. Supreme Court on more than one occasion. A popular public speaker, Stevenson regularly describes his personally difficult pathway to purpose:

  Following undergraduate study in philosophy, over three decades ago, Stevenson decided by process of elimination to attend law school (within a joint degree with public policy). He described an absence of intrinsic connection to this graduate study up until a particular experience within an in-field semester. In supporting a non-profit organization, Stevenson was assigned the task of making in-person contact with a death-row inmate who was wrongfully convicted and who was relying on the organization's service of legal representation given his state's absence of providing for it. Following that contact, Stevenson describes never looking back. He described returning to the law school classroom and library determined to absorb all there was to know about 'torts," etc., in order to be effective -- to be armed -- in addressing an injustice that compelled his attention.[58]

For students who aren't among the highest achieving, the prospect of purpose is no less valued and no less valuable, including as *context for academic work*. Discovery early enough may mean avoiding or reducing the need for remediation for those who continue to post-secondary study and may lead to potentially higher completion rates, as a result of having a clear and compelling "why" for the study.

Broadly speaking, Sir Ken Robinson described a "human energy crisis" related in part to the fact that strengths and interests can be "buried deep" inside individuals.[59] For too many, the existing means for accessing these internal drivers have not been sufficient. It's access that is important to society, not to individuals only.

Learnable –

Stevenson's experience fits into Damon's argument that finding personal purpose "has been a good deal harder than it should be."[60] Damon offers guidelines for student "pathways to purpose," which he refers to as a *learning* process:

> "The learning process takes time, but it's not an unpleasant process." Damon identified twelve steps that have characterized a common discovery process among youth who have connected with a compelling personal purpose.[61]
>
> "We should not leave such discoveries to chance." [62]

Damon's twelve steps are elaborated within Part Three of this document (see the subheading of "Embedded Personalized Guidance"), which elaborates the way that Innovation instruction could be mapped to the steps. That is, it's conceivable that innovation instruction could provide a natural instrument for purpose development.

Within these discovery-process steps, Damon argues that *support* is vital:

> "Anyone can find purpose and pursue it with rich benefit to themselves and others ... But support is vital along the way (including from family and community)." ... (Students) are determined but not self-sufficient.[63]

The need for support is notable because support is not always accessible to students, even among families with the best of intentions. Plus, no matter the family and community level of support (from much to none), early and continuing Innovation instruction may provide a robust type of support for finding purpose that is accessible to *all* students. It could do so over a period of years.

Present-day attention to purpose development among youth, including calls for support, resemble further reflections of John W. Gardner from over fifty years ago. Gardner lamented: "The reservoir of unused human talent and energy is vast."[64] And in the book about "the individual and the innovative society," he wrote:

> "(W)e must help the individual to (re-)establish a meaningful relationship with a larger context of purpose. … (O)ne of the reasons young people do not commit themselves to the larger social enterprise is that they are genuinely baffled as to the nature of that enterprise. … They do not see where they fit in. If they are to commit themselves to the best in their own society, it is not exhortation they need but instruction. … We must also help the individual to discover how such commitments may be made without surrendering individuality."[65]

 Indeed, a recent resource for finding purpose is Andrew Hoffman's publication *Finding Purpose, Environmental Stewardship as a Personal Calling*. In this book, Hoffman provides an echo of, and a response to, Gardner's words. The resource is constructed around the connection between personal purpose and a particular aspect of "the nature of the larger social enterprise" in the 21st century -- establishing the means to a sustainable world. With this context, Hoffman calls for *individual* responses to the questions of what needs to change, why, and how change takes place -- acknowledging the force of personal purpose.[66]

Like Gardner and others, Hoffman acknowledges the need to support students: "(W)e need to instill in people a deep desire to use their abilities and influence to make the world a better place."[67] That includes cultivating understanding of the *value* of a purposeful connection to the larger world (that is, "without surrendering individuality"):

- "Satisfaction comes not just from some inner feeling, but also from an assessment that what you are connected to and care about is being addressed."[68]
- "Satisfaction occurs in the world, not only in ourselves. It comes not from pleasure, but from meaning."[68]

More is Less? Innovation Learning as Natural Instrument for Purpose Cultivation --

Given the special human value for purpose and the belief that "we should not leave such discoveries to chance" -- for the sake of both individuals and the larger world -- it's significant that Innovation instruction, beginning within K-12 years, might be especially fitting as a natural and intentional instrument that can support purpose cultivation. There may even be *synergy* between the two learning processes.

The joint opportunity may amount to "more is less," especially if Innovation instruction's natural attention to student purpose is associated with the academic focus and integration that Damon and others have described.

Part Three -- Zooming in on the Complementary & Mutually-Reinforcing Learning Leverage Points

This section looks more closely at the special value of each of the mutually-reinforcing learning leverage points associated with the *provisional* framework of innovation's fundamentals:

- Intelligibility
- Engagement
- Embedded personalized guidance

A. Lever of Intelligibility

> *"It's not what you look at that matters, it's what you see."*
>
> – Henry David Thoreau

A Lens --

A high-quality framework of innovation's fundamentals, or principles, provides a lens for seeing innovation at work in the world:

> A well-articulated framework can provide a conceptual on-ramp that also provides a constant big-picture reference.
>
> Again, this perspective, or lens, captures what Daniel Willingham calls the "unifying concepts that come up again and again" -- "a limited number of ideas carried through a curriculum for years as different topics are taken up."[69] Unifying concepts provide support for successful thinking to which students may return time and again.

For example, considering hypotheses as Innovation's *creative structure* may help demystify the origins of ideas: "Good ideas are not conjured out of thin air; they are built from a collection of existing parts ..."[70] This perspective might help students to reflect upon the strands of knowledge that are commonly integrated for Innovation hypotheses. It may also help students "unpack" ideas they already have or have had. For example:

> *"What do you think you knew, or know, that prompted that idea?"*
> *Or in considering Innovation examples: "What did this practitioner know that prompted the idea?"*

Notably, Innovation's hypotheses (whether implicit or explicit) seem fundamental to *all engagement* with the methodology [71]:

- Generating *and testing* hypotheses (both "*what could be as new value*" and "*how it could become*")
- Situating "what" and "how" hypotheses within an overall design for action (e.g., using a tool such as the Business Model Canvas or initially a simplified version of the canvas)
- Acting on a hypotheses-based design for action and assessing the action/results.

Like Bruner, Willingham points to **connecting the concrete with the abstract** as the best way for students to gain traction with understanding unifying concepts:

- "The surest way to help students understand an abstraction is to expose them to many different versions of the abstraction."[72]
- Examples in the form of *stories* are said to add the benefit of meaning for even greater effect of connecting the concrete with the abstract:

  > "The human mind seems exquisitely tuned to understand and remember stories. Stories are believed to be treated differently in memory."[73]

Missing Complement of Examples --

Unlike Bruner's example of Algebra, for which there is a plentiful supply of Algebra problems to serve as variations on a small set of themes, for Innovation instruction there is not a ready supply of offering examples to complement a framework of fundamentals. In particular, there is not a supply of examples representing the methods perspective.

Filling that gap might make a significant difference in helping students understand Innovation's unifying concepts. Fortunately, the gap can be addressed.

Just below, see a sketch of just one possible new learning tool to fill this gap (on the ambitious end of the spectrum of ways to address the gap): a searchable online gallery of Innovation examples:

Searchable Online Gallery of Innovation Examples –
In this online gallery, each example of an Innovation offering is presented via a **profile template** that is based on the framework of Innovation's fundamentals, plus tags that highlight variations and allow for search:

- This combination is to bring forward both the concepts that unify all examples and the nature and extent of Innovation's variation.
- *Filters* (in addition to open search) might be incorporated to shine light on a variation taxonomy of sorts.
- Profiles should be *usable by middle-school students*, with perhaps a smaller collection of profiles designed especially for younger students.
- Wings and special exhibits might be curator-determined, but visitors could customize, archive, tag, and share their own collections.

The ideal experience of visiting such an online gallery of offering profiles might be like visiting a hands-on world's fair or museum or trade-show:

- Since visitors could go from one online wing to another within a second or two, rather than walking around a gallery, there could be a large number of wings.
- Also, a visitor could cluster a wing's profiles according to personal preferences. For example, visitors could create, save, and share their own wings, including simply as a collection of favorite profiles.

In a curated wing, a cluster of profiles might be dedicated to any one of the following sample variations of Innovation offerings:

- begun as a scalable startup organization
- initiated within a large existing organization
- enabled by artificial intelligence
- applying an advance in science
- applying an advance in invention
- based on "appropriate technology"
- based on ordinary knowledge
- aiming for societal change of "planet" vs "profit" vs "people" – or a mixture
- based on a particular type of "planet" change (e.g., renewable energy) or "people" change, etc.
- illuminating the "social differential," including possible catalysts for change in customers' behavior and capability
- situated in the social production system
- situated in the commercial production system
- featuring interesting "how" hypotheses
- initially viewed as "responsible" and later not
- based on offering value customers didn't know they wanted

- situated in industry X vs Y vs Z (e.g., sports, agriculture, higher education, medicine, government)
- illustrating increasing complexity, from an effective new connection of simple knowledge to a connection of a complex web of knowledge
- nature of value offered (e.g., “ease,” saving of time, safety, etc.)
- “small” examples (e.g., inside schools)

A visitor’s possibilities for clustering examples are limited only by *tags* (both existing and those that they might assign). In addition to variables such as those above, tags might highlight offerings with features like the following:

- co-created with customers
- based on public-private partnerships
- benefiting a certain category of customer (retirees, students, parents, owners of a small-business, teens, women, children, etc.)
- offerings originally conceived of as a new type of value, with subsequent need to figure out a successful means of revenue (like the original Google search offering)
- enacted by or for government
- featuring "disruptive" innovation (per Christensen criteria)
- led by youth (or young adults or a woman, etc.)
- designed to catalyze change in customers' behavior or capability, arranged by difficulty of change and learning
- different offerings featuring a thematic type of value (e.g., matchmaking – for volunteering, employment, dating, etc.)

An online gallery also could offer *instructional suggestions*, such as:

- choose a favorite offering, and explain why that choice
- choose a set of profiles that address a *cause(s)* of personal interest
- describe how you would like to support and/or modify such an initiative
- describe the way that differing offerings share constant fundamentals
- comment on the types of knowledge (and/or technology) associated with an offering’s idea for value
- choose an offering that draws upon advances in science and/or invention, and contrast the offering's innovation hypotheses with the related hypotheses for science and invention
- create and share a cluster of offerings that reflect a personal basis for interest (e.g. searching by a personalized combination of tags)
- consider a profile as the basis for “cross pollination” – for generating a new idea (e.g., the Uber of air transportation)
- develop a new profile for an Innovation offering not yet included in the gallery (doing so might include initial research – perhaps using AI – plus interviewing practitioners to confirm what has been captured and to fill in blanks)
- and so on.

Subscribe to "Offering of the Week" --

The gallery could deliver an "offering of the week" via email and/or social media to help put innovation's concrete purpose and practice into public drinking water, to stimulate awareness, new ideas, questions, etc.

Prototype Gallery --

To demonstrate the idea of a searchable online gallery, see a *rudimentary* prototype at InnovationAgents.org, where profiles are based on published accounts (usually by the practitioner) of the offering's development.

How a Gallery Might Become …

Hypotheses for "how a scaled-up, searchable online gallery of innovation offerings could become" might be sketched within the Business Model Canvas, capturing options for exploration and/or testing.

Within the process, it seems important to develop a *more advanced prototype* than the one mentioned just above (e.g., including perhaps dozens of offering examples, plus attention to graphic presentation of a template, etc.).

Prototype development could draw on options such as the following, which aim to utilize *existing resources* prior to interviewing offering practitioners to confirm draft profile depictions and to fill in blanks:

- AI tools – to fill in the blanks of a profile template, to the extent that AI can find the information.
- Existing research such as the work presented in *The Innovator's DNA*, which included a goal of capturing "when and how" entrepreneurs "came up with ideas that launched new businesses or products."[74]
- Student participation – perhaps drawing on AI and then themselves conducting the interviews of practitioners who developed the offering, to confirm the AI findings and to fill in blanks.

Of note, the work of generating a more advanced prototype *might inform:*

- "how" hypotheses for a scaled up version of a gallery
- a more advanced framework of Innovation's fundamentals.

Eventually, beyond developing an advanced prototype, "how" hypotheses might include options such as:

- "Crowdsourcing" (including from students) -- drawing upon what Clay Shirky calls "cognitive surplus," representing "the shared, online work we do with our spare brain cycles."[75] Shirky points to the prime example of contributions to Wikipedia.
- A private-public partnership – e.g., an opportunity for practitioners of many types to provide their intellectual support of the societal good of education, including the K-12 level.

****

Whatever the means, filling the gap of plentiful examples of Innovation offerings, is to provide an enhanced lens for Intelligibility. It's to support students in answering the following types of questions as a gateway to successfully engaging innovation's methods and to considering personal preferences:

> *"What is innovation? How does it work? Why does it work?*
> *Why does it matter? What do I like best? How might I participate?"*

Intelligibility's Support for Personal Connection --

Reflecting on personal preferences can begin early, in small but meaningful ways. Student assignments could, for example, call for selecting favorite examples and reflecting on why these examples are favorites. Also, by noting the types of knowledge ("existing parts") that were connected within the idea for the new offering ("what could be" hypothesis) and/or within select hypotheses for "how it could become an offering and catalyst of change," students can consider ways to prepare for making personal contributions.

As Mihaly Csikszentmihalyi and colleagues have noted:

> "Humans can observe and/or be shown how activities of humans have changed the environment, fostering realization that other people may be able to also bring about change ... A sense of what has been done helps lead to a sense of what might be done as well as an appreciation for the kinds of established constraints that might affect imagined changes." [76]

See a fuller discussion of support for personal connection below under the third learning lever heading of "Embedded Personal Guidance."

Mental Engagement – Unpacking Examples

Innovation's framework of fundamentals can support "unpacking" excellent examples, or what Willingham refers to as "understanding the parts and the whole."[46] This type of "mental engagement" can aid Innovation intelligibility. For example, the Kauffman Foundation's Panel on Entrepreneurship Curriculum in Higher Education described the benefit of maturing intelligibility in distinguishing examples of excellence, drawing on an analogy with music:

> Departments of music composition cannot make students creative. But studying how great music is made can ignite whatever creativity students possess and help bring it to expression. The aim of studying composition is to unpack works of genius and excellence and thereby lead students beyond imitation to originality. … Making innovation intelligible may help students to imagine and engage in entrepreneurial activities they otherwise might not have considered. [78]

To illustrate unpacking an innovation example that began with developing new technical capability (invention), consider the **Ocean Cleanup**, a nonprofit organization initiated by **Boyan Slat** as a young man, to offer the value of an effective means of removing plastic from oceans, which he hypothesized would prompt deployment and the change of ocean cleanup:

- An innovation example that begins with an hypothesis for new technical capability (or invention):
  A more effective way to remove plastic from oceans – via a device that intercepts even microbits of plastic by making use of ocean currents.

- The nature of practitioners' personal connections to the new offering or to a purpose associated with the offering:
  Love of recreational ocean diving led the teen-age Slat to observe how much oceans were becoming "littered" with plastic and to personal agitation. He described himself as a member of a generation left to deal with a massive problem.

- The knowledge this practitioner connected to come up with his initial "what could be" idea for new technical capability:
  Knowledge linked to being a recreational diver included basic knowledge of ocean currents. His initial knowledge and agitation generated the seed of an idea for new technical capability, which he believed could prompt the change of active ocean cleanup. The prospect of this change prompted him to gain new knowledge and to test the technical idea within school science projects.

- Knowledge the practitioner worked on developing:
  Using high school and college science projects not only to gain new knowledge (e.g., high concentrations of plastic and microplastics trapped by several large rotating ocean currents, or gyres, like the "Great Pacific Garbage Patch; poisoning of food chain; knowledge that there was no existing "treatment" that could meet the cleanup task), but also to build and test a series of prototype devices based on the initial idea that Slat generated during a diving trip as a teenager.

- Knowledge the practitioner had and connected in working on subsequent "how to" hypotheses once he completed college:
  Acting on the knowledge of test results of his prototype devices, plus belief that others cared about the purpose as much as he did, Slat delivered a TED Talk to share his device idea and prototype results as a way to recruit professional technical support, as volunteers, to continue device development toward the goal of gaining paying customers to allow for deployment.

- The nature of customer adoption needed for societal effect:
  Adoption by large customers, such as nations, who would pay for clean up in ocean areas that affected their society and/or attention to key ocean patches of plastic "garbage."

- Types of, and extent of, intended and resulting societal effect:
  Direct effect of change on "planet." Possibly indirect effects on "profit" in support of industries such as fishing and/or on a customer nation's economy, and on the "people" employed within the affected industries and/or living within affected customer nations

See the the Ocean Cleanup's current website and video of Boyan Slat's TED Talk: How the oceans can clean themselves: Boyan Slat at TEDxDelft

Any innovation example – large, small, successful, not successful – could be unpacked per a set of prompts that emphasize different aspects of an offering's concrete illustration of Innovation's fundamentals. For example, various prompts for mental engagement might include these:

- The practitioner's original point(s) of reference. For example:
  - starting with new technical capability or new knowledge
  - starting with observation (of customers, industry, etc.)
- Role of technology and its centrality to the offering (e.g., new technology, such as artificial intelligence, versus "appropriate" technology versus new application of existing technology versus no central technology role).
- The levels, types, and strands of *knowledge* connected as hypotheses.

  Intelligibility can encourage students to consider the association of "T-Shaped" knowledge with fertile new connections, or hypotheses.

  Similarly, students can consider the proposition that engaged experiences with the Humanities support Innovation's hypotheses:

  > "For, in effect, the humanities have as their implicit agenda the cultivation of hypotheses, the art of hypothesis generating … It is in hypothesis generating (rather than in hypothesis falsification) that one cultivates multiple perspectives and possible worlds to match the requirements of those perspectives." [79]
  >
  > Crucial perspective is gained from the humanities "... by absorbing, through literature, religion, psychology, sociology, drama and the like, the hopes, fears, aspirations and dilemmas of (one's) people and of the species."[80]

- Classifications of leverage (e.g., “incremental” vs “breakthrough”) and scale (e.g., large established organization vs startup venture), which could begin with an established classification system (e.g., by Jeff DeGraff and Shawn Quinn [81]).
- Similarities to other offerings (e.g., the Uber of private jets).

Established Models & Tools --

A subset of existing Innovation models (including conceptualizations) and tools can be drawn upon in specific support of Intelligibility and specifically in support of “unpacking” examples. Although the models have been developed to support new ideas and implementation; however, this subset of models and tools in particular can aid understanding innovation and its methods. Plus, an initial step of *understanding them* is likely to benefit subsequent use. At present, some (but not all) of these tools are geared toward professionals or more advanced students. There is a seeming opportunity though to translate some of the tools into a form suitable for young students. The following list of examples begins with models and tools that could be used by all ages:

Clayton Christensen proposes viewing customer needs through the lens of the **“jobs”** they need to get done.[82]

“The Ten Faces of Innovation” emphasizes that there is more than one productive personal style of attunement to, and engagement with, innovation's purpose. **Ten different personal orientations** (e.g., the anthropologist, the experimenter, the convener, the cross-pollinator) are divided into three groups: “learning personas, organizing personas, and building personas.” [83]

With IDEO’s origination, “**design thinking**” begins with a brief of a problem to be addressed and emphasizes observation that is empathetic and includes ”watching what people don’t do and listening to what they don’t say.” Then it builds on this approach to detecting opportunity with processes for designing an effective treatment (usually an hypothesis for “what could be”). The more interdisciplinary the team involved (not multidisciplinary, the author emphasizes), the better the prospects for hypotheses that represent high-leverage opportunities.[84]

Peter Drucker held that all innovation results from one or more of seven **“symptoms,**” which can and should be actively observed. [85]

Stephen Goldsmith identified four “**discovery methods**” within the context of the *social production system* for identifying a catalyst for transformative change.[86]

Clayton Christensen also offered the theory of "**Disruptive Innovations**," described as: "Not breakthrough technologies that make good products better; rather, they are innovations that make products and services more accessible and affordable, thereby making them available to a larger population.[87]

Roger Martin built on the original design thinking model to describe what might be thought of four models for connecting knowledge within "what could be" hypotheses, specifically for business ideas – e.g.,"**integrative thinking**," which is oriented to merging opposing tensions into a novel, productive idea.[88]

The aim of "**mass customization**" follows from C.K. Prahalad and M.S. Krishnan's model for "maximal value" of "N=1; R=G," which emphasizes an ever-improving match between customer interests and global resources, which the authors argue has been gaining traction for years, not a new idea. Total optimal value is realized when value is customized for every individual customer (N=1) by drawing on a global span of resources (R=G).[89]

"**Intellectual capital**" speaks to three primary forms of resources that can be leveraged in support of Innovation:

- "Customer capital" focuses upon mutual learning between customer and practitioner, oriented to qualitative methods.
- "Structural capital" organizes and distributes strategically collected data for:
  - rapid knowledge sharing
  - collective knowledge growth
  - shortened lead times
  - more productive people.
- "Human capital" denotes human resources possessing both pertinent knowledge and innovation capability, including capability in generating and using customer capital and structural capital.[90]

Over time, the constant lens of innovation's fundamentals (*especially in combination with plentiful examples and also with the support of certain models and tools),* can launch and support deepening intelligibility, along with support for deepening inspiration and engagement.

B. Lever of Engagement

> *"No amount of doubling down on math and science courses is going to produce the innovators we need in the 21st century. ... The key is engagement." [91]*
>
> –Richard Miller, President, Olin College of Engineering

Engagement Facilitators –

The provisional framework of Innovation's fundamentals shines light on at least three aspects of Innovation that might facilitate student engagement within a schooling context, including among young students. Combining all three facilitators might work especially well:

- ***The "power of small" –*** This opportunity is based largely on Peter Drucker's argument that innovation "pertains to all activities of human beings other than those one might term existential rather than social."[92]

  Ideas and action situated in small contexts -- when they work or strike one as promising or interesting -- can be strong not only in leverage, but in experiential reward and in learning effect.

  Additionally, Douglas & Seely Brown argue for *bounded* engagement: "Students learn best when they are able to follow their passion and operate within the constraints of a bounded environment."[93]

  A series of continually positive "just right" experiences, perhaps even beginning with "mental engagement," can lead continually upward in development (given Csikszentmihalyi's argument that there is growth in every "just right" experience).[94]

- ***Hypotheses as a familiar on-ramp -*** Innovation's essential creative structure of hypotheses – a structure that students know from early instruction in Science – can support digesting the distinctive attributes of Innovation's hypotheses and support early attempts at developing Innovation hypotheses.

  There's additional familiarity when Innovation's "what could be" hypotheses are boiled down to the notion of possibilities for *new value*. Even young students have vast experience as customers (of proposed value). The complementary hypotheses of "how it could become" are likely less familiar, and thus can benefit especially from beginning small and with situations where students already possess pertinent knowledge (e.g., classroom and school situations).

- ***Power of Student Interest –*** Again, Douglas and Seeley Brown provide sample arguments that personalization also facilitates effective engagement:
  - "The passion of the learner is the greatest source of inspiration but also the largest reservoir of tacit knowledge," and "(tacit understanding)

relates most deeply to the associations and connections among various pieces of knowledge."[95]

- Again: "Students learn best when they are able to follow their passion and operate within the constraints of a bounded environment."[95]

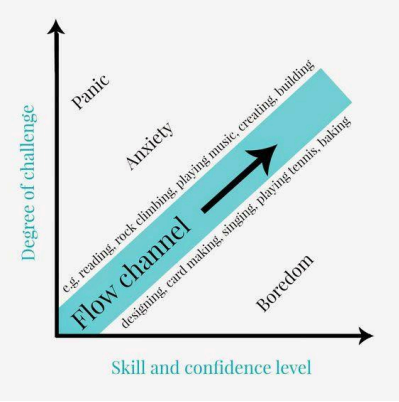
- Good questions are especially important, and peer-to-peer learning is integral, based on active engagement within "collectives of purpose" -- where there is shared interest in a purpose.[95]

Similarly, IDEO's General Manager, Tom Kelley, advised:

- "(T)his work [of understanding customers] requires curiosity. How can you get better at it? Find a field that commands your interest." [96]

Even for the smallest experiences, engagement can likely benefit from students' authentic interest in the subject matter.

Scaffolding Engagement –



The opportunity for scaffolding engagement borrows from Csikszentmihalyi's example of a "flow" channel, where each of a series of experiences is neither too difficult nor too easy. If the experience is too difficult, it provokes anxiety, or perhaps disinterest and lost opportunity in the case of innovation's methods. If it's too easy, it's boring. [97]

Willingham reinforces the notion of this "just right" channel: "Working on problems that are of the right level of difficulty is rewarding, but working on problems that are too easy or too difficult is unpleasant." [98]

Most important ultimately, Csikszentmihalyi holds that every experience within the flow channel produces growth in abilities, for a potential channel of ever-developing growth and personal evolution. [99]

This overall approach seems similar to existing scaffolding with the methods of Science, which may offer a useful reference.

Benefits of Engagement – “Good” and “Good for You”

“Good” – It’s not unusual to find expectation of positive experiences for students when they engage with methods like Innovation’s. It’s noteworthy, however, that these expectations tend to imply *successful* engagement, which reinforces attention to engagement facilitators and to engagement scaffolding:

- "What is needed is an opportunity for youth to experience the joys and responsibilities of making things happen" ... including attention to "activities that are halfway between the spontaneous play of childhood and the serious work of adulthood."[100]
- "Effective surprise" -- "Good observations often *seem* simple in retrospect, but the truth is that it takes a certain discipline to step back from your routine and look at things with a fresh eye."[101] As Wendy Kopp put it regarding a national teacher corps, "How could this not already be in place?" [102]
- "A certain unclassifiable sixth sense of what is possible" -- following experience with a new idea that catalyzes change. [103]
- "Creative confidence" as described by IDEO's David Kelley and Tom Kelley.[104]
- "The creative process is ... one of the most powerful and intimate involvements with life."[105]
- Even "brushes with purpose." [106]

“Good for you” – Similarly, many voices advocate that engagement experiences are also good *for* students. Willingham argues that deep learning is above all a product of practice, especially hands-on practice, as it cultivates understanding of a subject's parts and whole, and it relates the challenging abstract concepts to the concrete.[107]

Such benefits of engagement contrast with one description of a status quo where: "We mainly train [adolescents] to be consumers -- of abstract information, entertainment, and mostly useless products -- with too little regard for concrete, active engagement with the environment."[108]

Concrete, active engagement with Innovation’s methods might help cultivate:

- Practical abilities -- especially for those who have undiscovered talents in this important practitioner skill area -- while containing the demands of implementation within learning contexts. [109]

- Innovation's version of participating in teams -- ideally "collectives of purpose" [110] -- where the dynamic can be both cross-functional (a division of specialized labor) and collaborative (a merging of minds).
- Learning from failing -- especially if learners recognize ways they didn't observe Innovation's fundamentals and especially if the failure motivates them to adjust and try again.
- Understanding that seemingly simple concepts (principles) often are not so simple to adhere to, including for longtime innovation practitioners.[111]

  In particular, practice can include the experience of finding oneself *strongly* attached to an idea ("inner-driven") in which there is not customer interest (*not* "other-focused"). This potential experience supports not forgetting the "simple" principle that customers are innovation's gatekeepers – it's customer adoption that catalyzes change. Practice supports learning to navigate the combination of inner-driven and other-focused.[112]
- A more instinctive *customer-focus* when applying technology or advances in science/invention toward innovation's purpose of resource leverage. As Steve Jobs famously put it: ~"We're the ones who are stupid if customers can't figure out how to operate the devices we make."
- Awareness of:
  - the extent of logistics involved in successful engagement even for small-scale efforts
  - noticing others' strengths in addition to discovering personal strengths
  - and much more.

Sample Scaffolding –

The following set of stages provide examples of the opportunity to scaffold engagement by utilizing the three leverage points of: the power of small; hypothesis as a familiar structure; and embedded personal guidance. Brief elaboration of each stage follows this sample list:

- *Mental engagement – including building on prior experiences*
- *Explore creativity practices (e.g., observation log)*
- *Test hypotheses*
- *Draw on Innovation models and tools* (e.g, with some providing the option of "recipes")
- *Extra-curricular engagement*
- *Aim toward elements of mature creativity*

Within the following brief elaboration, *note the prevalence of engaging with the methodology's essential creative structure of hypotheses*:

1. *Generative* Mental Engagement – including building on prior experiences

In addition to “unpacking” examples provided in the prior “Intelligibility” section, which emphasize understanding by “taking in” an example, different types of mental engagement can support students in early *generative* engagement.

For example, drawing on a subject that is known and personally important (perhaps recycling), questions like those below can be engaged and then related back to the framework of Innovation’s fundamentals:

- How much of what you *could* recycle [readily] do you actually recycle (or compost, etc.)? When you don't recycle, what's the reason?
- Is "value" associated with your amount of recycling -- value such as "ease" and/or "meaning" (connection to a purpose larger than oneself).
- What might lead you to recycle more? (Or less?)
- What might you do if you wanted to increase others' recycling/composting in a given context (home, classroom, cafeteria, school, restaurants, etc.)? What new value might change your customers’ behavior?
    - Consider intuition-based answers as working hypotheses. Express the ideas in the form of hypotheses. Probe for what knowledge students are drawing upon.
    - Ask how they might test their ideas and/or how they might *investigate* what types of value would influence "customers" (gatekeepers) in that context
- Proceed with "how" hypotheses.
    - The array of "how" hypotheses that arise intuitively might then be sketched into a large "business model canvas" (or simplified version).
    - Students could work in groups on this or on different types of examples, guided by their interest, and the class could then consider the different examples (and/or the work of other groups.
- With hypotheses generated from intuition, briefly unpack them. Ask students to consider what knowledge they drew upon for their hypotheses. What's the category/strand of that knowledge? What is *not* known that might matter?
- Within class sharing, make constant reference to the framework of fundamentals. Also, utilize pedagogical practices such as those from Writers' Workshop (e.g., beginning with "I like [this element of what you’ve presented]" and proceeding with ["I'd like to see ..."], etc.).
- If student motivation is present, proceed with testing and/or implementing or “park” the example for future consideration.
- After this exercise, refer to the real-world example of the then-new offering of curbside recycling pick-up (which provided the value of “ease” of recycling)..

2. Elaborate & explore creativity *practices*

Per the work of resources such as author Steven Johnson, who investigated and elaborated a set of practices he associated with fertile creativity among an array of creators (including Charles Darwin) across the domains of science, invention, and innovation, over centuries [113]:

> *Have students engage with examples of the practices, such as **logging observations***. Begin by sharing with students accounts of how Johnson found this to be a fertile practice associated with big ideas of the past.
>
> Add scaffolding such as "questions for the week," tailored perhaps to particular innovation concepts. For example, honing in on the concept of Innovation's function of *resource leverage*, a question for the week might be:
>
> - Where do I see resources underutilized? Or where do I see waste?
>   Examples of what students might log: Many school buildings are empty all summer and on weekends. Youth have talents/strengths/interests that a community could benefit from. A lot of edible food goes to landfills. Outgrown resources like youth sports equipment, books, etc., are stored in family homes.
>
> - In advance of logging, introduce the practice by discussing actual innovation examples that have focused on the innovator practice that highlights the question for the week.
>   For example, Salman Khan, in founding the Khan Academy referred to the "ridiculously underutilized resource of the Internet" for benefits to education. The overall "sharing" economy also offers a cluster of examples (e.g., AirBnB, Uber). Varied examples can keep students' minds open in support of interesting different logging experiences.
>
> - Generally, guide students to actively consider resources of all types, including knowledge/information resources, human resources, recreation resources, etc.
>
> - After the period of observation, have students reflect independently on what they logged, including any ideas they considered for making the resources more fruitful. Are ideas based on offering *new value* to a set of "customers"?
> - Share observations with other students. As one approach, the instructor could cluster students' observations into categories for posting in the classroom. The clusters and particular examples then could be discussed, built upon, and potentially even serve as a basis for (bounded) implementation.

The same practice of logging observations could be applied to other Innovation concepts. For example, "value as a force for change" could be associated with an observation question of the week such as:

- Where are people experiencing "rough edges" in their activities? For example: hard for youth to find a babysitting job and/or for adults to find babysitters, experiences of being new to a school, experiences of being bullied, some kids want to play sports and don't have the resources for equipment.
- Or similarly, where do I notice opportunities for improvement in the value of what is being offered (e.g., school lunches? raise funds with better offering than selling popcorn or pizza dough?)
- At some point, encourage students to log observations that they associate with a topic of special personal interest.

Structured exercises for different creativity practices could help students develop day-to-day consciousness of innovation's purpose and cultivate awareness of opportunities. Practices can help bring Innovation's unifying concepts to life, supporting "deep memory" of the framework of fundamentals and supporting "opportunity finding." Also, experiences with a variety of practices could lead to student adoption of preferred practices (an element of personal connection).

3. Hypothesis Testing

Hypothesis testing includes the instructional-context benefit of being bounded and yet is fundamental to Innovation's practice. To begin, the *purpose-based departure* of Innovation's hypotheses from those of Science can prompt students to consider the different *basis for testing* Innovation's hypotheses and implications for *designing* those tests:

- For the type of change associated with science, the "truth" of an hypothesis is with respect to a formal, existing reality.
- For innovation's type of change, "truth" is with respect to customer response to the new value hypothesized – will customers adopt the value? The equivalent applies to innovation's "how" hypotheses.

Overall, the rigor and nature of testing innovation's hypotheses reflects the distinctive purpose, and testing decisions are determined by a practitioner's judgement, often linked to the nature of resources at stake. For example:

> *What are we prepared to lose?*
>
> *What is at stake if the idea doesn't look hopeful, or upon implementation if the idea doesn't work (could the resources involved have been better used)?*
>
> *How accurate do we want the gauge to be? This may vary for the task of exploring hypotheses vs making decisions about implementation.*

The gold standard of rigor for testing hypotheses *of any type* is rooted in the testing methods of science (e.g., validity and reliability), and in some instructional contexts, designs for testing innovation hypotheses may draw on methods of science. However, innovation's distinctive purpose is the gold standard for the range of testing decisions:

- In-person testing could exercise students' empathy muscles, supporting attention to customers as gatekeepers.
- Testing also could involve hands-on experience with the practice of prototyping, especially with developing a "minimum viable product" -- as minimal as drawing a picture of an envisioned offering.
- Finally, testing could lead to *revising* hypotheses (and/or testing revisions).

4. Draw on Innovation Models & Tools

The message within a cookbook's introduction from Julia Child and colleagues speaks to the support that "recipes" can provide for early hands-on practice with "fundamental techniques":

> "Our primary purpose in this book is to teach you how to cook, so that you will understand fundamental techniques and gradually be able to divorce yourself from a dependence on recipes." [114]

Since innovation's framework of fundamentals *situates* an array of models and tools, continued reference to the framework can facilitate experimenting with different tools and also support recognizing how various tools provide differing aspects of support.

One important caveat is that a recipe/tool is not a substitute for understanding the context of change. As expressed by prominent designer Donald Norman:

> "Today … designers work on organizational structure and social problems, on interaction, service, and experience design. Many problems involve complex social and political issues. As a result, designers have become applied behavioral scientists, but they are woefully undereducated for the task. Designers often fail to understand the complexity of the issues and the depth of knowledge already known. They claim that fresh eyes can produce novel solutions, but then they wonder why these solutions are seldom implemented, or if implemented, why they fail. Fresh eyes can indeed produce insightful results, but the eyes must also be educated and knowledgeable."[114.5]

With caveats like this in mind, tools can be selected based on varying tasks (e.g., from hypothesis generation to testing, implementing, and assessing):

- Some models and tools emphasize an overall process, including generating and implementing hypotheses, along the lines of a recipe for cooking (e.g., "design thinking" and "lean startup").

  Other models and tools support one or more particular aspects of the work (e.g., a model of ten innovator "personas" describes varying ways to connect personally to innovation's purpose and practice).

  Also, in some cases, it is skilled cooks, not beginners, who can make the best use of a model (e.g., the benchmarks of "disruption").[87]

- For students, the combination of a framework of fundamentals and models/tools is complementary and potentially synergistic. For example: as the intelligibility offered by fundamentals sets the stage, tools might support students in getting started, with the fundamentals providing checks along the way (e.g., considering *all* pertinent strands of knowledge for hypotheses, confirming that customers find forcefully positive value in the offering, etc.

- Overall, with the framework of fundamentals situating models and tools, students can be encouraged to try out different models and tools and can learn to use them nimbly.

5. Extracurricular Engagement

Since innovation fundamentally involves producing new value, students can draw upon their developing consciousness of Innovation's forces (and methods) as they pursue activities that they might already be engaging. For example:

- As school or community volunteers or employees, students who love an academic subject could try leveraging that personal resource by offering the value of tutoring to younger students, perhaps adding value by completing *training* in tutoring. Testing “how” hypotheses might include contact with school and/or neighborhood adults, PTO leaders, etc. Eventually, students might develop a scheduling tool (or they might find a “partner” to do so).

- Students could make greater use of their existing technological savvy (often an underutilized “resource”) by supporting certain customer segments not as savvy, especially as artificial intelligence is likely to broaden the divide. For example, they could develop or improve organization websites (perhaps using ‘vibe coding”), offer support for learning basic tasks such as nimble use of music playlists, Skype or Facetime, basic photo and video editing, etc.

- School organization fundraising efforts represent another example of activity already happening, where the same basic task of incorporating innovation's forces could be engaged. For example, is there an option for more compelling value than flavored popcorn? Ideas/hypotheses could be tested/iterated as could approaches to all logistics (the business model).

Any activity associated with producing change by way of value invites practice with innovation's methods, beginning with the essential creative structure of hypotheses – generating and testing them. Any activity also can situate hypotheses within a plan for action (e.g., using the Business Model Canvas).

Since bounded extracurricular conditions (e.g., one-time events) do not call for the same type of commitment as starting a business, they can invite trying out ideas. At a minimum, these opportunities allow for hands-on practice with Innovation's purpose, forces, and methods.

6. Aim Toward Maturing Creativity

Descriptions of mature creative capability reinforce the value of having a means to scaffolding learning. They reinforce the pertinence of intentional and structured cultivation over time.

For example, consider the developmental demands indicated by Robert Sternberg's WICS model (Wisdom, Intelligence, and Creativity Synthesized), which unpacks fundamental elements of mature creativity for the explicit purpose of understanding what is to be learned. [115]

> Building on a period of funded creativity scholarship from the latter half of the 20th century, Sternberg drew on the work of multiple scholars in elaborating this model: "Wisdom, Intelligence, Creativity Synthesized (WICS)." He presents the elements in reverse order of the WICS acronym:
>
> - "Creativity": "(W)ork that is novel (original, unexpected), high in quality, and appropriate (useful, meets task constraints)."
>
> "Creavity is the potential to produce and implement ideas that are novel and high in quality. (Creativity) goes beyond creative intelligence ... in that it contains attitudinal, motivational, personality, and environmental components as well as the cognitive one of creative intelligence."
>
> - Intelligence: "Creative work and the broad-based creativity underlying it, requires applying and balancing the three intellectual abilities -- creative, analytical, and practical -- all of which can be developed."
>
> "Creative ability is used to generate ideas. ... Without well-developed analytical ability, the creative thinker is as likely to pursue bad ideas as to

pursue good ones ... Practical ability is used to translate theory into practice and abstract ideas into practical accomplishments. It is also used to convince other people that an idea is valuable ... (and) to recognize ideas that have a potential audience."

- "Analytical ability involves analyzing, evaluating, judging, inferring, critiquing, and comparing and contrasting."
- "Creative ability involves creating, designing, inventing, imagining, supposing, and exploring."
- "Practical ability involves applying, using, implementing, contextualizing, and putting into practice."

- Wisdom: "People can be intelligent and even creative but also foolish."

  "(W)isdom is the application of intelligence, creativity, and knowledge as mediated by positive ethical values toward the achievement of a common good through a balance among (a) intrapersonal, (b) interpersonal, and (c) extrapersonal interests over the short and long term."

Additional descriptors of mature creativity, from a range of sources, include notable themes:

Teams --
In recent decades in particular, it has become commonly held that learning to be creative *within a team* represents a fundamental element of maturing creative capability.

Innovation by nature is cross-functional, but not a simple division of labor. Douglas Thomas and John Seely Brown have referred to a collaborative meeting of minds, with reference to modern teams as *"collectives of purpose,"* where cross-functional work is deeply collaborative.[116]

Internal and external conditions --
Multiple thought leaders associate the mature creative process with both *internal and external conditions* that are *robust* in terms of: openness; flexibility, and complexity. As one example:

> Social innovation thought and action leader, John W. Gardner, noted that making complexity productive requires a "tolerance" that is borne of "profound confidence" in one's capacity to "bring some kind of new order" from "a wild profusion of ideas and experience." [117]

For most students, this quality of confidence is almost certainly a product of experience and development. Especially if intrinsic motivation takes hold, young learners could help create fertile external conditions that support

peers' engagement and learning. In fact, students are likely to influence learning environments and to do so in big ways.

Support for Discernment –
Jerome Bruner provided an early voice for considering "discernment" the most important creative ability:

> "To create consists precisely in not making useless combinations and in making those which are useful and which are only a small minority. Invention is discernment, choice." [118]

Csikszentmihalyi and others also spoke of discernment as central, specifically with respect to the evolving state of the world:

> "It is no longer possible for mankind to blunder about self indulgently … The most important challenge that confronts us now is learning how to assess the pros and cons of the fruits of our imagination." [119]

Leadership –
Joseph Schumpeter described the early capitalist entrepreneur as "just another leader," evolving from and displacing the feudal system.[119.5]. And organizational psychologist Robert Quinn refers to the "fundamental stance of leadership" as being "inner-driven and other-focused," which fits well within innovation's practice where customers ("other") are the judges of the value and gatekeepers of change, and where practitioners conceive of the value, in connection with a purpose ("inner-driven"). Quinn argues that it is this stance, not a position within an organization chart, that determines the actual effect of leadership, which is accessible to all.[120]

Style of Thought --
Bruner also referred to a "style of thought" that distinguishes any discipline and that requires time and participation for absorption. (e.g., "function" within biology).

> "Increasing experience with a subject may be necessary to bring the meaning of its style of thought "increasingly to light." [121]

For innovation, style-of-thought candidates might be "change by way of value" or "leverage" and/or "inner-driven and other-focused."

C. Lever of Embedded Personalized Guidance

> *"If (young people) are to commit themselves to the best in their own society, it is not exhortation they need but instruction."* [122]
>
> –John W. Gardner

Even the earliest experiences of learning about Innovation can benefit from an instructional aim to emphasize students' consciousness about Innovation examples that they find important, compelling, interesting – or not – and to think about which ways of contributing might best express their personal strengths -– ways in which they're most naturally effective, which for many or most students would involve a learning process in itself (some students may never have used their signature strengths in a school setting, others may have limited or zero awareness of strengths they possess that others don't).

Like a theatrical production, with roles that extend well beyond lead actors (to lighting, music, stage sets, costumes, marketing, etc.), the roles involved in conceiving, designing, and producing change-catalyzing value tend to be many and varied – even when scale is very small.

There is enough value in a larger purpose, or venture, to extend to many types of Innovation practitioners who collaborate to advance a shared purpose with shared understanding and language about Innovation.

- Peter Drucker argued:

  "Innovators … need to be temperamentally attuned to the innovative opportunity. It must be important to them and make sense to them. Otherwise they will not be willing to put in the persistent, hard, frustrating work that successful innovation always requires."[123]

- C.K. Prahalad advised a cohort of Acumen Fund Fellows:

  “Don’t do (this work) … for morality only. Do it because intellectually it’s the most exciting thing you can aspire to as a young person.”[124]

- Steve Case, co-founder of AOL and chair of the Startup America Partnership, has described entrepreneurship as a model of “people, passion, and perseverance.”[125]

  “People” refers to a team’s shared belief in, and passion for, the vision of what could be. And perseverance includes all that goes into the “overnight success” that is “ten years in the making.”[125]

- Douglas Thomas and John Seely Brown in *The New Culture of Learning*, reinforce the function of personally compelling purpose, which they refer to as “passion,” in their call for "a new culture of learning" -- beginning with formal schooling -- one that cultivates the imagination for a world of *constant* change and where continuous learning is lifelong.[126] However, like many others, Thomas and Seely Brown also note that not every student is connected with a passion (or purpose): "Discovering one's passion can be complicated."[127]

Damon was disturbed by the low incidence of student connection with a purpose that he found among high school students in his nationally-representative research, as conveyed in this document’s Part Two. Arguing that it shouldn’t be so difficult for youth to connect with a compelling larger purpose, Damon identified a twelve-step process that he found had characterized the (relatively rare) successful development of purpose among students.

The balance of this section outlines the steps that Damon elaborated and maps them to potential Innovation instruction, with one substitution. Whereas Damon emphasized the integral fit of support from a student’s immediate family and community, if that support is substituted (or expanded) with “support associated with learning about innovation,” there is noteworthy resemblance between a fundamentals-based process for learning about innovation and the steps that Damon found to lead youth to make long-term commitment to a purpose larger than the self and also personally-compelling. Damon’s steps are listed just below, followed by the mapping:

1. Inspiring communication with persons outside the immediate family
2. Observation of purposeful people at work
3. First moment of revelation: something important in the world can be corrected or improved.
4. Second moment of revelation: I can contribute myself and make a difference

5. Identification of purpose, along with initial attempts to accomplish something
6. Support from immediate family
7. Expanded efforts to pursue one's purpose in original and consequential ways
8. Acquiring the skills needed for this purpose
9. Increased practical effectiveness
10. Enhanced optimism and self-confidence
11. Long-term commitment to the purpose
12. Transfer of the skills and character strengths gained in pursuit of one purpose to other areas of one's life. [128]

Example of the mapping –
Consider the fit of Damon's process of steps for discovering purpose with the preceding sections on instruction opportunities associated with the provisional framework of Innovation's fundamentals:

Steps 1-3:
1. Inspiring communication with persons outside the immediate family
2. Observation of purposeful people at work
3. First moment of revelation: something important in the world can be corrected or improved.

These steps were addressed under the learning leverage point heading of "Intelligibility" above, including the following quote and comments:

> "Humans can observe and/or be shown how activities of humans have changed the environment, fostering realization that other people may be able to also bring about change ... A sense of what has been done helps lead to a sense of what might be done as well as an appreciation for the kinds of established constraints that might affect imagined changes." [129]

Intelligibility's combination of unifying concepts and varying types of examples, especially in combination with the pedagogical power of "stories," can help develop early connections to students' authentic interests. Learners are encouraged to reflect on the types of real-world innovation examples that appeal to them (e.g., considering favorite examples, appealing roles, etc.). Intelligibility facilitates understanding common types of innovation variation, in support of personal connections, including multiple types of variation:

- Practitioner styles and roles, guided in part by models like ten innovation "personas," emphasizing that there is more than one productive personal style of attunement to, and engagement with, innovation's purpose. Within this model, ten different personal orientations (e.g., the anthropologist, the

experimenter, the convener, the cross-pollinator) are associated with different leanings, but with the same fundamental sensing of "sharp edges" of offerings "crying out for improvement." [130].

- Form of offerings (e.g. products vs experiences), nature of value offered (e.g., convenience), intended societal benefits (e.g., "profit vs. planet vs. people" – or a mixture), etc..

Plus, innovation's fundamentals help students see how the methodology relates to other types of methodologies and societal functions (as described under "Intelligibility"). This perspective can support understanding of personal leanings that do or do not call for direct use of innovation's methods -- in part by clarifying how methodologies relate and in part by articulating the overarching imperative for innovation's societal effects in the 21st century (with most everything relating). The closer that innovation examples can get to students' authentic interests (even latent or seedling interests), the more likely it seems that the learning will be received by students as compelling "value." Even *progress* in a personal sense of direction is likely to be valued.

Also, see the sketch for the potential new instructional tool of a searchable online gallery of innovation examples under Intelligibility in Part Three. This type of tool aims to support steps like those listed as 1-3.

Steps 4-10

4. Second moment of revelation: “I can contribute myself and make a difference”
5. Identification of purpose, along with initial attempts to accomplish something
6. Support from immediate family
7. Expanded efforts to pursue one's purpose in original and consequential ways
8. Acquiring the skills needed for this purpose
9. Increased practical effectiveness
10. Enhanced optimism and self-confidence

Steps like these were addressed under the "Engagement" section, within what could be a multi-year process of scaffolding.

Hands-on experiences support a whole different quality of exploration of innovation's varying ends and means, including unique qualities of feedback and discovery, which can support further exploration and/or development of *purpose*:

- Within every hands-on experience, there is opportunity for new perspective regarding personal connection in terms of both purpose and medium of expression. Like a theatrical production, with roles that extend well beyond lead actors (to lighting, music, stage sets, costumes, marketing, etc.), Innovation’s roles in conceiving, designing, and producing change-catalyzing value tend to be many and varied. There is enough value in a compelling purpose, or venture, to extend to many "practitioners."

- The nature of the collective effort also provides an example of how broad access to fundamentals-based innovation instruction might add to, or substitute for, the effect of the family support identified in Damon's process (as might positive customer response).
- Broad access to Innovation instruction, including engagement, also can generate creativity's fruitful external conditions (openness, flexibility, complexity), in support of *individuals'* fruitful internal conditions (again, openness, flexibility, complexity). To the extent that purpose discovery represents or resembles a creative process, these conditions themselves provide support for that process.

With repeated experiences over time, the combination of hands-on practice and deepening understanding of innovation's essential purpose and forces can provide continuing fodder for reflecting on personally compelling types of purpose.

- That includes gaining the type of perspective that allows for productive questions, which can facilitate related types of experience (e.g., decisions about internships, elective courses, summer and extra-curricular activities), all of which can contribute to continuing purpose development and also to more informed approaches to planning for post-secondary pathways.
- Increasingly linked to career navigation, this includes growing awareness of the types of personal strengths (many of which may not have been pertinent within academic work) that can support a developing sense of direction:
    - What types of value do I like to help create and/or put out into the world (or into my community)? What do I think can and should change in the world? What types of changemaking *roles* have I gravitated toward? What do these roles tell me about my strengths? What is my medium of expression?
    - If I lean toward a "planet/sustainability" category of purpose (for example), do I prefer innovation's direct means of addressing that purpose or an indirect, pipeline means (e.g., advancing knowledge via methods of science/research, advancing technical capability via methods of invention/technology)?

Steps 11-12:
11. Long-term commitment to the purpose.
12. Transfer of the skills and character strengths gained in pursuit of one purpose to other areas of one's life.

The combination of these last two steps brings to mind Seligman’s depiction of “the full life,” associated with the meaning of personal connection to a larger purpose as an integral element and also assuming a life that includes engagement of one’s signature strengths.

At a minimum, if well-being theory is correct that meaning and engagement of strengths are associated with the rare quality of experience valued “for its sake alone,” it’s likely that discovery would support grounded commitment and transfer.

Echoes of, and response to, John W. Gardner --

Again, innovation instruction based on a framework of fundamentals, which features the call for, and value of, personal connection to the larger social enterprise, might be viewed as a response to John Gardner's 1963 call to action, which remains utterly relevant today:

> "(W)e must help the individual to re-establish a meaningful relationship with a larger context of purpose. … (O)ne of the reasons young people do not commit themselves to the larger social enterprise is that they are genuinely baffled as to the nature of that enterprise. … They do not see where they fit in. If they are to commit themselves to the best in their own society, it is not exhortation they need but instruction. … We must also help the individual to discover how such commitments may be made without surrendering individuality." [131]

Today, Gardner’s last sentence might be rephrased: “*We must also help the individual to discover how much energizing enrichment and meaning there is in committing themselves to the best in their own society.”*

Indeed, Bruner wrote in 1960 (well before early phases of implementing artificial intelligence many decades later):

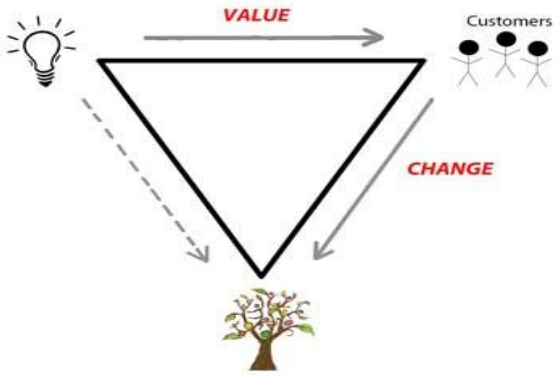
> “One thing seems clear: if all students are helped to the full utilization of their intellectual powers, we will have a better chance of surviving as a democracy in an age of enormous technological and social complexity.”[132]

IN SUM -- Leveraging the Combination of an Innovation Framework & Students' Progress in Personal Direction

If the structured exploration of personally-compelling purpose that is embedded in fundamentals-based innovation instruction can facilitate progress in a personal sense of direction, student experiences of progress are likely to be received as "forcefully positive value" (based on Seligman's "well-being" theory).

The human value for purpose may provide the ultimate leverage point – the secret sauce – for learning about innovation. It may be precisely because of this particular value and its positive force that broad student access to innovation instruction stands a chance of addressing the societal "ill" of needed advances in innovation's effects.

Broad access to early and continuing innovation instruction seems significant as a possibility for catalyzing the positive-sum change of more flourishing individual lives and more societal capability for *responsible versions* of innovation's needed effects.



NOTES:

[1] Said of Bill Drayton by McKinsey & Company manager in: David Bornstein, *How to Change the World, Social Entrepreneurs and the Power of New Ideas*, (Oxford University Press, New York, NY, 2004), p 53
[1.5] Jerome S. Bruner, *The Process of Education*, (Harvard University Press, 1960), p 31
[2] Daniel T. Willingham, *Why Don't Students Like School?*, (Jossey-Bass: San Francisco, 2009), p 68
[3] Michael Crow, President, Arizona State University, presented in keynote talk for national university program of Ashoka: Innovators for the Public, hosted spring 2010 by Arizona State University.
[4]The expression and concept of "integrating and applying" knowledge (as opposed to the university's traditional focus on "generating" knowledge, with attendant reward systems) comes from Clayton M. Christensen and Henry J. Eyring, *The Innovative University: Changing the DNA of Higher Education from the Inside Out,* (Jossey-Bass: San Francisco, 2011).
[5] Jerome S. Bruner, *Actual Minds, Possible Worlds*, (Harvard University Press, 1986), p 13. Bruner differentiates between "paradigmatic imagination" – "the ability to see possible formal connections (of existing knowledge) before one is able to prove them in any way" – and "narrative imagination" (e.g., "gripping drama). Although "paradigmatic" implies hypotheses of science, with respect to an existing formal system of reality, the notion of new connections of existing knowledge fits also with descriptions of innovation's ideas regarding new opportunities. See, for example: *(a)* Steven Johnson, *Where Good Ideas Come From: The Natural History of Innovation*, (New York Riverhead Books, 2010) and *(b)* Steven Blank, keynote speaker at "Lessons Learned" conference, spring 2010, where he depicted "startup" ventures as needing to generate a combination of "what" and "how" hypotheses as they fit into a business model, such as "the business model canvas," a product of Alexander Osterwalder, based on his 2005 PhD work supervised by Yves Pigneur [Alexander Osterwalder & Yves Pigneur, Business Model Generation, (John Wiley & Sons: 2010)]. Blank proceeded to use this business model platform in working with the U.S. National Science Foundation to design training for academics regarding translating scientific discoveries to the marketplace,.
[6] Jean Baptiste Say, A Treatise on Political Economy, (1821), Book I, Chapter I
[7] Peter F. Drucker, *Innovation and Entrepreneurship*, (HarperBusiness, 1985), p 7
[8] Bruner, 1960, p 11
[9] Bruner, 1960, p 7
[10] Bruner, 1960, p 7
[11] Willingham, 2009, p 67
[12] Bruner, 1960
[13] Drucker, 1985, p 35
[14] See footnote [5] above.
[15] Jean Baptiste Say, *A Treatise on Political Economy*, (1821), Book I, Chapter I
[16] Bruner, 1986, p 52 & John W. Gardner, *On Leadership*, (The Free Press: New York, NY, 1990)
[17] Ken Robinson, *Out of Our Minds, Learning to Be Creative* (Capstone Publishing: UK, 2011), p 131, p 142
[18] Bruner, 1960 & Willingham, 2009, p 27
[19] Bruner, 1960, p 12
[20] Peter F. Drucker, *Post-Capitalist Society*, (Harper Press, 1993), p 46
[21] Drucker, 1993, p 46
[22] See elaboration of this table at https://innovationagents.org/. See narrative account of initial sources at https://innovationagents.org/wp-content/uploads/2026/03/Themes_March2026.pdf.
[23] Drucker, 1985, p 27
[24] Douglas Thomas and John Seely Brown, *A New Culture of Learning, Cultivating the Imagination for a World of Constant Change*, (Create Space: Lexington, KY, 2011)
[25] Steven Johnson, *Where Good Ideas Come From: The Natural History of Innovation*, (New York Riverhead Books, 2010)
[28] Martin E. P. Seligman, *Flourish, A Visionary New Understanding of Happiness and Well-being*, (Free Press, Simon & Schuster: New York, 2011)
[29] William Damon, *Path to Purpose, How Young People Find their Calling in Life* (Simon&Schuster: New York, 2008)

[30] See for example the demands depicted in: Robert J. Sternberg, *Wisdom, Intelligence, and Creativity Synthesized*, (Cambridge University Press: Cambridge, UK, New York, 2003)
[31] Mihaly Csikszentmihalyi, *Creativity: Flow and the Psychology of Discovery and Invention*, (HarperCollins: New York, 1996), p 338
[32] Clayton M. Christensen, Michael B. Horn, & Curtis W. Johnson, *Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns,* (McGraw-Hill: New York, 2011). On p 32, the authors describe Dell computers "under the lid" as a collection of separately manufactured parts that are configurable to each customer's specifications based on a modular interface among the parts. In this paper, the suggestion is that shared reference to the methodology's fundamentals can provide the modular interface that connects participants within otherwise varying venues.
[33] John W. Gardner,*Self-renewal; the individual and the innovative society* (Harper & Rowe, New York, 1963), p5, p7
[34] Robert E. Quinn, *Change the World: How Ordinary People Can Accomplish Extraordinary Things*, (Jossey-Bass: San Francisco, 2000). Also: "Determination and Openness," www.ThePositiveOrganization.wordpress.com, Feb. 22, 2016
[35] Seligman, 2011
[36] Seligman, 2011
[37] Damon, 2008, p 106
[38] Damon, 2008, p 120
[39] Damon, 2008, ch 2
[40] Damon, 2008, p 32
[41] Damon, 2008, p 113
[42] Damon, 2008
[43] Damon, 2008, p 94
[44] Damon, 2008, p 113
[45] Damon, 2008, p 109
[46] Robert E. Quinn, 2000. Also: "Determination and Openness," www.ThePositiveOrganization.wordpress.com, Feb. 22, 2016
[47] Daniel T. Willingham, *Why Don't Students Like School?*, (Jossey-Bass: San Francisco, 2009)
[48] Education Week, June 8, 2017, Teacher Blog, "Most Students Are Not Naturally Interested in STEM, Teachers Say"
[49] Gallup News, "The School Cliff: Student Engagement Drops With Each School Year," Jan. 7, 2013, https://news.gallup.com/opinion/gallup/170525/school-cliff-student-engagement-drops-school-year.aspx
[50] Damon, 2008, p 59
[51] Damon, 2008, p 80
[52] Damon, 2008, p 104
[53] Damon, 2008, p 103
[54] Damon, 2008, p 106
[55] Douglas Thomas and John Seely Brown in *A New Culture of Learning, Cultivating the Imagination for a World of Constant Change*, (Create Space: Lexington, KY, 2011)
[56] Two Stanford professors wrote a book after a course they offered on "Designing Your Life" became so popular that it became standard for all Stanford freshmen: Bill Burnett and Dave Evans, *Designing Your Life* (Alfred A. Knopf: New York, 2016)
[57] Wendy Kopp, *One Day, All Children: The Unlikely Triumph Of Teach For America And What I Learned Along The Way*, (Public Affairs: New York, 2001)
[58] Bryan Stevenson has described this path during many interviews, speaking engagements, and in the book: *Just Mercy: A Story of Justice and Redemption* (Random House: New York, 2014)
[59] Ken Robinson, "Bring on The Learning Revolution," TED Talk, 2015, https://www.youtube.com/watch?v=kFMZrEABdw4
[60] Damon, 2008, p 120
[61] Damon, 2008, p 97
]62] Damon, 2008, p 106
[63] Damon, 2008, p 104, p 99
[64] John W. Gardner, *On Leadership*, (The Free Press: New York, NY, 1990), Introduction

[65] Gardner, 1963, p 12
[66] Andrew J. Hoffman, *Finding Purpose, Environmental Stewardship as a Personal Calling*, (Greenleaf Publishing Ltd: U.K, 2016), ch 3
[67] Hoffman, 2016, p 5
[68] Hoffman, 2016, p 3
[69] Willingham, 2009, p 68
[70] Johnson, 2010, p 35
[71] Steven Blank, keynote speaker at "Lessons Learned" conference, spring 2010, where he depicted "startup" ventures as needing to generate a combination of "what" and "how" hypotheses as they fit into a business model, such as "the business model canvas," a product of Alexander Osterwalder, based on his 2005 PhD work supervised by Yves Pigneur [Alexander Osterwalder & Yves Pigneur, *Business Model Generation,* (John Wiley & Sons: 2010)]. Blank proceeded to use this business model platform in working with the U.S. National Science Foundation to design training for academics regarding the work of translating scientific discoveries to applications.
[72] Willingham, 2009, p 67
[73] Willingham, 2009, p 32
[74] Jeffrey Dyer, Hal Gregersen, and Clayton Christensen, *The Innovator's DNA: Mastering the Five Skills of Disruptive Innovators,* (Harvard Business Review Press, 2011)
[75] Clay Shirky, *Cognitive Surplus: Creativity and Generosity in a Connected Age*, (Penguin Publishing Group, 2010)
[76] David Henry Feldman, Mihaly Csikszentmihalyi, and Howard Gardner, *Changing the World, A Framework for the Study of Creativity*, (Praeger Publishers: Westport, CT, 1994), p 38
[77] Willingham, 2009, ch 4
[78] Kauffman Foundation, "Entrepreneurship in American Higher Education," A Report from the Kauffman Panel on Entrepreneurship Curriculum in Higher Education
[79] Bruner, 1986, p 52
[80] Gardner, 1990, p 165
[81] Jeff DeGraff and Shawn Quinn, *Leading Innovation: How to Jump Start Your Organization's Growth Engine*, (McGraw Hill, 2006)
[82] Christensen Institute, https://www.christenseninstitute.org/video/what-is-jobs-to-be-done-theory/
[83] Tom Kelley and Jonathan Littman, *The Ten Faces of Innovation*, (Currency/Doubleday: New York, 2005)
[84] Tim Brown, *Change by Design*, (Harper Business, 2009)
[85] Drucker, 1985, p 35
[86] Stephen Goldsmith, *The Power of Social Innovation* (Jossey-Bass, San Francisco, 2010)
[87] Clayton Christensen, https://www.christenseninstitute.org/theory/disruptive-innovation/
[88] Roger L. Martin, *The Design of Business: Why Design Thinking is the Next Competitive Advantage*, {Harvard Business Review Press, 2009)
[89] C. K. Prahalad and M. S. Krishnan, *The New Age of Innovation,* (McGraw-Hill: New York, 2008).
[90] Thomas A. Stewart, *Intellectual Capital, the New Wealth of Organizations*, (Currency Doubleday: New York, 1997), p 78
[91] Richard Miller, President, Olin College of Engineering, Quote occurring within last two minutes of: T-Summit 2016, Video: National Town Hall, https://www.uidp.org/t-summit-2016-videos/
[92] Drucker, 1985, p 7
[93] Thomas and Seely Brown, 2011
[94] Mihaly Csikszentmihalyi, *The Evolving Self: A Psychology for the Third Millenium*, (HarperCollins: New York, 1993)
[95] Thomas and Seely Brown, 2011
[96] Tom Kelley, *The Art of Innovation,* (New York : Doubleday: New York, 2001)
[97] Mihaly Csikszentmihalyi, Flow : the psychology of optimal experience, (Harper Perennial: New York, 1991)
[98] Willingham, 2009, p 10
[99] Csikszentmihalyi, 1993
[100] Mihaly Csikszentmihalyi and Barbara Schneider, Becoming adult : how teenagers prepare for the world of work, (Basic Books: New York, 2000), pp 219-220

[101] Jerome S. Bruner, On Knowing, Essays for the Left Hand, (Belknap Press of Harvard University Press: Cambridge, 1962), p 18
[102] Wendy Kopp, One Day, All Children: The Unlikely Triumph Of Teach For America And What I Learned Along The Way, (Public Affairs: New York, 2001), p 4
[103] A. G. Lafley and Ram Charan, The Game-Changer, (Crown Business: New York, 2008)
[104] David M. Kelley and Tom Kelley, Creative Confidence: Unleashing the Creative Potential Within Us All, (Crown Publishing Group: New York, 2013)
[107] Willingham, 2009, ch 4
[108] Csikszentmihalyi and Schneider, 2000, p 219
[109] As one example of practical abilities, see the WICS model's inclusion and description: Practical ability is used to translate theory into practice and abstract ideas into practical accomplishments. It is also used to convince other people that an idea is valuable ... (and) to recognize ideas that have a potential audience." "Practical ability involves applying, using, implementing, contextualizing, and putting into practice."
[110] Thomas and Seely Brown, 2011
[111] Drucker, 1985. In this text, Drucker described reader views that innovation and entrepreneurship is "*only* marketing" and agreed that it is *only* marketing (which doesn't make it simple).
[112] Robert E. Quinn, 2000. Also: "Determination and Openness," www.ThePositiveOrganization.wordpress.com, Feb. 22, 2016
[113] Johnson, 2010
[114] Thomas A. Stewart, The Wealth of Knowledge (Currency Books, 2001), p 107
[114.5] Donald A. Norman, JND.org
[115] Robert J. Sternberg, *Wisdom, Intelligence, and Creativity Synthesized*, (Cambridge University Press: Cambridge, UK, New York, 2003)
[116] Thomas and Seely Brown, 2011
[117] Gardner, 1963, p 38
[118] Bruner, 1962, p 20
[119] Mihaly Csikszentmihalyi, The Evolving Self: A Psychology for the Third Millenium, (HarperCollins: New York, 1993)
[119.5] Joseph A. Schumpeter, Capitalism, Socialism, and Democracy, (Harper & Brother, New York and London, 1942)
[120] Robert E. Quinn, 2000. Also: "Determination and Openness," www.ThePositiveOrganization.wordpress.com, Feb. 22, 2016
[121] Bruner, 1960, p 28
[122] Gardner, 1963, p 12
[123] Drucker, 1986, p 138
[124] C.K. Prahalad, video, Keynote Address at AcumenFund 2009 Fellows Graduation, acumenfund.org
[125] Steve Case, video, Feb. 24, 2010, Stanford University, ecorner.stanford.edu
[126] Thomas and Seely Brown, 2011
[127] Thomas and Seely Brown, 2011, p 79
[128] Damon, 2008, p 96
[129] David Henry Feldman, Mihaly Csikszentmihalyi, and Howard Gardner, Changing the World, A Framework for the Study of Creativity, (Praeger Publishers: Westport, CT, 1994), p 38
[130] Tom Kelley, The Ten Faces of Innovation, (Currency Doubleday: New York, 2005)
[131] Gardner, 1963, p 12
[132] Bruner, 1960, p 10