The Educational Problem or Challenge:

• People can be talented without being creative and,

• Creative people may not initially be identified as talented, so...

• How do we help the talented achieve creative success?

• How do we articulate new ways of identifying creative promise?
In search of some answers, we’ll talk about:

• False assumptions about “creativity”
• Our focus on creating
• 4 strategies for creative development:
  ▪ Problem-finding
  ▪ Combining & Synthesizing
  ▪ Polymathy
  ▪ Playing
• New directions for creative education
Assumptions about “Creativity”

• Intelligence correlates with “creativity”

• Talent correlates with “creativity”

• “Creativity” is domain specific

• “Creativity” tests measure “creativity”

• “Creativity” is a personality trait
1. Often Assumed: You Have To Be A Genius To Be Creative

Lewis Terman, inventor of the IQ test, tested the hypothesis by following hundreds of students with IQs over 140 for many decades.

But... The result, verified dozens of times since:

   High IQ individuals have no higher levels of creative achievement than average college students.

A creative scientist who didn’t make Terman’s cut-off!
2. Often Assumed: Talent Equals Creative Skill

Moreover, many creative people have initially been labelled “untalented.”

Studies of prodigies confirm that precocious talent does not usually lead to mature creative outcome.

Vincent Van Gogh, late-bloomer
Some Mathematical Talent Resists Testing

Designer Wallace Walker invented a new geometry called “kaleidocycles”

Artist M. C. Escher invented a new geometric principle called “color symmetry”
3: Often Assumed: Creativity Is Domain Specific

- Most innovations occur at the intersections of domains or fields
- Domains evolve
- Even within domains, people who are identified historically as creative tend to be extraordinarily broad
- Experts rarely make major breakthroughs – the “novice effect”
4. Often Assumed: “Creativity” Tests Measure “Creativity”

- MacKinnon’s Tiling Test
  - High “creativity” corresponds to high complexity, diverse colors, lack of symmetry
  - Low “creativity” corresponds to low complexity, few colors, high symmetry
Architect Philip Johnson’s Mosaic

Eero Saarinen: “I asked Philip what he did with the tiles, and he said, “Oh, those colors were awful. I threw the colored tiles away and used only the black and white.”
Was Piet Mondrian Creative?

“Composition B (No. II), 1935
Architect Eero Saarinen’s Mosaic

Philip Johnson: “’What did you do, Eero?’”—I told Philip I had used only the white, and he was so jealous.”
Were These Painters Creative?

Robert Rauschenberg
“White Painting, 1951”

Kazamir Malevich,
“White on White”, 1918
5. Often Assumed: “Creativity” Is A Personality Trait

But... Nobel laureate Richard Feynman failed as a molecular biologist; Maurice Allais had little impact in history, despite contributions to economics; and Louise Nevelson was much more ambitious about sculpting than dancing, though she studied eurythmics for over 20 years.

No one is creative at everything!
Assumptions about “Creativity”

• Intelligence does not correlate with “creativity”— experience and imagination matter more.

• Precocious talent does not correlate with “creativity”— creative skill can be learned at any stage of life.

• Creative people are rarely specialized.

• “Creativity” tests do not measure “creativity”— creative activities predict creative outcome.

• “Creativity” is not a personality trait— it is a set of idea-stimulating strategies.
Creating Is a *Learnable* Process:

“Creating refers to the invention, recognition, or reformulation of *a problem or challenge* in such a way that makes it amenable to resolution in a new and effective manner.”

- Note: Replacing “creativity” (a passive concept) with “creating” (an active process), shifts our focus
  - from “what” creativity is to “how” creating can be learned,
  - from inborn traits to learned behaviors,
  - from problem-solving to problem-finding,
  - from specialization to exploratory combining and synthesizing,
  - from prodigies to polymaths.
4 Strategies for Creative Development

• Problem-finding
• Combining & Synthesizing
• Polymathy
• Playing
To create is to embrace challenge and search out new problems.

When uncomfortable, my instinct is not to avoid the discomfort but to become at peace with it. My instinct is always to seek out challenges as opposed to avoiding them.

Josh Waitzkin (Chess Master, Martial Artist)
The mere formulation of a problem is far more essential than its solution, which may be merely a matter of mathematical or experimental skills. To raise new questions, new possibilities, to regard old problems from a new angle requires creative imagination and marks real advances in science.

“If I had an hour to solve a problem I'd spend 55 minutes thinking about the problem and 5 minutes thinking about solutions.”

Albert Einstein

Problem Discovery & Formulation Are More Important than Searching for Solutions!
Questioning Is the Heart of Arts

““The purpose of art is to lay bare the questions that have been hidden by the answers.”
James Baldwin

“How do I create something out of nothing? I think it is by questioning.”
Amy Tan
Questioning is for Everyone at Every Age

• There are no experts in what we don’t know.
• If the experts had the answers, we wouldn’t have the problems.
• Ask the wrong question, and you will never get a useful answer.
• Asking the right question gets you more than halfway to the answer.
• Questioning is a skill that can be learned! So how do we teach it?
• *Make Areas of Ignorance Explicit!*
Problem Finding Curricula

https://doi.org/10.1080/02783199409553572

Curriculum on Medical Ignorance
Developed by Marlys and Charles Witte, MDs, & Ann Kerwin, Ph. D. at the University of Arizona Medical School.
Strategies for Finding Ignorance, aka Finding Problems

• Play devil’s advocate: “Turn it on its head”!
• Extrapolate any idea or finding ‘til it collapses: New possibilities exist where things fail!
• Challenge assumptions!
• Ask what isn’t there that should be.
• Ask what is there that shouldn’t.
• Try to do the impossible!
• Invent imaginary worlds! Play “what if?”
• Teach what we don’t know!
Overt Ignorance/MisKnowns/Hidden Knowledge: The Arthroscopic Kidney Surgery Problem

Arthroscopic surgery beyond joints...

✓ Stomach
✓ Lung
✓ Gall bladder

• Kidneys? Impasse.
Until a Young Intern Asks a “Naïve” Question

Why do we operate from the front?
Turn the problem on its head!

• The patients were in the wrong position!

• Turn them over, and the surgery is trivially easy!
4 Strategies for Creative Development

• Problem-finding
• *Combining & Synthesizing*
• Polymathy
• Playing
To Create is To Combine & Synthesize

“My greatest strength lies in finding hidden harmonies—discovering connections where others might see chaos or disconnect.”

~Joshua Waitzkin
Combining & Synthesizing = Creative How-To

“The scientist or the artist takes two facts or experiences which we separate; he finds in them a likeness which had not been seen before: and he creates a unity...”

Jacob Bronowski
mathematician, poet, historian of science
Hidden Likeness/Hidden Knowledge in Science and Art...

Newton’s apple and the moon...both falling

Why do you paint?
For exactly the same reason I breathe.
That’s not an answer.
There isn’t any answer.
How long hasn’t there been any answer?
As long as I can remember.
And how long have you written?
As long as I can remember.
I mean poetry.
So do I.
Tell me, doesn’t your painting interfere with your writing?
Quite the contrary: they love each other dearly.

E.E. Cummings’s visual poetry
Combining in Childhood: The “Blending” of Ideas and Materials

“balloon dog”

Roxaboxen
Adult Combining as Creative Strategy

Alexis Carrel, surgery and lace-making & E.E. Cummings, cubism and poetry
Combining & Synthesizing

• Presume the integration of two or more unlike things that have never been combined before.

• These unlike things may be problems, concepts, methods, and/or materials.

• Creative activity therefore depends on a wide or idiosyncratic range of experience and interest.
Creative People Are “Ambicerebral”

- “Integrative activity sets” (Dewey, 1934)
- “Networks of enterprise” (Gruber, 1984)
- “Correlative talents” (Root-Bernstein, 1989)
- (A)vocational polymathy
4 Strategies for Creative Development

- Problem-finding
- Combining & Synthesizing
- **Polymathy**
- Playing
Modern Leonardos: Creative People Are Always Polymaths

One who purposefully develops knowledge and skills in more than one discipline, or unusual breadth and depth within a single discipline.
The Polymathic Approach

I tend not to dwell on the parallels between chess and business, chess and the martial arts, or any two things for that matter, because the truth is that all pursuits are connected if we gain an eye for the thematic links.

- Joshua Waitzkin -
Polymathy Predicts Success:

• Catherine Cox, The Early Mental Traits of Three Hundred Geniuses, in *Genetic Studies of Genius*, 1926, vol 2.
• Brook Hindle, *Emulation and Invention*, 1981.
Adult Avocations Correlate with Scientific Success: Science Nobels

Compared with typical scientist, Nobel laureates are at least:

- 2X photographers
- 4X musicians
- 17X artists
- 15X craftsmen
- 25X writers
- 22X performers

Root-Bernstein, et al., 2008
Polymathic Interests of Nobel Prize Winners

- ECONOMICS (62)
- LITERATURE (105)
- PEACE (96)
- CHEMISTRY (149)
- MED/PHYSIO (184)
- PHYSICS (177)
- CRAFTS
- ARTS
- ART WRIT
- HUM/SOC SCI
- SCIENCES
- NATURE
- SPORTS

% Nobels
Ave # of field interests per Nobelist range from 1.9 (Peace) to 2.8 (Lit).
Einstein’s Music
Made Possible His Science

A table, a chair, a bowl of fruit, and a VIOLIN... what else does a man need to be happy?
- Albert Einstein (1879-1955)

"The theory of relativity occurred to me by intuition, and music is the driving force behind this intuition. My parents had me study the violin from the time I was six. My new discovery is the result of musical perception."
Dag Hammarskjöld’s Arts Interests Made Possible His Peace Diplomacy

The northern warbler’s first trill.
Over pale ice fields space is thawing.

Posthumous Nobel Peace Prize, 1961

Barbara Hepworth, “Single Form” at the UN, in memory of DH
Wisława Szymborska, NP Literature, 1996

Inspiration comes to those who “do their job with love and imagination... A swarm of new questions emerges from every problem they solve.”

- Wrote limericks (unserious poetry)
- Constructed postcard collages for friends (unserious art)
- Explored ideas of use in her serious poetry
Herbert A. Simon, NP Economics, 1978

Artificial intelligence, computer science, cognitive psychology, political science, economist ("bounded rationality" & "satisficing"), philosopher.

Pianist, composer, painter, chess player and more.

“I can rationalize any activity I engage in as simply another form of research on cognition... I can always view my hobbies as part of my research...”

“[T]he ‘Renaissance Mind’ is not broader than other intelligent minds, but happens to cover a narrow swathe across the multi-dimensional space of knowledge...”

“What I am a monomaniac about is decision-making.”
Creative Polymathy in a Nutshell

• Creating requires **finding problems**, taking on challenges...

• Creating requires **combining as yet unrelated ideas, skills, methods, materials** and so forth to meet the challenge...

• Creating promotes the ambicerebral **synthesis of disparate interests** that make combining possible...

• But...**if everyone is trained the same way to know the same things then how does novel combining take place?**
4 Strategies for Creative Development

• Problem-finding
• Combining & Synthesizing
• Polymathy
• Playing
A key component of high-level learning is cultivating a resilient awareness that is the older, conscious embodiment of a child's playful obliviousness.

~Josh Waitzkin
the uninhibited exploration of ideas and materials for the fun of it, playing provides a permissive space for subverting received knowledge, recombining ideas, and transferring techniques to novel effect.

“Gunderman, something tells me you’re not taking this experiment seriously!”
Alexander Fleming, Bacteriologist
Won the Nobel Prize in 1945 because his play generated new combinations of knowledge!

“I play with microbes... it is very pleasant to break the rules and to be able to find something nobody had thought of.”
Claes Oldenburg, Sculptor

“Everything I do is completely original—I made it up when I was a little kid.”

As a child, Oldenburg invented the imaginary country of Neubern.
Noun: Imaginary World, Paracosm

Concept and Activity: Worldplay

- “the invention of an imaginary place, often inhabited by imaginary beings, engaged in imaginary culture”
- a persistent, consistent pretense
- a powerful tool for self-initiated learning
- a mature creative strategy
Imaginary worldplay typically....

- Combines fantasy with plausibility.
- Recreates or re-imagines real world issues and processes.
- Explores alternatives.
- Synthesizes knowing and feeling.
- Involves creative behavior, i.e. the making of things.
C.S. Lewis’s “Animal-Land”

A “Learning Laboratory”

“In mapping and chronicling Animal-Land, I was training myself to be a novelist.”
Childhood Worldplay as an Indicator of Creative Potential

MacArthur FELLOWS
- 90 respondents reporting paracosm play
- 23 accepted
- F = 7, M = 16
- 25.5% of group

MSU Students
- 262 respondents reporting paracosm play
- 32 accepted
- F = 21, M = 11
- 12% of group

CHILDHOOD WORLDPLAY (relaxed assortment): MacARTHUR FELLOWS AND MSU STUDENTS

* = p<.05  ** = p<.001  *** = p<.0001
Worldplay is a Mature Working Strategy Among Creatives

MacArthur Fellows were also significantly more likely to recognize worldplay at work than were MSU students.
Imaginative Play: A Permissive Space For Polymathic Problem-Finding, Combining & Synthesizing!

“Contrary to what I once thought, scientific progress. . . began with the invention of a possible world, or a fragment thereof, which was then compared by experimentation with the real world. And it was this constant dialogue between imagination and experiment that allowed one to form an increasingly fine-grained conception of what is called reality.”

~ François Jacob, NP Physiology or Medicine, 1965

The point of writing is to “see what happens” when “things we at first think are impossible to bring together or almost daring and scandalous to combine...[can be] the beginnings of good art...”

~ Orhan Pamuk, NP Literature, 2006
New Directions to Foster Creating

A focus on developing ambicerebral minds through polymathy, individualized problem-finding, and playful combining.
New Directions in Nurturing a Talent for Creating

1. Add problem finding to the training of talent.
2. Teach what we don’t know and can’t do as well as what we do know and can do.
3. Encourage correlative talents and idiosyncratic networks of interests.
4. Foster extra-disciplinary breadth of interest to complement specialized training of disciplinary skills.
5. Mentor and role model (a)vocational polymathy: Take up a hobby and link it to your pedagogy!
6. Recognize self-initiated complex imaginative play to foster the development of all these creative processes.
New Directions in Identifying a Talent for Creating

• Look for questioning
• Look for autodidactic tendencies
• Look for polymathic interests and ability
• Look for kids who combine and connect
• Look for self-initiated imaginative play
THANK YOU!

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