Importance of “Curiosity” as a clinical competence in medical education and its positive effects on the trainees “Well-being”
Faculty

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Curiosity helps Learning, memory and well-being

Anonymous painter, 15th century – Cahiers de Science et Vie no. 114.
Early philosophers and religious thinkers centered on the question of curiosity's moral status rather than on its psychological underpinnings (vice ‘curiosity killed the cat’ or virtue). (Pandora’s Box, Eve and forbidden tree)

Curiosity was seen as an intrinsically motivated desire for information. E.g., Aristotle, commented that men study science for intrinsic reasons and "not for any utilitarian end”.

Curiosity was viewed as a passion, with the motivational intensity implied by the term. Cicero referred to curiosity as a "passion for learning" and argued that the story of Ulysses and the Sirens was really a parable about curiosity: "It was the passion for learning that kept men rooted to the Siren's rocky shores“.

Curiosity was seen as appetitive. Kant referred to an "appetite for knowledge“.

“Few phenomena have been the subject of more protracted discussion than human knowledge. Yet this discussion has usually paid little attention to the motivation underlying the quest for knowledge, with the result that two important questions still confront us.

The first question is why human beings devote so much time and effort to the acquisition of knowledge. Sometimes there is some obvious drive to whose satisfaction knowledge can contribute. But strangely enough, many of the queries that inspire the most persistent searches for answers [...] are of no manifest practical value or urgency.

The second question [...] is why, out of the infinite range of knowable items in the universe, certain pieces of knowledge are more ardently sought and more readily retained than others.”

Berlyne, *A theory of human curiosity*  
British Journal of Psychology, 45, 3: 180, 1954

- **Specific**: Search for defined information
- **Epistemic**: Seeking information acquiring knowledge
- **Diversive**: Seeking stimulation
- **Perceptual**: Seeking out novel stimuli
Curiosity, exposure, and confidence

• Curiosity is highest when exposure is lowest, and it decreases as exposure increases i.e. curiosity is highest for novel stimuli.

• Both the information-gap theory and Dubey and Griffiths’ model predict that an inverted U-shape relationship exists between curiosity and confidence.

Types of curiosity

Daniela Pusca & Derek O. Northwood

- Perceptual curiosity: A need to resolve a problem
- Epistemic curiosity: A need to obtain new knowledge, A need to reduce uncertainty, A need to understand how things work
- Specific curiosity: A need to locate particular information
- Diversive curiosity: A need to seek stimulation from any source, to relieve boredom
- Empathic curiosity: A need to know how what other people are thinking and feeling

Creativity and innovation

Creativity is related to imagination, while innovation is related to implementation of the idea or the product.
Neural mechanisms of curiosity
Curious about Curiosity

- Min Jeong Kang, Colin Camerer, and their colleagues (2009)
- Used fMRI with the goal of identifying the neural pathways of curiosity.
- The scientists performed a test in which they scanned the brains of nineteen people with fMRI while they were presented with forty trivia questions.
- Questions were selected to create a diverse mixture of high and low specific epistemic curiosity, that is, interest in specific knowledge.
- The participants were asked to sequentially read a question, guess the answer (if they didn’t know it), rate their curiosity to find out the correct answer, and indicate how confident they were in their guess.
- In the second stage, each subject saw the question presented again, immediately followed by the correct answer.
- The reported curiosity was found to be an inverted-U-shaped function of the uncertainty.

Neuroscience work in the area of curiosity

• Kang and her colleagues

• The fMRI images showed that in response to self-reported high curiosity, the brain regions that were significantly activated included the left caudate and the lateral prefrontal cortex (PFC)—areas that are known to be energized on anticipation of rewarding stimuli.

• The left caudate had also been shown to be activated during acts of charitable donation and in reaction to punishment of unfair behavior, both of which are perceived as rewarding.

• Kang and her colleagues’ findings were consistent with the idea that epistemic curiosity elicits anticipation of a reward state—that the acquisition of knowledge and information has value in our minds.

States of Curiosity Modulate Hippocampus-Dependent Learning via the Dopaminergic Circuit

Matthias J. Gruber, Bernard D. Gelman, and Charan Ranganath

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http://dx.doi.org/10.1016/j.neuron.2014.08.060
Curiosity modulated activity in the dopaminergic circuit

Development of curiosity

• Infants solve tasks by resolving the sampling problem – attentional mechanisms select a subset of informational from everything their perceive and beyond.

• Theory of choice and preference infers that learners seek stimuli that match their preferred level of complexity, which increases over time as we build up mental representations and acquire more knowledge.

• Novice to expert – is there a link?
Curiosity and Motivation

- Curiosity is a cognitive process which leads to the behavior perceived as motivation
- Relationship between curiosity and motivation creates a feedback loop
- Curiosity is intrinsic and influenced by dopamine mediated reward system
- The process of “seeking out” is due to curiosity
- Curiosity acts as motivation to learn new skills and knowledge
The Five Pillars of Curiosity
### Historical perspective of the 5 Dimensional Model of Curiosity

<table>
<thead>
<tr>
<th>Types of Curiosity</th>
<th>Work done by</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deprivation Sensitivity</td>
<td>George Lowenstein (Carnegie Mellon Univ)</td>
<td>Information Gap theory</td>
</tr>
<tr>
<td>Joyous Exploration</td>
<td>Edward Deci (Univ of Rochester)</td>
<td>Attain a Pleasurable state</td>
</tr>
<tr>
<td>Social Curiosity</td>
<td>Britta Renner (Univ of Konstanz)</td>
<td>Humans are inheritably social animals</td>
</tr>
<tr>
<td>Stress tolerance</td>
<td>Paul Silvia (Univ of N Carolina)</td>
<td>Willing to take anxiety</td>
</tr>
<tr>
<td>Thrill seeking</td>
<td>Marvin Zuckerman (Univ of Delaware)</td>
<td>Want to amplify the intense experience associated the risk</td>
</tr>
</tbody>
</table>
Let's find out What is your prominent Curiosity type?
What kind of curiosity do you have??

**Scoring instructions:**

- Compute the average score for each dimension (reverse score the items under stress tolerance).

- By comparing your results with those of a nationally representative sample of people in the United States, you can determine whether you are low, medium, or high on each dimension.
### The Five Dimensional Curiosity Scale

#### What Your Score Means

<table>
<thead>
<tr>
<th>Deprivation Sensitivity</th>
<th>Joyous Exploration</th>
<th>Social Curiosity</th>
<th>Stress Tolerance</th>
<th>Thrill Seeking</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW &lt;3.7</td>
<td>LOW &lt;4.1</td>
<td>LOW &lt;3.0</td>
<td>LOW &lt;3.1</td>
<td>LOW &lt;2.6</td>
</tr>
<tr>
<td>MEDIUM +/4.9</td>
<td>MEDIUM +/5.2</td>
<td>MEDIUM +/4.4</td>
<td>MEDIUM +/4.4</td>
<td>MEDIUM +/3.9</td>
</tr>
<tr>
<td>HIGH &gt;6.0</td>
<td>HIGH &gt;6.3</td>
<td>HIGH &gt;5.8</td>
<td>HIGH &gt;5.8</td>
<td>HIGH &gt;5.2</td>
</tr>
</tbody>
</table>
Curiosity and Exploration Inventory (CEI-II)

Instructions: Rate the statements below for how accurately they reflect the way you generally feel and behave. Do not rate what you think you should do, or wish you do, or things you no longer do. Please be as honest as possible.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Very Slightly or Not At All</th>
<th>A Little</th>
<th>Moderately</th>
<th>Quite a Bit</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I actively seek as much information as I can in new situations.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. I am the type of person who really enjoys the uncertainty of everyday life.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. I am at my best when doing something that is complex or challenging.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. Everywhere I go, I am out looking for new things or experiences.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. I view challenging situations as an opportunity to grow and learn.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. I like to do things that are a little frightening.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. I am always looking for experiences that challenge how I think about myself and the world.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. I prefer jobs that are excitingly unpredictable.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. I frequently seek out opportunities to challenge myself and grow as a person.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. I am the kind of person who embraces unfamiliar people, events, and places.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Stretching: 1,3,5,7 / Embracing: 2,4,6,8,10.

Curiosity, Learning and Well-being

Curiosity driven learning and intrinsic motivation is foundation of efficient education (Oudeyer & Smith 2016)

Brain is a predictive machine that is constantly trying to anticipate what will happen next – is intrinsically motivated to pursue activities...

Curiosity (exploration & absorption) – where exploration has positive association to well-being (Fredrickson 1998, 2001, Gallagher, 2007)
The results indicate that curious individuals tend to report higher levels of subjective well-being which, in turn, is associated with lower levels of depression.

The findings contribute to the understanding of positive results obtained from clinical samples that underwent positive psychotherapy of depression.
Five-Dimensional Curiosity Scale (5DC) and Personality Clusters

Journal of Research in Personality

Strength Article

five-dimensional curiosity scale: Capturing the bandwidth of curiosity and identifying four unique subgroups of curious people

B. Kashdan, Melissa C. Stiksma, David J. Disabato, Patrick E. McKnight, John Bekier, and Lazarus

Mason University, United States
## Five Distinct Factors:

- Joyous Exploration
- Deprivation Sensitivity
- Stress Tolerance
- Social Curiosity
- Thrill Seeking

All form, The Five-Dimensional Curiosity Scale (5DC).

Each factor has substantive relations with a battery of personality, emotion, and well-being measures.
Four Distinct Types of Curious People
The Fascinated (28% of sample), Problem Solvers (28%), Empathizers (25%), and Avoiders (19%).
The Four Distinct Types of Curious People in Study

- The Fascinated (28% of sample)
- Problem Solvers (28%)
- Empathizers (25%)
- Avoiders (19%)
These subgroups challenge an assumption that there is a homogenous population to be discriminated on a single dimension from incurious to very curious. With greater bandwidth and predictive power, the 5DC offers new opportunities for research on origins, consequences, life outcomes, and intervention strategies to enhance curiosity.
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How to nurture curiosity in our learner?
Curiosity: The impulse to seek new information and experience and explore new possibilities is a basic human attribute.
Curiosity can generate Workplace Improvement

200 employees were asked two text questions in a randomized fashion on the start of a day.

1) “What is the one topic or activity you are curious about today?“

Other group got following text:

2) “What is the one topic or activity you will engage in today?“
The barriers to curiosity in workplace environment

- Leader and teachers in organization and school have wrong mindset about exploration.
- Seen as costly mess and slow down in organization
- Even though creativity is a goal, they reject the creative ideas
- They seek efficiency to the detriment of exploration
- History of T model by Ford company in 1908
How to increase curiosity in Our Learner?

• Recruit learners for their curiosity

• Role model “inquisitiveness”

• Emphasize learning goals

• Let learners explore and broaden their interest

• Give them time and resources to explore interest
Recruit for Curiosity

- “T shaped employees” at IDEO company
- Interest outside the work
- Reading books unrelated to their expertise and field
- When applicant inquire about organization that aren’t directly related to their job

• Google hired people for curiosity: “We run this company for questions, not answers – Eric Schmidt 2011
Role model “Inquisitiveness”

• “What is the one thing I should teach you or do to make things better for you?

• Acknowledge that you don’t know all the answers. It’s ok to be guided by curiosity.

• Intellectual humility

• Give feedback based on inquisitiveness and not based on judgment.
Emphasize “Learning goals” –not performance goals

• Setting target or performance goals is not always a good thing to do

• Focus on learning goals - hard to do it in competitive high-stake national exams environment (e.g. USMLE in USA)

• Learning goals e.g. developing competence, acquiring skills, mastering new situation

• “Plussing” technique at Pixar studio (learning by reacting positively to ideas that may be mediocre)
Let learners explore and broaden their interest

- Give learner time and resource to explore their interests
- Provide opportunity to explore unfamiliar and unrelated activities
- Allow them to broaden their networks
- Connect learner across the organizational departments
To avoid losing Childhood curiosity

- Ask learner: “why?” “What if…” and “How might we….”
- Teach them how to ask good questions
- “Go back method” – see assignment or task as fluid and to “go back” and rethink them
- Help learner to transition from good answer to asking good questions
Benefits of Curiosity in Health Professionals

- Fewer diagnostic errors – less confirmation bias
- More innovation
- Reduce group conflict (take interest in other’s ideas)
- More open communication and better team performance

Francesca Gino, Harvard Business Review Sept- October 2018
Questions