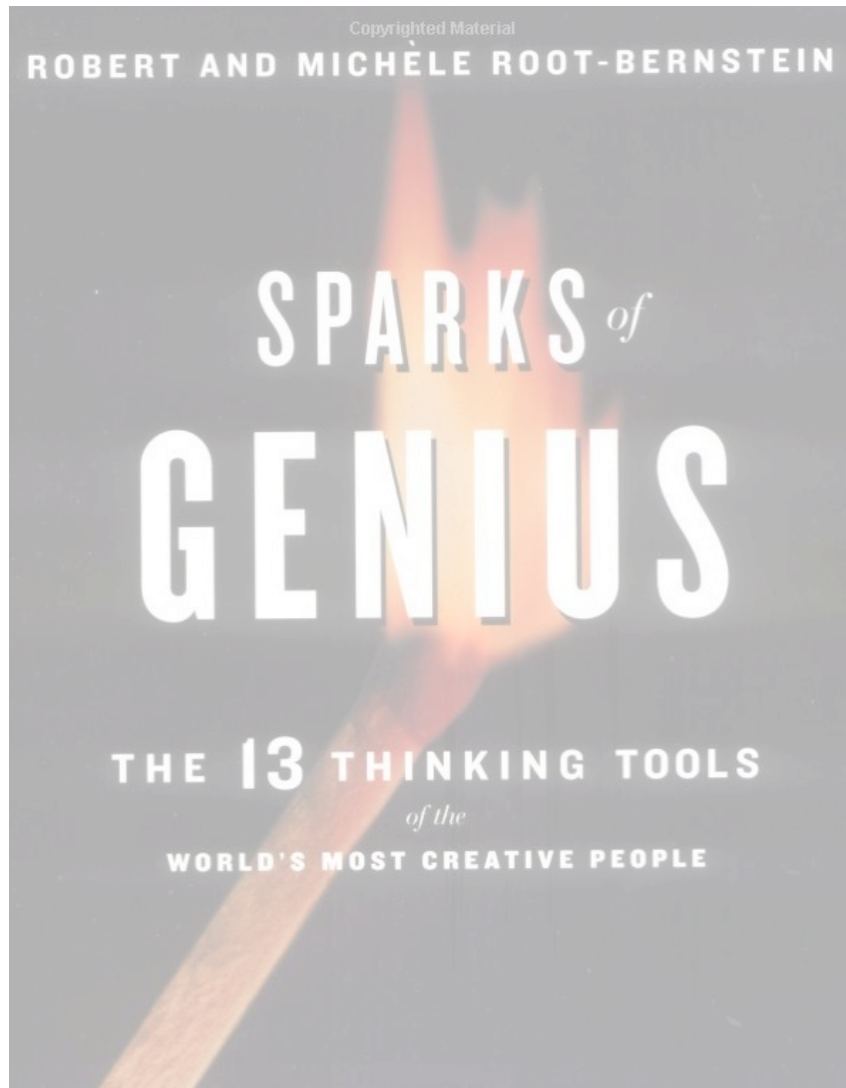


A PORTFOLIO OF THINKING SKILLS

Karen N. Johnson
2013

The inspiration for this talk



For a long while, I've been interested in how we think, how we analyze.

When I "discovered" the book Sparks of Genius, I found chapter after chapter resonated with me.

It seemed each chapter made sense from a tester's skill set, each chapter seemed to offer insight into what skills a tester might do well to have and develop. Thinking skills.

In the year plus since reading this book, I've actively pursued more information on many of the thinking skills.

This is my own current state of that research, reading and interest.

I invite you to consider each thinking tool and how you might improve your own thinking skills.

Sparks of Genius: Thinking Tools

The book identifies the following thinking tools:

1. Observing
2. Imaging
3. Abstracting
4. Recognizing Patterns
5. Forming Patterns
6. Analogizing
7. Body Thinking
8. Empathizing
9. Dimensional Thinking
10. Modeling
11. Playing
12. Transforming
13. Synthesizing

This presentation's thinking tools

This presentation addresses, the following tools:

1. Observing
2. Imaging
3. Abstracting
4. Recognizing Patterns
5. **Forming Patterns**
6. Analogizing
7. Body Thinking
8. Empathizing
9. **Dimensional Thinking**
10. Modeling
11. Playing
12. **Transforming**
13. **Synthesizing**

Four thinking skills I have not addressed (yet.)

I also added the skill: focusing (14) as I believe the ability to focus is another essential thinking skill.

About me ~



- Software Test Consultant
- Published Author
- Teach Software Testing
- Speak at conferences
- Co-founder of WREST, the Workshop on Regulated Software Testing

Twitter

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or

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Publications and Presentations

Please see my website.



Definition

ob·serve

Verb

- Notice or perceive (something) and register it as being significant.
- Watch (someone or something) carefully and attentively.

Synonyms

watch - notice - remark - note - keep - perceive

Quotes

- “We only see what we know.” Goethe
- “Look at things for the very first time.” Perez de Ayala from *Advice for a Young Investigator*
- “These things were not observed because they were not expected or specifically looked for.” Perez de Ayala from *Advice for a Young Investigator*
- “The medical ear must be properly trained to hear stories – a medical history, after all, is a short story.” from John Stone in *Sparks of Genius*

A mind map on the word observe

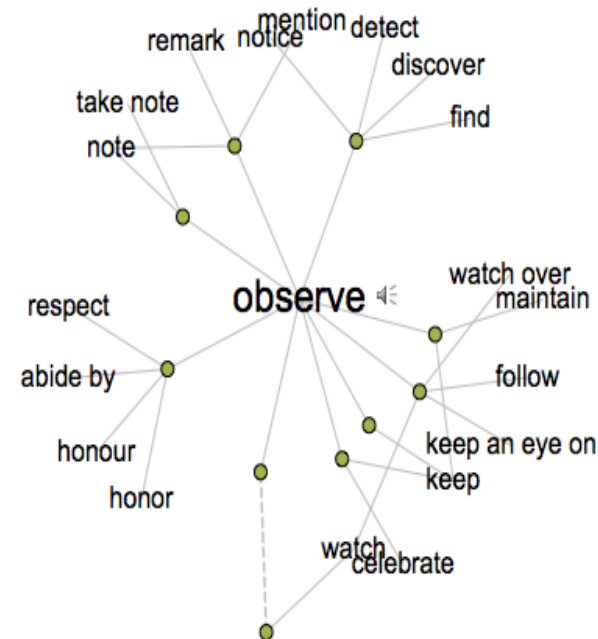


Image from VisualThesaurus.com

How this skill applies to testing

We observe software to discover defects. We observe the programs we test.

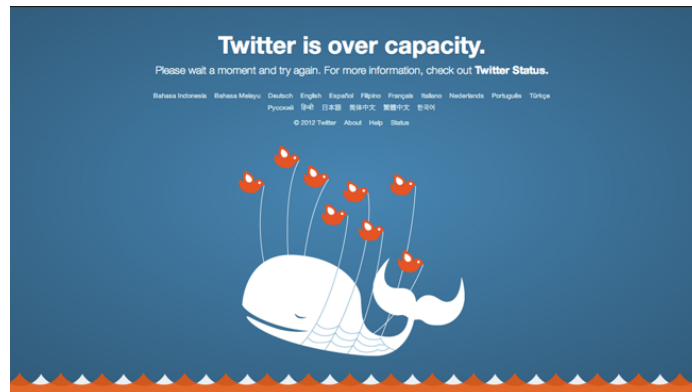
Notice the word observe is a verb; testing and observing are active processes.

When we observe beyond confirming expected results of a test case, we begin to observe whatever it is there is to see.

If we test with an eye only on confirming what a test case instructs us to test or to check for, that is all we may notice.

Example

Whether logging in or using a feature of an application, an application may produce unexpected results. Are you ready to notice?



The Twitter fail whale screen shows when you might not expect it.

Exercises

- 1.) Log into an application. What if an error message appears? Are you ready to notice?
- 2.) If you practice Exploratory Testing and you use the concept of "tour" testing - how would you (or why would you?) tour an application without being observant?
- 3.) We focus on improving testing skills when what we might need most is to focus on improving our thinking skills. Have you thought about your skills of observation.

Why does this skill matter?

Having an investigatory approach to testing means we have to be ready to observe, otherwise the “experiments” we conduct with software may fall flat.

The longer we work with an application or product the more challenging it can be to be observant of a product. Next time you test software you have worked with for awhile, try to look at the product again as though for the first time. Do you observe anything different?

Games to increase observation skills



Spot It
An inexpensive game designed to improve observation skills.

Many testers play a game called "Set."

Also look at the last reference on reading about a game called, Kim's game.

Interesting reading on "observing"

We can learn from other disciplines. Look to these sources for other professions where skills of observation are valued.

Yale University's School of Medicine uses fine art to improve observation and diagnostic skills

<http://www.dermatology.yale.edu/education/braverman/description.aspx>

New York cops use a class at the Metropolitan Museum of Art to teach cops how to improve their observation skills.

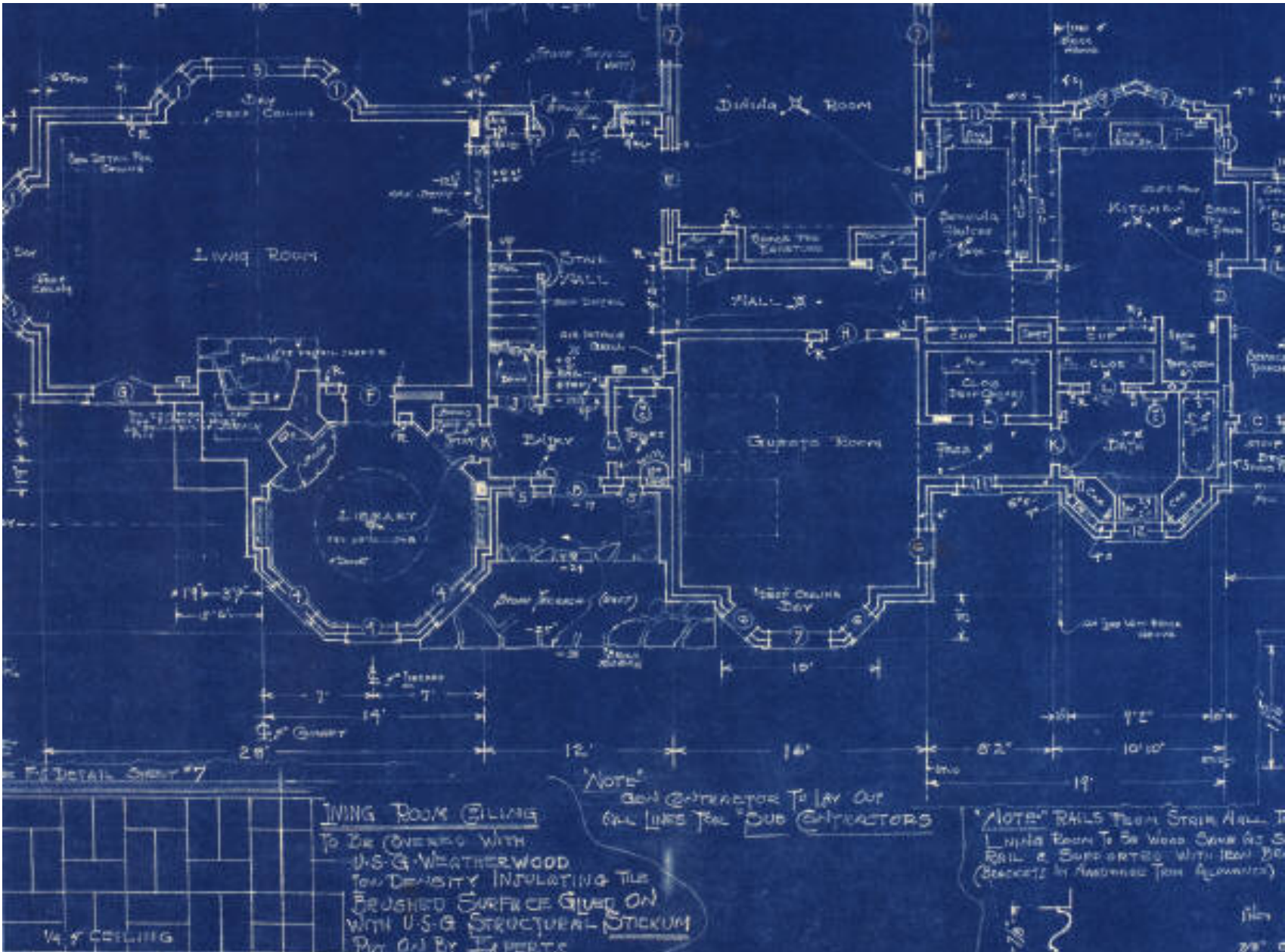
<http://www.smithsonianmag.com/arts-culture/Teaching-Cops-to-See.html>

The Science Education Resource Center promotes an online activity for improving observation skills for geophotography students

<http://serc.carleton.edu/NAGTWorkshops/geophoto/activities/71114.html>

The Boy Scouts have a game called, Kim's game that promotes skills of observation and memory.

http://www.macscouter.com/Games/bp_chapter2.asp#heading57



A Portfolio of Thinking Skills © Karen N. Johnson, 2013 v3

Definition

imaging

- The ability to form mental images of things or events
- To imagine the look of things without a reliance on being able to see things physically before your eyes

Quotes

“Some people need to close their eyes, apparently because seeing interferes with their visual imagination.” Sparks of Genius

“I think that not all scientists have to have a visual image, but I do. I can’t do a problem unless I have a visual image. That’s how I solve problems.” Margaret Geller in Sparks of Genius

“There are three classes of people: those who see. Those who see when they are shown. Those who do not see.”
- Leonardo da Vinci

A presentation on imaging



David Bolinsky: Visualizing the wonder of a living cell

http://www.ted.com/talks/david_bolinsky_animates_a_cell.html

Medical animator David Bolinsky presents 3 minutes of stunning animation that show the bustling life inside a cell.

How this skill applies to testing

Having the ability to imagine an application and/or a feature without having the software "to touch."

To understand, to be able to imagine and in turn be able to find the flaws in the design and development - sometimes before the software is even built.

Example

When a design specification is explained on a white board or napkin, we may begin to imagine the flow and implementation of a feature.



Resources for More

The next time you are learning about a new feature or something you need to test, try imagining the system through your own mental images instead of relying on words or a linear approach.

Look to the following resources for more on imaging and being able to draw.

Gamestorming: A Playbook for Innovators, Rulebreakers, and Changemakers by Dave Gray, Sunni Brown and James Macanujo

Books By David Sibbet: Visual Teams, Visual Leaders and Visual Meetings

The Tester's Notebook

Testers I meet are often not sure what notes to record. Notes can help you:

- Keep track of the process and/or steps you have taken
- Keep note of what data was used while testing
- Notice patterns

And one of the most important reasons to take notes is to record your test ideas!

Remember that notes don't have to be words, they can be doodles that might help you envision a data workflow or feature to feature interaction.



What to record

A blog post of mine which was originally posted on [testingReflections.com](http://testingreflections.com) that describes in detail how and what I record in notes.

See:

<http://testingreflections.com/node/6536>

Own your notes!

Don't worry about other people reading your notes.

Own your notes.

More of my thoughts on note-taking

A podcast where I talk about note-taking:

<http://blog.softwaretestpodcast.com/2012/08/12/episode-36.aspx>

Conference paper on reporting skills which also refers to note-taking

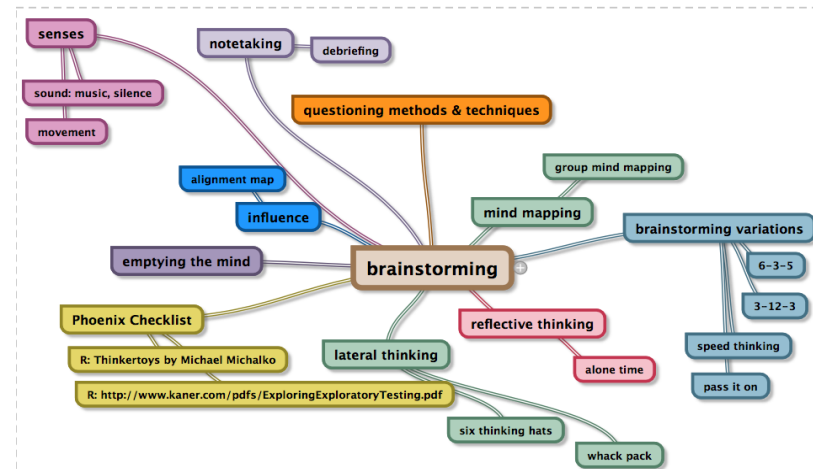
<http://karennicolejohnson.com/wp-content/uploads/2010/08/KNJohnson-CAST-2010-reporting-skills-and-software-testing-paper.pdf>

Mind Mapping

Many of our fellow testers use mind maps to explore test ideas, track status and to record notes.

Learn more about mind mapping from the originator Tony Buzan or search for books and resources on mind mapping.

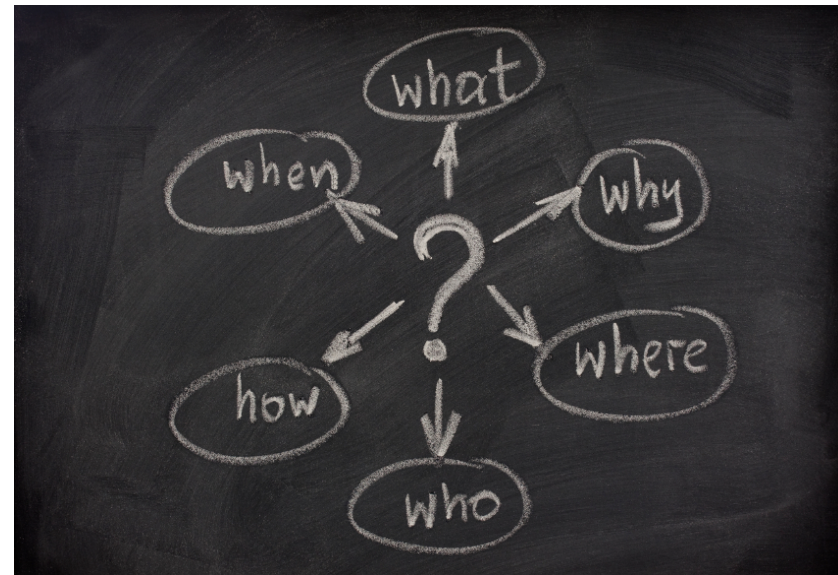
Learn about mind-mapping

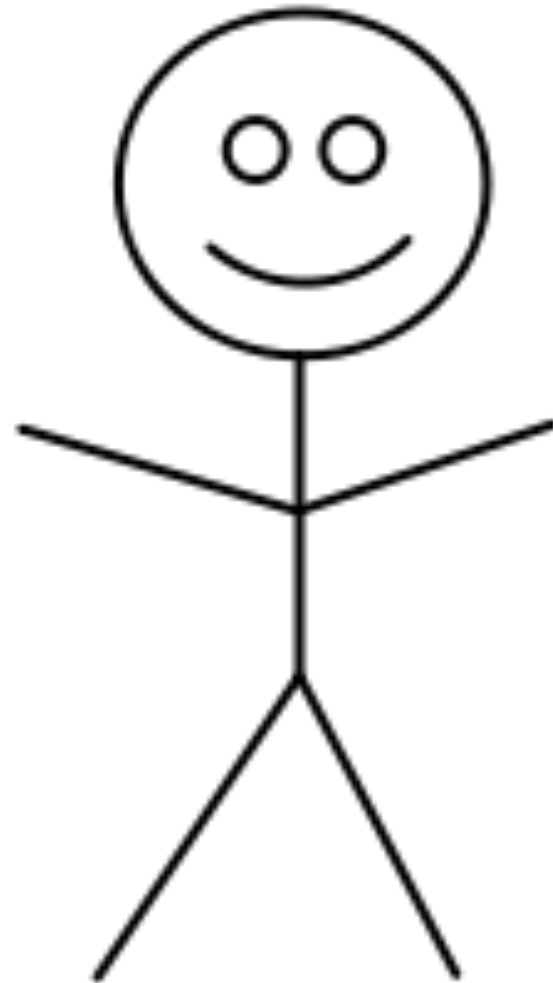


How to Practice

Ask to review the error messages for an application and imagine the steps and/or condition needed to make each error message appear. Can you imagine?

Polya: Understanding the problem. Draw a figure.





Definition

ab·tract·ed, ab·tract·ing, ab·stracts

1. To take away; remove.
2. To remove without permission; filch.
3. To consider (a quality, for example) without reference to a particular example or object.
4. (bstrkt) To summarize; epitomize.
5. To create artistic abstractions of (something else, such as a concrete object or another style)

Quotes

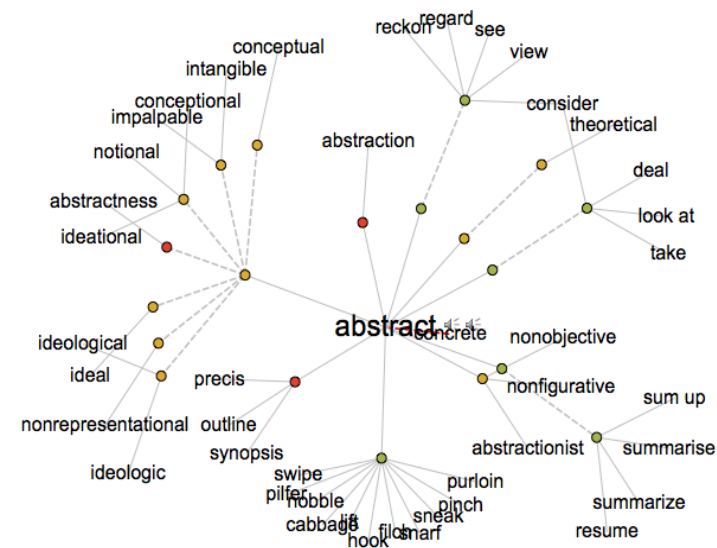
“See with your mind not your eyes.” Sparks of Genius

“The paper of yours is so lightly written that you must have sweated terribly.” from George Wald in Sparks of Genius

“These things were not observed because they were not expected or specifically looked for.”
From The Art of Scientific Investigation

Simplicity is the ultimate sophistication. ”
- Leonardo da Vinci

A closer look at the word abstract



This image is from VisualThesaurus.com

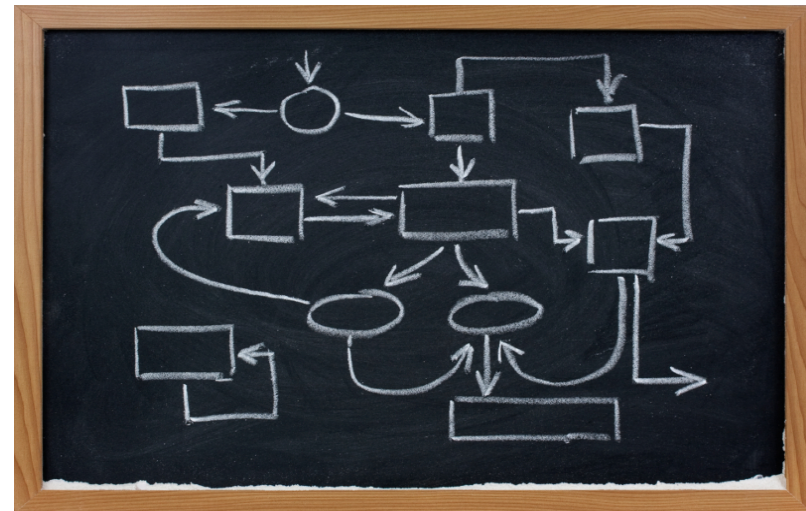
How this skill applies to testing

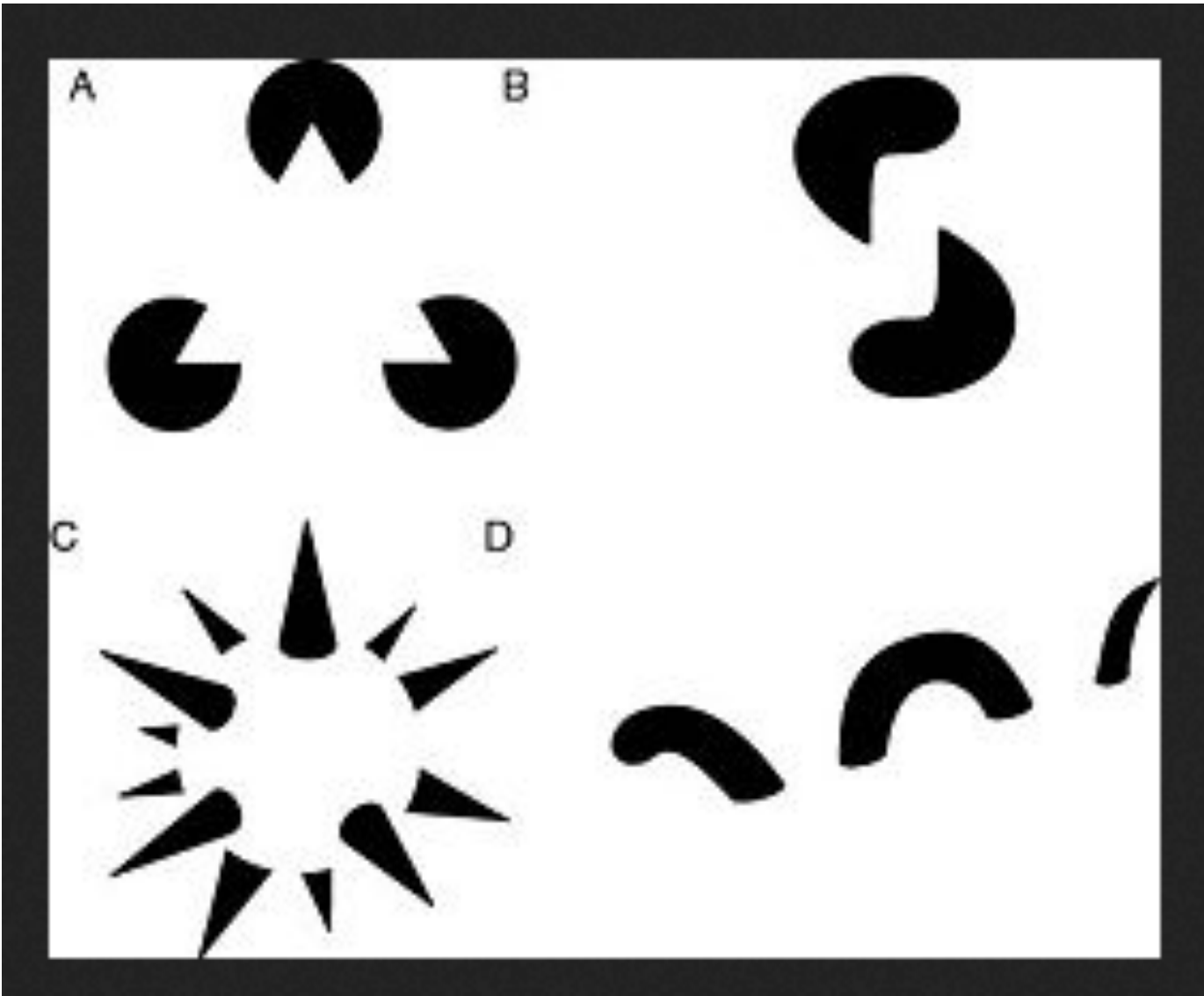
- Being able to see past the features of an application and focus on what the core purpose of the program does.
- Being able to recognize the essentials of a program; being able to pick out a programs essentials helps to keep testing risk-based and “in sync” with the business needs.

Example

Mental decluttering

- Find the simple concepts hiding among complex expressions.
- When a complex program is explained to you, can you see past all the “bells and whistles” and remain focused on the primary solution the product hopes to provide?





Definitions

pattern

1. A perceptual structure
2. Plan or create according to a model or models
3. Form a pattern
4. Be compatible, similar or consistent; coincide in their characteristics

Quotes

“See with your mind not your eyes.” Sparks of Genius

“The paper of yours is so lightly written that you must have sweated terribly.” from George Wald in Sparks of Genius

“These things were not observed because they were not expected or specifically looked for.”
From The Art of Scientific Investigation

UX + Gestalt Patterns

The **gestalt effect** is the form-generating capability of our senses, particularly with respect to the visual recognition of figures and whole forms instead of just a collection of simple lines and curves.

There are several visual Gestalt principles including patterns of grouping, closure and proximity.

Edward Tufte and Stephen Few are two authors who review the concepts of Gestalt effects in their work.

Roadblocks

- Clutter can prevent us from noticing patterns.
- The expression: can't see the wood through the trees.
- Being preoccupied can block us from recognizing patterns and from observing.

Pattern Recognition and Culture

Pattern recognition is influenced by our society and culture. In the book, *Sparks of Genius*, the author explored the children's game of hopscotch around the world and found that while the game exists in many countries, the form varies.

Example: hopscotch around the world



How recognizing patterns applies to software testing

When we test software, we may find some error conditions only occur after a series of steps or only under specific conditions, being able to discern this information can be essential in finding and being able to replicate a software defect.

Exercises

- Playing chess
- Jigsaw puzzles
- Rubik's cube

- When we look for patterns in clouds, we are attempting to recognize items we may find familiar and look for similarities in the clouds.





Definition

Analogy (from Greek ἀναλογία, *analogia*, "proportion" is a cognitive process of transferring information or meaning from a particular subject (the analogue or source) to another particular subject (the target), or a linguistic expression corresponding to such a process.

- Wikipedia

Edward deBono, Lateral Thinking

In deBono's book *Lateral Thinking*, he highlights a value of analogies is if the comparison to something else has a solution, than perhaps a similar "solution" can be applied and thereby solve the current issue at hand. This type of strategy is similar to Polya's when Polya offers the question: has a similar problem been solved?

Quotes

"..the power to recognize analogies is an excellent test of intelligence." Helen Keller

"The paper of yours is so lightly written that you must have sweated terribly." from George Wald in *Sparks of Genius*

"Metaphors does more than adorn our thinking. It structures our thinking." *Sources of Power*, Gary Klein

"The critical part of interesting analogies is that they reveal not mere resemblances but inapparent relationships between abstract functions, one if which is understood, the other not." from *Sparks of Genius*

How this skill applies to software testing

Having the ability to learn and apply knowledge from one discipline or one experience or one context to another, gives us more options, more insight. Analogies allow us to use our interdisciplinary learning to our work.

Practice

Look for the similarities in objects, in situations and see if you can draw relationships where you thought there was no correlation.

Resources for more

Sparks of Genius
By Robert & Michele Root-Bernstein

Lateral Thinking
By Edward deBono

Mind Performance Hacks
By Ron Hale-Evans

How to Solve It
By George Polya

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How to Solve It
By George Polya



Definitions

Kinesthetic learning (also known as **tactile learning**) is a learning style in which learning takes place by the student carrying out a physical activity, rather than listening to a lecture or watching a demonstration. People with a preference for kinesthetic learning are also commonly known as "do-ers". Tactile-kinesthetic learners make up about five percent of the population.

Proprioception (/ˌprɒpri.əˈsɛpʃən/ **PRO**-pree-o-**SEP**-shan), from Latin *proprius*, meaning "one's own", "individual" and perception, is the sense of the relative position of neighbouring parts of the body and strength of effort being employed in movement

Quote

I hear and I forgot.
I see and I remember.
I do and I understand.
Chinese Proverb

Mind/Body Connection



How this skill applies to software testing

As we test, we build mind/body connections. Even our ability to recall our steps, the details, the variables improves over time. While we look to other fields – most readily sports – we believe their deliberate practice helps their mind/body connections – are we sure the same is not happening to us?



Examples

- Muscle memory
- Gaining a feel for something
- Learning through experience

Ted Talk

Wayne McGregor

A choreographer talks about moving ideas from our mind to our body.

<http://blog.ted.com/2012/09/14/tips-for-thinking-like-a-dancer-from-acclaimed-choreographer-wayne-mcgregor/>



Definition

Empathy

- Understanding and entering into another's feelings
- Sharing the feelings of others (especially feelings of sorrow or anguish)

Quotes

- "A musician cannot move others unless he too is moved." Bach
- "Look at things for the very first time." Perez de Ayala from Advice for a Young Investigator
- "These things were not observed because they were not expected or specifically looked for."
- From The Art of Scientific Investigation
- "The medical ear must be properly trained to hear stories – a medical history, after all, is a short story." from John Stone in Sparks of Genius

How this skill applies to testing

When we work with software developers, user interface designers or business owners and ask questions, some of the questions we ask help us to understand someone else's point of view; we are empathizing with developers who are interpreting requirements, user interface designers who are trying to design with the user in mind and business owners who are championing product development to suit either their needs or needs of other people.



Applying this skill to testing

Building user personas is about empathizing with our users. We build personas to understand the context, the mindset and the needs of a user. We design, develop and test from a user perspective.

Stanislavsky method

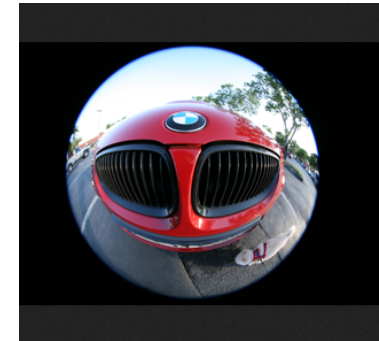
Two of the suggestions for improving an actor's ability to empathize and to be able to draw emotional reactions from memory:

Practice "inner attention." Observe your responses to the world and remember your physical and emotional memories of your responses. Being able to call upon these reactions and being able to reenact feelings is what actors do.

Practice "external attention" to people and things. Study other people and things closely.

Photography

The fish eye lens was built by Robert Wood, a physicist who wanted to know how the world looked through the lens of a fish.



Acting

According to the book Sparks of Genius, Tom Hanks wanted to know how it felt to be an astronaut so he would walk on the bottom of his pool breathing through a hose, pretending to train for weightlessness.





Definition

modeling

The act of representing something, usually on a smaller scale.

Comments & Snip-its:

- Physical representation – renders immediate perception and view
- Gaming often relies on the use of modeling.
- “...a condensation of time and place.”
- “...to test decision making and strategy. ... to make mistakes, find weaknesses and explore possibilities”

Quotes

- “To model an object is to possess it.” Picasso
- “Knowing the limitations of a model is as important as knowing its valid uses.” Sparks of Genius
- "All our ideas and concepts are only internal pictures".
-- Ludwig Boltzmann (1899)

Examples

- The tailor’s dummy
- Crash test dummies
- Dolls, airplane models, train models, ship models
- The alpha helix
- Architecture models
- Civil engineering: bridges
- Personas in design and development

Why this skill matters to testing

Similar to abstracting or imaging, our ability to “wrap our heads” around designs, products and concepts that are not fully realized helps us perform as part of the team that builds and provides a solution for customers, not just test according to the requirements.

The ability to devise a mental model or a physical representation or functional model in order to:

- Understand
- Make something accessible
- Test decision-making or hypothesis
- To make mistakes
- Or as Picasso said, to possess something.

Story

Some years ago when I was learning or trying to learn a data replication schema, my boss Bob draw a wheel with spokes and a hub and explained the concept with a simple drawing.

He went onto detail the concepts of:

- Master/slave
- Timestamps
- Frequency intervals
- Dirty reads



And perhaps some additional concepts were clarified, all with a simple drawing of a wheel.

War Games

One of the most known uses of modeling is “war games.”

Modeling provides an opportunity for simulation. This is especially valuable when the actual scale of what is being modeled is so large that a full representation may not be feasible.

“Knowing the limitations of a model is as important as knowing its valid uses.” from Sparks of Genius

Search on the “von Reiswitz” game for more information on war games.

Payne's Mental Model

The following information, taken from Understanding Learning: the How, the Why, the What by Dr. Ruby K. Payne, explains the characteristics and purposes of mental models.

Mental models are how the mind holds abstract information, i.e., information that has no sensory representation.

All subject areas or disciplines have their own blueprint or mental models.

- Mental models tell us what is and is not important in a discipline. They help the mind to sort.
- Mental models often explain the “why” of things working the way they do.
- Mental models tell the purposes, structures, and patterns of a discipline.
- Mental models are held in the mind as two-dimensional pictures, movements, stories, or analogies.
- Mental models “collapse” the amount of time it takes to teach/learn something.
- Mental models of a discipline are contained within the curriculum.

Resources for More

Book: "The Design of Everyday Things" Donald Norman 1988)

Movie: Lorenzo's Oil

YouTube: Rebecca's example of Payne's Model

<http://www.youtube.com/watch?v=X0sRH1GG2GE>

Ted Talk

Sendhil Mullainathan: Solving social problems with a nudge. When a mental model does not work:

http://www.ted.com/talks/sendhil_mullainathan.html

Research Paper

<http://mentalmodels.princeton.edu/papers/2005HistoryMentalModels.pdf>

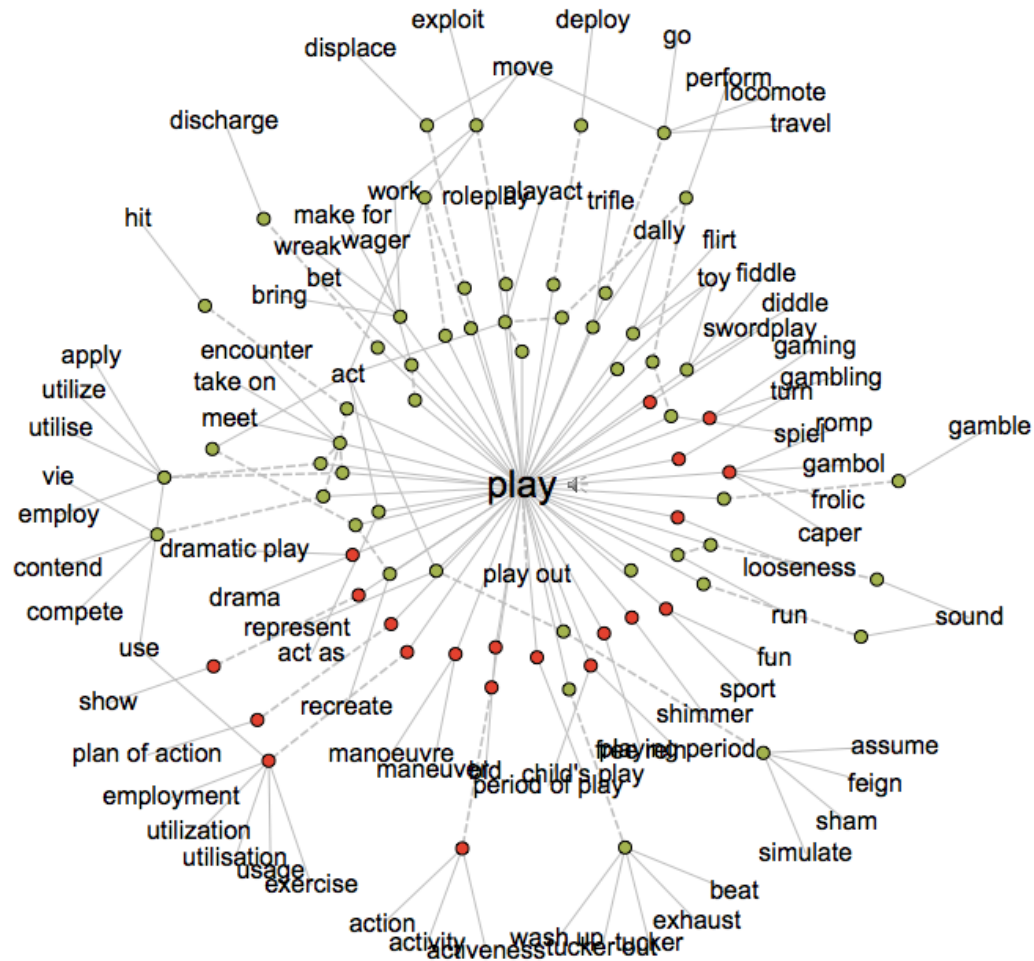
See the following for class exercises:

<http://www.geocities.ws/dustinbaier805/assignment3.htm>

<http://www8.cs.umu.se/kurser/5DV048/VT09/utdelat/F8.pdf>



Interesting associated words & phrases



- Exploit
- Role play
- Wreak
- Encounter
- Compete
- Use
- Exercise
- Take On
- Contend
- Apply
- Exercise

Are these not the activities we do as testers?

Proof on the value of play

“Einstein described his scientific method as combinatorial play. He famously used thought experiments, which are essentially elaborate analogies, to come up with some of his greatest discoveries. By bringing together what we know and what we don't know through analogy, metaphorical thinking strikes the spark that ignites discovery. ” Quoted from Ted talk -- Metaphorically speaking, by James Geary.



Quotes

“A little nonsense now and then, is cherished by the wisest men.”

— Roald Dahl, *Charlie and the Great Glass Elevator*

“You can discover more about a person in an hour of play than in a year of conversation.”

— Plato

“This is the real secret of life -- to be completely engaged with what you are doing in the here and now. And instead of calling it work, realize it is play.”

— Alan Wilson Watts

Resources

YouTube, video called Sunday

<http://www.youtube.com/watch?v=dUxMm8aj3gs>

Facebook

See the National Institute for Play

WordPress site

<http://stevemccurry.wordpress.com/2013/01/29/power-of-play/>

Why does this skill matter?

Without a sense of investigation, experimentation and play, testing could be quite dull.

Alexander Fleming discovered penicillin by experimenting and playing.

The issue is not with having a sense of play towards our work but our attitude about play and the word play.

Ted Talks

Tim Brown: Tales of creativity and play

http://www.ted.com/talks/tim_brown_on_creativity_and_play.html

Tim Brown: Tales of creativity and play

http://www.ted.com/talks/tim_brown_on_creativity_and_play.html

James Geary: Metaphorically Speaking

http://www.ted.com/talks/james_geary_metaphorically_speaking.html

Bug Bashes

Have you noticed that during bug bashes and Exploratory Testing we allow ourselves to play?



Procrastination, Distractions & Stress

These are issues we all battle: procrastination, distractions and stress.

The skills that help overcome these obstacles are: discipline, mental toughness and deliberate Practice.

Some insights into procrastination

- I don't understand what I am supposed to do.
- I don't want to do what I'm supposed to do.
- I resent having to do the task.
- I don't know where to begin.
- I'm afraid.
- I want the work to be perfect and with that criteria in mind,
- I can't start or I can't finish the task.
- I have other tasks I'd prefer to do.
- I don't want to work at all (right now).

Procrastination



Try a Practical Maneuver

- Give yourself a small reward for each task completed.
- Use an alarm clock and limit the time for the task.
- Try some of the time boxing ideas I'll share.
- Reduce the task size.
- Look for simple tasks that can draw you back to the work.
- Realize a single task accomplished is better than no tasks touched.



Solution Combination

- Self-control
- Self-mastery
- Deliberate practice
- Mental toughness
- Willpower
- Focus

Quote

“Self control is more indispensable than gunpowder.”

~ Henry Morton Stanley

For more information

In the Fall of 2012, I gave a keynote on the topic of discipline, you can find more on my website and on Slideshare.

How this skill applies to testing

In testing we need to intensely focus in order to not only confirm software works as expected but to watch for other sometimes unpredictable ways that software does work.

11 Steps to Becoming an Expert

1. Slow down
2. Start with a goal
3. Chunking
4. Practice at the edge of your ability
5. Get feedback
6. Repeat
7. Vary your approach
8. Count good repetitions
9. Record the data and review
10. Make it harder
11. Find someone who is better

From:

<http://expertenough.com/2327/deliberate-practice-steps>

Quote

“We can’t get good at something solely by reading about it. And we’ll never make giant leaps in any endeavor by treating it like a snack food that we munch on whenever we’re getting bored. You get good at something by doing it repeatedly. And by listening to specific criticism from people who are already good at what you do. And by a dedication to getting better, even when it’s inconvenient and may not involve a handy bulleted list.”

~ *Merlin Mann*

Quote

We are what we repeatedly do. Excellence, then, is not an act, but a habit.” ~ *Aristotle*

Additional Skills to Investigate

- Memory
- Transfer of skills
- Decision making
- Note-taking
- Clarity
- Asking questions
- Brainstorming
- Problem solving
- Mental Toughness
- Discipline
- Synthesizing – Making Sense, Sense Making
- Storytelling
- Scientific method
- Critical thinking
- Synthesizing

THANK YOU!

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