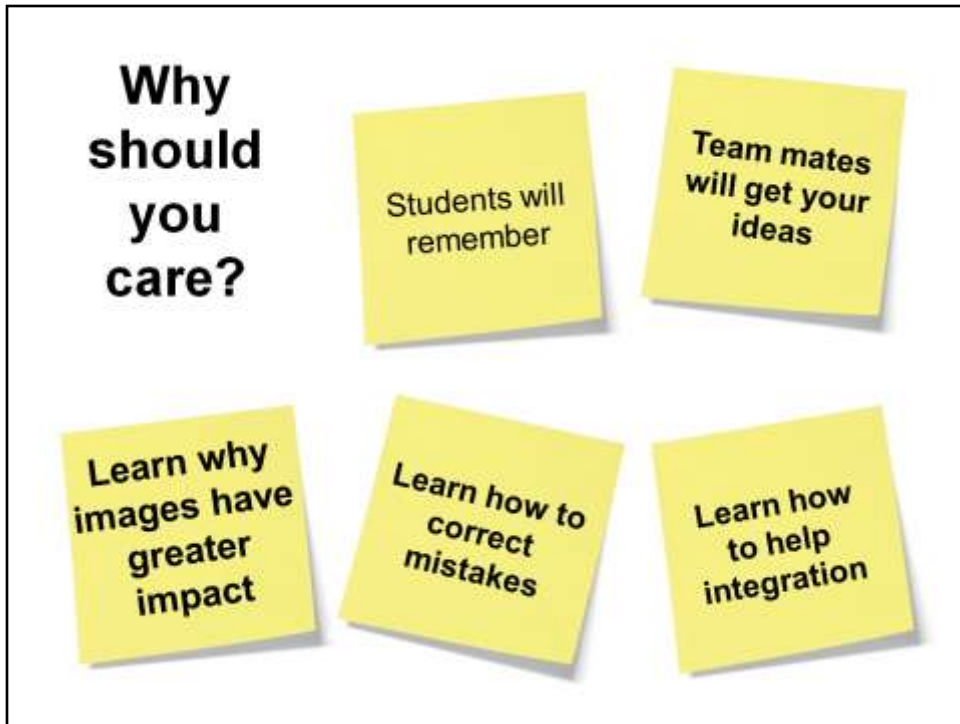


File #6883458 for photo

I got interested in Neuroscience and its applications to learning when I read Norman Doidge's book "The Brain that Changes itself". I was reading the book on our family vacation last year and as I read my wife kept on saying that this looked alot like reading for work. I kept on saying that it was just pleasure – one year later and she was proven right.



Do you wonder why people don't understand the idea you're trying to get across in a meeting? Are you mentoring another developer and struggling to understand why they still don't get it? Do you run training courses and wonder why the attendees only learn 10% of the material.

Survey

- Background
- Motivation

Time Limit: 1 min per person

Use tick marks on flip to note passage of time (one per 15 secs) aka Lightning talks

Mark - We're going to do a quick general sampling survey. The expectation is that after 5-6 people we will have found a representative sample of our audience. We will record key points on a flip chart. Our focus is to find a little a bit about who you are and why you're interested in this talk – to make sure our talk will meet your needs.

After each volunteer – we ask for another who is different from the ones so far

Need a helper: Tick Marks

Outline

- Neuroscience Background – 15 min
- 3 Topic Areas (of a possible 5) 15 min each
 - Topic Area Presented
 - Discussion After Each Topic
- Your Plays
- Wrapup

Mark – just a quick run through



<http://www.sxc.hu/photo/990137> - image

One of the ways that we can integrate what we've learned and make it our is to restate in our own words. To that end think of a problem you've had trouble explaining to your fellow team members. Pick one problem per group.

At the end of the presentation I'm inviting you to create a short play at the end of the session – at most two minutes.

At the end of every section we present you will have five minutes to discuss what you've learned and prepare your play. Even if you're uncomfortable with performing you will still gain some of the benefit by participating in the discussion.

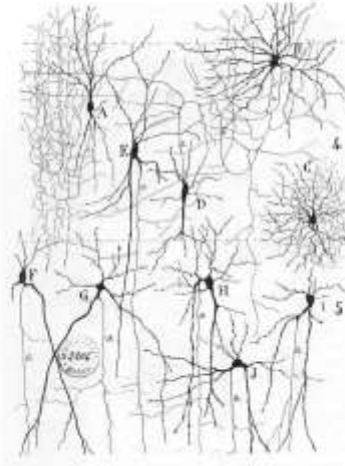
Linda: Give them example – a concrete example of what the play would be.



File #: 3881049 for photo

- Lead with the Abstract
- Not Grounded in the Listeners experience
- Too many words on the slide distract the audience from what you have to say. Your brain can't pay attention to two things at once. With words on the slide the speaker will lose.
- Passive students – i.e. Those just listening and taking notes, aren't using all of the brain. They retain knowledge but don't really understand it.
- Habituation – Your audience falls of the wagon because they hear the same voice droning on and on. It can happen to the most dynamic speaker. It takes only a few minutes

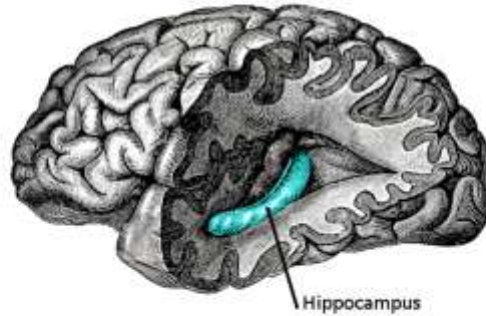
Introduction to Neuroscience



- Neuroplasticity
- Neural Networks
- What are memories/things we learn?
- Role of Hippocampus

Only Twenty years ago most people in the world of neuroscience believed that your connections in your brain were fixed by the time you were a teenager (or even younger). Now we understand that our wiring continues to change (even new neurons can grow) even as we grow older. This is called Neuroplasticity, the discoveries around it are what make this presentation possible. All of our knowledge, all of our memories and all of our ideas are just stored in neural networks – in other words everything inside our brain is just encoded as the connections between a neurons. Neuroplasticity just says that we're able to make changes to those connections.

Hippocampus



The hippocampus is the gatekeeper to laying down long term memory and apparently also to integration. It appears that its required to integrate images, patterns, faces, sounds, ... into episodic memory. Zull p80-82

Choose 3 of 5

- Prior Knowledge
- Mistakes
- Emotion
- Images
- Integration

Remind them that we're going to working on our plays.

90 minutes isn't long enough to present all of this material and we want to put our audience in control – the importance of emotion. So we will cover 3 of the 5 sections and its up to you to choose.

The sections are:

Need short pithy descriptions here

Prior Knowledge

“The single most important factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly.”

David Ausubel



Can't create new networks out of thin air. We can't understand something that isn't connected to something we already know.

(p94)

The best approach for a teacher is to build on existing neuronal networks (p101)

Knowledge as we know is just represented in the brain as neural networks and these neural networks don't just spring out of thin air. So to create new neural networks and new knowledge we have to find existing networks to hook onto.

Ask open ended questions around the topic that will help discover their existing knowledge.

Questions like: “What does this make you think of?” or “Is there some part of this that rings a bell for you?” or “What is the first thing you thought of when we began this topic?” - help discover the students prior knowledge. P120 In addition help involve the learners peers.

Tell the story of teaching Lean Wastes.

Abstract vs. Concrete



Picture: <http://www.sxc.hu/photo/1129314>

How many people have a background in math or computing science? How much of what we learned in undergrad was taught with the theory first?

Begin with concrete examples. The abstract and theoretical have less meaning if no neural networks are associated with the concrete experience of the learner.

So how do we teach a new skill that is completely foreign to someone?

In small, simple, concrete parts. Use examples. When I teach Karate I start with the foot work, once that has been mastered I add hands and then flow.

Notice in doing this we focused on actions and movements, we didn't name anything. Once we have the basic skill down, then we can discuss where it fits in to the world.

Once we've provided concrete examples it helps to keep the abstract ideas simple and give our audience a chance to remember them. We can always provide more detail in a followup paper or via references.



Point out that the discussion breaks are a form of integration and test by analogy – turning information into knowledge. We circulate and provide support.

Remind



Using this PowerPoint break timer

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Mistakes



Picture: <http://www.istockphoto.com/stock-photo-5066615-the-important-part.php>

Errors are neural networks too. Focusing on the errors will just reinforce them. Instead ignore what it is wrong and focus on what is right.

A teacher can't remove existing networks nor reduce them. Networks disappear or weaken when they're not used. P101. In addition neural networks are easily reinforced. Focusing on the mistake will help reinforce it, ...

Just like any other kind of knowledge mistakes are neural networks, the more we focus on them the more we reinforce them. So instead of focusing on the mistake we should focus on what is right.

Environment

How many people have the experience of making the same spelling mistake over and over? Environment is mine – I've been struggling to spell this word correctly for a long time. The more I focus on wanting to spell it correctly the more likely I'm to make the mistake. Why does this happen – like any piece of knowledge in our brain the spelling mistake is encoded in a neural network and the more we use that connections in that network the stronger they get. So the more I repeat the mistake the more likely it is to happen. If there is someone staring over my shoulder focusing on my mistake and telling me: "Mark don't make that spelling mistake again" – the more network is reinforced, the more I'm likely to make the mistake.

Good Examples




Picture: http://www.istockphoto.com/file_closeup.php?id=5422719

Teachers provide support by showing examples and good answers. (p147)

Come back to Karate example and show that isn't explaining using words we show what needs to be done.

Discussion Break



Remember you're preparing
your play



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Emotion



Picture: <http://www.sxc.hu/photo/841690>

Fear inhibits learning p53 – fear distorts, what we learn from neuroscience is that the fear bypasses hippocampus the goes into the Limbic.

The limbic system handles our emotional system and our relationships with people, objects, thoughts etc. It is used to drive our behaviour however it can sometimes get in our way. In response to events, people, ... it can generate towards and away responses

Things:

- Boss sent you on a course and you don't want to be there
- Intimidated by learning Unit Testing or new language
- Bullied by the teacher: I don't want stupid questions
- Afraid of being shown to be stupid.
- A roomful of people you don't know

All of these can generate an away response. Once that's happened our brain is going to want to flee and not learn. Away responses worked well when many new situations were fatal and sudden surprises might eat you. That's less of a problem in today's world, but that is the system we've evolved with.



Image a bright version of: <http://www.sxc.hu/photo/841690>

Our goal is to generate a towards response instead of the away response.

- Make learning their idea help them discover the interest in learning about Unit Testing themselves. Once they've started engage them in the Cognitive task. Put the learner in control. (p52), *Example*


-When you have a room full people who don't know each other take a few minutes to introductions, survey the room to understand their interests.

-Get people to talk about themselves

All of these break down barriers between people reducing the likelihood of an away response.

Image the opposite of the previous fear image

Discussion Break



Remember you're preparing
your play

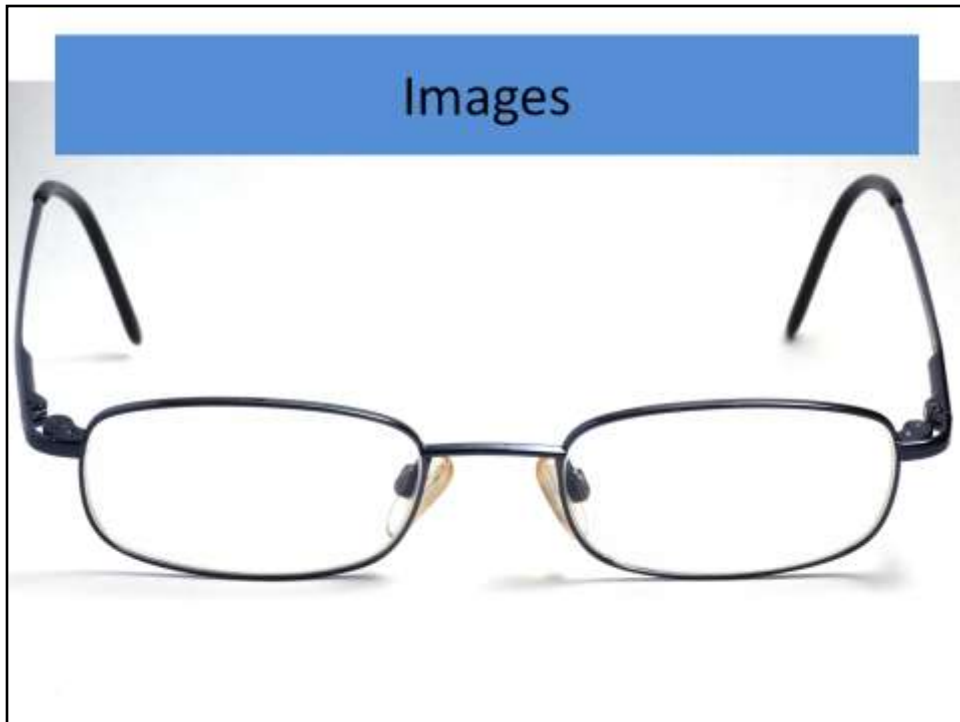


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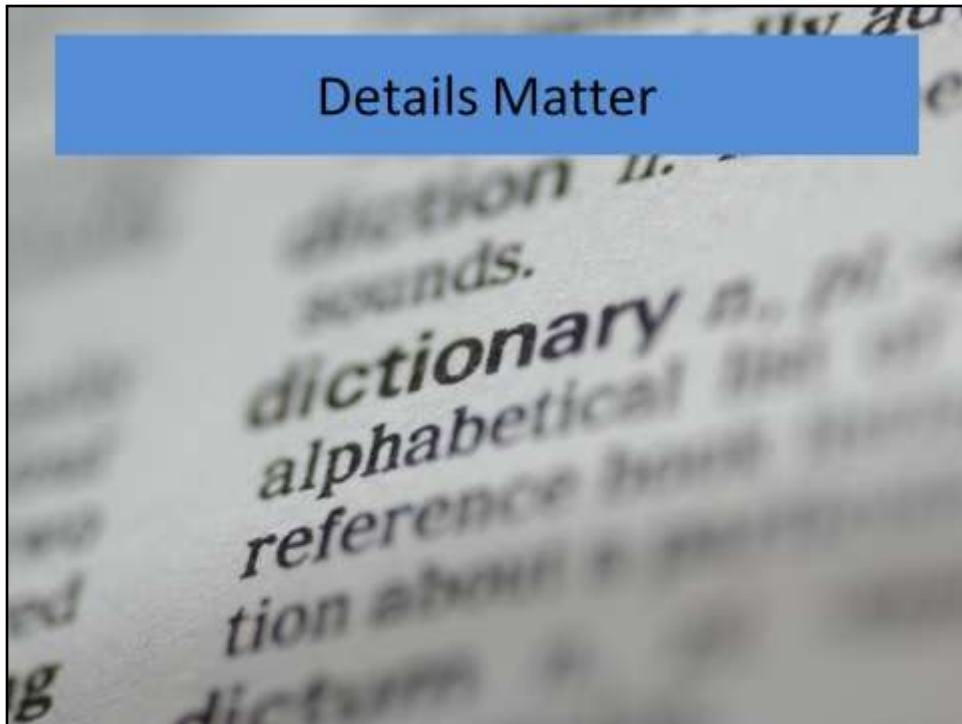
<http://www.sxc.hu/photo/538137>

Linda - Importance of Images – some details from Medina & Some from the start of Zull's chapter. Vision Trumps Other Senses – Medina.

Mark - Notice how I have been presenting – full of images and few words, stimulates the senses. Using ideas from Garr Reynolds (Presentation Zen). Few words and lots of images. Powerpoint slides with lots of words encourage distraction and multi-tasking. Since our brains don't multi-task well we have a choice either read the words on the screen or listen to the speaker. Inevitably we do the former.

In addition images are like google for the brain. They're easily remembered, provide fast lookup service and can provoke strong emotional reactions.

While not as strong as images, sound plays a similar role. At Agile 2007 I attended - Jean Tabaka's presentation "Why I don't like Monday's" (<http://www.infoq.com/presentations/tabaka-dont-like-mondays>). Jean used the Boomtown Rats song as a background/intro to her presentation. 2 yrs later and its one of two presentations that I can remember any detail from.



Picture <http://www.sxc.hu/photo/532561>

Examples: Mark's Karate, Linda's Chimp story

Mark – When an expert sees something new in their field they can quickly tell what is important and what isn't when a novice sees something new all details seem of equal importance. Its up to the teacher to emphasize the details that matter. When I see something new in Karate, I know to study first the feet, then the hand movements, finally the pace and sense of flow. As a beginner the same movement is just an overwhelming mass of detail, so the Sensei has to choose what they want to emphasize. Be aware of details – even if your not thinking about it your students won't pick the ones that matter.

Linda's Chimp story



<http://www.sxc.hu/photo/771656>

Perspective Matters - Talk about the study that shows the value of different perspectives (i.e. Standing in front of a picture vs. looking at it from different angles), Can't pay attention to a single focal point. (p142). Brain evolved for scanning. Give people different perspectives. Ask them to see things from different perspectives

Mark – Are brains didn't evolve to stand in one place staring at the same thing for any length of time, yet none the less that's often how we study topics. The human brain evolved for scanning – when we look at picture like the one of the screen we don't see it all at once, our eyes flit about the scene jumping from element to element. After a while we can no longer focus on the image, it becomes blurred in our minds and our attention wanders. Yet when we ask people to pay attention and focus we expect them to be physically still and focus on one thing. Studies have shown that when we study the same picture from different angles we remember more than if we just stand in front of it.

Give people different perspectives on the same idea, but also ask students to share their ideas and images.



It would be clever to give all the action taking slides the same format different from the rest.



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Illustration - <http://www.sxc.hu/photo/24508>

Information can only be shovelled into the prefrontal cortex in small chunks. Between those chunks we need a chance to integrate what we've learned.

Note taking helps but its not enough. It doesn't make knowledge your own. Instead you want to try restating the ideas on your own words. Our goal is to enlarge the neural network that encodes the idea. How do we do that?

Mark give students assignments and problems that require them to use the different parts of the brain. As an example assignments that ask them about spatial issues, both the big picture and the details. One approach you might ask students to describe Agile from 30,000 ft and then also describe the daily standup from ground level. The key here is to involve as many parts of the brain as you can:

- Sounds
- Repeption
- Draw a picture
- Language – i.e. Rephrase in your own language
- Movement – motor systems – i.e. The plays you will be performing
- Smells – where applicable

Analogies




Test Learning by asking the learner to provide analogies

Comparing Apples and Oranges

After we share information with a our audience we have to check to see if they've understood what we said. In a group setting like this the performance of the play is good way to see if we've reached a common understanding.

Just talk about what where doing with the play. Use this presentation as analogy because it works on both the macro and micro.

Discussion Break



Remember you're preparing
your play



Using this PowerPoint break timer

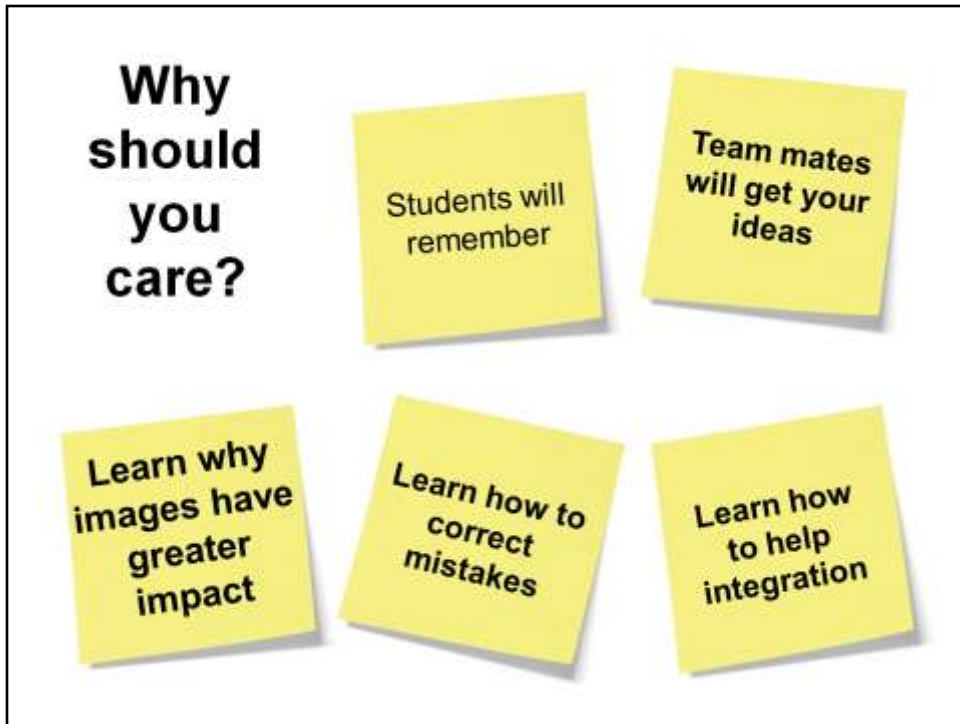
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If there are too many tables ask tables to pair up and present their plays to each other.



Do you wonder why people don't understand the idea you're trying to get across in a meeting? Are you mentoring another developer and struggling to understand why they still don't get it? Do you run training courses and wonder why the attendees only learn 10% of the material.

CALL^{TO} ACTION



Think of how you mentor, coach or teach

Search for: **“Abstract”, “Listeners Experience”, “Passive Students”, or “Habituation”?**

Create an **ACTION PLAN** for updating your slide decks and the way you mentor

Watch the people you train/mentor - listen to them, learn from them

Mark talks

References

- [The Art of Changing the Brain \(Amazon.ca\)](#) - James Zull
- [Your Brain at Work \(Amazon.ca\)](#) – David Rock
- [Brain Rules \(Amazon.ca\)](#) - John Medina
- [Made to Stick \(Amazon.ca\)](#) – Chip and Dan Heath
- [The Brain that Changes Itself \(Amazon.ca\)](#) - Norman Doidge
- [Presentation Zen \(Amazon.ca\)](#) - Garr Reynolds

Thanks

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Kolb's Learning Cycle



http://www.ldu.leeds.ac.uk/ldu/sddu_multimedia/kolb/static_version.php

We Didn't Cover

- Habituation
- Rewards don't work
- Seeing images for only a few seconds enough to remember them
- Can scan 50,000 images per sec in long term. No upper limit on memory capacity./think of this as google for your brain?/
- Sound like images but not as strong
- Exercise important - but rarely controlled by the educator
- Repetition