

HOW TO SUCCEED IN A MATH CLASS

Part of the Math Resource Center (MRC) workshop series

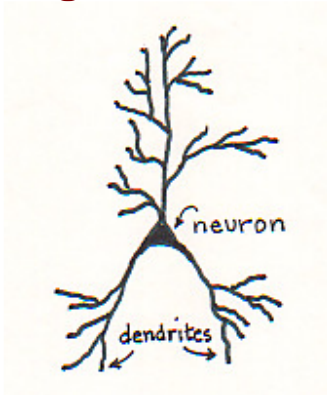
The first two pages of this handout reproduce parts of a presentation about the brain given by Diana Hestwood and Linda Russell of Minneapolis Community and Technical College.

This is your brain...



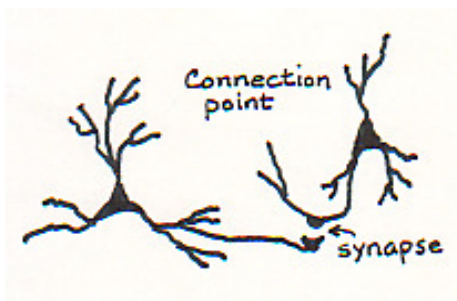
- Brain cells are called **neurons**.
- You are born with about 200 billion neurons.
- Dendrites** (fibers) grow out of the neurons when you listen to/write about/talk about/practice something.

Learning is natural!



- Neurons know how to grow dendrites, just like a stomach knows how to digest food.
- Learning = Growth of dendrites.**
- New dendrites take time to grow; it takes a lot of practice for them to grow.

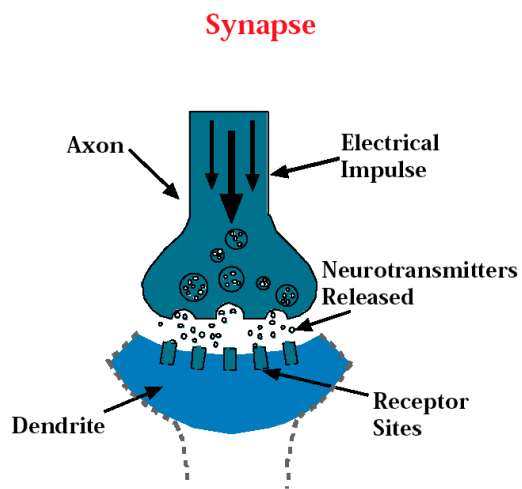
Connections form between neurons.



- When two dendrites grow close together, a contact point is formed. A small gap at the contact point is called the **synapse**.
- Messages are sent from one neuron to another as electrical signals travel across the synapse.

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Practice builds strong connections!



- Special chemicals called **neurotransmitters** carry the electrical signals across the synapse.
- When you practice something, the contact area at the synapse grows wider and there are more neurotransmitters. It becomes easier for the signals to cross the synapse.
- You grow dendrites for **exactly** the same thing you are practicing.
- If **you listen or watch** while math problems are solved, **you grow dendrites for listening or for watching**.
- If **you actually solve** the problems yourself, **you grow dendrites for solving**.

Key ideas to remember when trying to learn:

Dendrites cannot grow in a void!

- New dendrites can only grow off of what is already there, so new skills need to connect to, and grow off of, previously learned skills.
- If you do not have the necessary dendrites in place, when you try to learn new material, it will seem to go “right over your head.” (You won’t make a connection.)
- If you learn something new and do it only once or twice, the dendrite connection is very fragile and can disappear within hours. You need to practice regularly.

Things you can do.

- Make sure you are actively DOING something when you study.
 - Make study cards.
 - Draw pictures or diagrams.
 - Solve lots of problems; check your answers.
 - Check your understanding by explaining how to do a problem to another student.
 - Create a practice test for yourself. Work it in the same amount of time you’ll be given in class.

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Here are some specific ideas to remember about several aspects of “studying.”

- **Vague doesn’t help** – how do you fix something if you don’t describe exactly what’s going on? Think about how these examples aren’t really helpful:
 - My computer’s busted. My car’s busted. My boss is a jerk. I don’t get this stuff.
 - I studied, but still got a bad grade.
 - My goal is to pass this class. [Great! But how do you make that happen?]

- **We think in words and pictures**, not math symbols – you have to **turn math into a story** that has main ideas, vocabulary, and procedures.
 - For each section, be able to state from memory (1) the big idea/purpose of that section, (2) two or three concepts, which may include definitions or theorems, and (3) all the steps of two or three techniques. **Create and memorize note cards with this information.**

- **Explain your ideas to others** – try to describe what you learned in class, summarize the textbook, or explain how to do certain techniques or problems to someone who is willing to listen (and even better, ask questions like “what do you mean by ...?”). This forces you to **process** the information, forming the all-important dendrites and synapses.

- **Be active** – growing dendrites (“learning”) requires you to do exactly what you want to learn
 - **HOW do you use class time?** If you just listen to lecture and write down a few things, how is that different from watching TV? You just trained your brain to listen to someone talking about math, NOT how to DO what they were talking about. (Can you make a meal by watching an hour-long cooking show?)
 - Alternative: Write more words so you capture ideas for later.
 - Next to each step of an example, write words describing the step.
 - Write key phrases/sentences/words the instructor uses several times.
 - Write questions or make a mark next to things that confuse you.

 - **HOW do you use your notes?** Just looking at them or comparing the notes to homework problems only trains you to handle a matching task.
 - Complete your notes: as you read through them, finish examples, write comments about key ideas, fill in gaps using the textbook, and write questions you can ask or look up later. This helps you review the flow of ideas and find gaps or ideas you don’t understand.
 - Look for and explain similarities and differences between your notes and the book’s examples and homework problems.

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- **HOW do you use your book?** Reading it one sentence at a time like a novel often obscures the big ideas and puts people to sleep.
 - Read with a pencil and paper handy: Write summaries of each section that include descriptions of the main ideas in your own words, major vocabulary words and their exact definitions, and the purpose and steps of each technique in the section.
 - Do the examples from the book on a new page without looking back, then find out exactly which steps are causing you difficulty.
 - Write the questions that are in your mind in the book next to the words or example that caused confusion.
 - Explain to yourself how steps of the examples show the ideas written in words.

- **HOW do you do homework?** Focusing on getting it done doesn't help you learn – putting the answers on the paper is about taking information FROM your mind, not putting it INTO your mind.
 - When you get several problems wrong in a row, STOP! You're *training* your brain to do the problems incorrectly. Instead, write down questions describing exactly what part confuses you, or how you interpreted each step of the technique. You'll find this detail makes it easier to fix your own errors, and it also makes it easier for others to help you.
 - Write down how many problems you needed your notes or the book to help you do. Just put a mark next to the problem number each time you looked something up. This tells you how well you've memorized the material.
 - Write down how many problems you got wrong on the first try – this tells you how well you understood the material. If you had to fix more than two or three problems, you will probably make mistakes on the exam.
 - If you begin doing the problems without thinking, your brain is no longer learning. (This is a good thing if you're getting all of them right!)
 - Rewrite your homework in an organized manner with the middle steps – it helps you review and reinforce the ideas, as well as catch mistakes.

- **HOW do you prepare for/take tests?** Cramming facts into your brain and hoping for the best isn't a good strategy.
 - Take time to memorize definitions, properties, and steps of techniques.
 - AFTER memorizing, make up practice tests and do it with a time limit (use a watch or cooking timer) – how much can you do without mistakes or notes?
 - When you get your test, write down important facts you don't want to forget BEFORE you try to do the problems on the test.
 - If you get stressed/blank out, pause to breathe and stretch your neck and shoulders – the adrenaline from stress gets stuck in your brain and blocks the neurotransmitters from crossing between dendrites!

- **If your brain wanders, take a break, eat, drink, walk, etc.** You have to re-engage your brain so it's actually forming connections again.
- **Don't try to do all this at once** – remember, it takes a while to develop a new habit and make it work well, so focus on doing one or two new techniques consistently.