By: Rebecca Adler Rebecca Adler is a PhD candidate at Vanderbilt University in the department of Psychology and Human Development. Her research focuses on student self-regulation and motivation, particularly in the context of mathematics. She is currently working on her dissertation on self-regulated studying and hopes to continue conducting research bridging theory and practice. When not working, Rebecca enjoys singing, volleyball, and painting. This post was originally published on the cogbites website (here). (Cover photo by Lum3n on Pexels) Think about the last time you had to solve a challenging math problem. Perhaps you felt overwhelmed and didn’t know where to start. We know that there is substantial evidence suggesting that students should learn things like facts and foreign languages by practice testing themselves (1). But how best do we learn mathematics, where students need both procedural knowledge (i.e., knowledge of the steps necessary to solve a problem) and conceptual knowledge (i.e., knowledge of domain principles)? That is, what study strategies are best for learning mathematics? One study strategy that is helpful for learning math is to study a worked example. A worked example, like the one seen in the figure below, is a problem with the solution steps already worked out. Worked examples, paired with traditional problem-solving, have been found to be effective in helping students learn to solve problems across multiple domains, including mathematics, physics, engineering, and computer science. Sometimes, worked examples are accompanied by  prompts for students to self-explain the steps involved. Image created by Rebecca Adler Why do worked examples help math learning? It first helps to understand cognitive load theory, which states that people can only think about a limited amount of things at a time (2). When people have too many things to focus on, they may have difficulty focusing on the relevant information needed for learning. Studying a worked example helps overcome this difficulty by highlighting the relevant information. In a typical experiment investigating worked examples, students undergo a learning phase and a test phase. Depending on the student’s assigned condition, the learning phase either consists of alternating worked examples with traditional problem-solving, or just problem-solving (like a typical worksheet your math teacher may have given you). Then, there is a test on the math material covered in the learning phase. In general, those who studied worked examples perform better on the test than those who just problem-solved. Although there are many experiments showing that worked examples are an effective technique for math learning, researchers Barbieri, Miller-Cotto, Clerjuste, and Chawla (3) wanted to know just how effective worked examples actually are. To answer this question, they conducted a meta-analysis, a technique that statistically summarizes the results from multiple research studies on the same topic. Specifically, they analyzed results from 55 studies that investigated the effects of worked examples in math learning. Image from Yan Krukau on Pexels How effective are worked examples for math learning?