电磁铁不吸针的那节课，我把线圈拆了重绕

科学课第三章讲电，老师安排我们动手做电磁铁：一根铁钉、一段漆包线、一节电池，绕好通电，看谁能吸起最多的大头针。我信心满满，因为前一周刚在科普视频里看过这个实验，步骤在我脑子里过了一遍，觉得闭着眼都能做。我绕得很快，线圈松松垮垮地缠在钉子上，留了两段线头，接上电池，然后满怀期待地把钉尖凑向那堆大头针。

一枚都没吸起来。我以为是电池的问题，换了一节新的，还是不吸。同桌的电磁铁已经吸起一小串针了，正得意地晃来晃去。我盯着自己手里这根钉子，第一次觉得它不像磁铁，就是一根泡在铜线里的普通铁钉。那几分钟我挺烦躁，脑子里冒出的念头是放弃，反正实验报告写个结论也能交。

老师走过来，没直接说答案，只问了一句：你的电路真的通了吗？这句话点醒了我。我把两个线头举到窗边的光下看，才发现问题：漆包线外面那层绝缘漆我根本没刮，线头看起来是铜色，实际上被一层透明的漆包着，电路从头到尾就没接通。我绕得再漂亮，电进不去，磁场就是零。

我把松垮的线圈全拆了，用砂纸把两段线头刮亮，重新绕。这次我数着圈数，一圈挨一圈绕紧，绕满三百圈才停。接通的那一瞬间，钉尖凑近大头针，针像被看不见的手推过来一样，啪地贴上钉身。我一层一层往上加，最后吸起了二十三枚，是全班最多的几个之一。

这节课留给我的心得，比吸起针的那一下深得多。第一，失败的原因常常不在大方向上。我的方案没错，材料没错，绕线的动作也做了，错的只是刮漆这个我根本没意识到存在的步骤。方向对了不等于细节对了，而实验恰恰死在细节上。第二，怀疑要按顺序来。我当时先怀疑电池、再怀疑钉子，唯独没怀疑自己最得意的那一步。后来我做物理题也学乖了，检查的时候先查自己写得最快、最顺手的地方，因为那里最容易藏着我没验证过的假设。

第三点是我没预料到的：拆掉重绕需要比第一次更多的耐心。三百圈数着绕，手腕发酸，中途好几次想差不多就行。但正因为拆过一次，我知道松垮的线圈就算通电，磁场也会漏掉大半。坚持重绕不是赌气，是因为分析已经告诉我正确答案长什么样，剩下的只是把手跟上。那次电磁铁没吸起针的四十分钟，后来我一直记着：它教会我的不是电磁感应，而是先验证，再自信。

When My Electromagnet Refused to Pick Up a Single Pin

Chapter three of science class was about electricity, and our hands-on task was to build an electromagnet: one iron nail, one length of enameled wire, one battery. Wind it, connect it, and see who could pick up the most pins. I was confident, because I had watched a science video about this exact experiment the week before. The steps felt familiar; I thought I could do it with my eyes closed. I wound fast, the coil loose and sloppy on the nail, left two ends of wire, touched them to the battery, and brought the tip toward the pile of pins.

Not a single pin jumped. I blamed the battery, swapped in a fresh one, still nothing. My deskmate was already swinging a small chain of pins proudly. I stared at

the nail in my hand and realized it was not a magnet at all, just an ordinary nail soaking inside copper wire. Those minutes made me irritable. The thought that crossed my mind was to give up, since a conclusion for the lab report could still be written.

The teacher walked by and, instead of giving the answer, asked one question: are you sure your circuit is actually closed? That woke me up. I held the two wire ends toward the window light and found the problem: I had never scraped off the insulating lacquer on the enameled wire. The ends looked copper-colored, but a clear coating still wrapped them, so the circuit had never been closed from the very start. However neat my winding was, no current got in, and the magnetic field stayed zero.

I unwound the whole loose coil and sanded both wire ends bright, then started over. This time I counted every turn, winding tight against the previous one, and stopped only at three hundred. The instant the circuit closed, the pins leapt onto the nail as if pushed by an invisible hand. I kept adding layers, and in the end it held twenty-three, among the best in the class.

The lesson this class left me runs deeper than the moment the pins jumped. First, the cause of failure is rarely in the big picture. My plan was right, the materials were right, the winding motion was even done. What went wrong was the scraping step, one I had not known existed. A correct direction does not guarantee correct details, and experiments die in the details. Second, doubt should follow an order. I suspected the battery, then the nail, but never the step I was proudest of. Now when I check physics problems I start with whatever I wrote fastest, because that is where unverified assumptions hide.

The third point surprised me: rewinding took more patience than the first attempt. Counting three hundred turns made my wrist ache, and more than once I wanted to settle for close enough. But because I had already torn it down once, I knew a loose coil would leak most of its field even if current flowed. Persisting was not stubbornness; the analysis had already shown me what the right answer looked like, and all that remained was for my hands to catch up. I still remember those forty minutes when my electromagnet held nothing. What it taught me was not electromagnetic induction. It taught me: verify first, then be confident.