Sample Engineer’s Notebook Entries

The following would be considered an excellent example of entries in an engineer’s notebook.

5/13 I came up with a way to use the wheel and axle in my design. A weight falls into the bucket and causes the axle to spin. The wheel (what looks like a hand crank in this case) is attached to the axle and would also spin. Hitting something and transferring its energy to the next part of the system. Now I have to figure out how to use it in my system.

My instructor let me borrow a book to help me get some ideas for my system. I found a great idea for a screw and wedge mechanism on page 194:


5/15 It’s Sunday, and I came in at 10:00 AM to work on the project. I spent the morning modifying the wheel and axle design, because I think it is going to cause too much friction between the inside walls and the bracket that will hold it in place. I also went to the other Technology Lab and found some Ti diameter aluminum bar stock to make my wheel and axle.

2nd Idea: Modified wheel and axle address potential friction issue

smaller Ø keeps string from binding

Cantilevered keeps string less surface contact

Continued on page 126
5/15 (continued) I added a slotted hole to the design which will allow a shaft to connect to the wheel and axle. As the wheel and axle spins, the shaft (which is held in place by a pin) will also spin. A spring inside the slotted hole will allow the pin (which attaches to a screw on the other end) to move linearly, hence the reason for the slot.

I drew up the necessary models in CADD, and assembled them to make sure they will work (in theory). I then created a dimensioned drawing of the new wheel and axle design and fabricated it on the metal lathe.

Aluminum Axle
Scale 1:1

CADD Printouts of Assembled Sub System and Technical Drawing of Wheel and Axle

Signature: [Signature]
Date: May 15, 2005

Disclosure to and understood by: [Signature]
Date: 5/15/05
Proprietary Information
5/17 I finished machining the wheel and axle, and tossed together a mock-up of an idea for the pin so that I could test the design. The spring was purchased from the local hardware store, and cost me 50c. My instructor gave me a bin full of scrap hardware parts to scavenge through. That’s how I found the 6-32 machine screw and 5/16 nut.

<table>
<thead>
<tr>
<th>Wheel and Axle Mechanical Advantage Calculations</th>
<th>$MA = \frac{r_w}{r_a}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$r_a =$ radius of the axle</td>
<td>$6/8$ without considering friction in the system my wheel and axle design should give one and one-half times.</td>
</tr>
<tr>
<td>$r_w =$ radius of the wheel</td>
<td>$MA = \frac{0.75}{0.5}$ Hopefully this will be enough to turn the screw on the other end of the pin. I think a brass weight falling into the bucket should work.</td>
</tr>
<tr>
<td>$MA =$ mechanical advantage</td>
<td>$MA = 1.5$</td>
</tr>
</tbody>
</table>

Why did the previous examples represent an excellent engineer’s notebook?
• The pages have been sequentially numbered.
• The pages are part of a bound notebook.
• There is a dedicated location on each page for the designer’s and witness’s dated signatures.
• All figures and calculations have been clearly labeled.
• Inserted items have been properly attached to their respective pages.
• The date for each entry is clearly identified.
• The student included annotated sketches that help the reader understand the ideas.
• Detailed explanations of how the designs are supposed to work were given.
• The student gave evidence of research.
• Problems that were encountered through experimentation were chronicled, and ideas to fix them were clearly evident.
• A technical drawing for a prototype was given, which specified the material from which the part was to be made.
• A digital photograph of the prototype was included that suggests how the object is to be assembled.
• The information given in the entries is proportional to the amount of time given per class period.
• Any mistakes that were made had a single line drawn through them, and were initialed.
The following is an example of an unacceptable engineer’s notebook. Keep in mind that each entry represents a reflection of 75 minutes of continuous work.

- 9/22 Designed wood guide and first displacement arm.
- 10/11 Had to cancel on my field trip in English to work on this stupid project. Zip ties are the key. I’m sore of it.
- 10/12 It didn’t work! We got it working once before, but not during the formal test. Rubber bands # of % Inventor # of %. My partner is worthless.

Why did the previous example represent an unacceptable engineer’s notebook?
- The student submitted a sheet of loose leaf paper that was removed from a wire bound spiral notebook. An engineer’s notebook must be a bound document. No pages should ever be removed from an engineer’s notebook.
- The page number is not identified in ink.
• The student did not sign and date the page.
• There were several class days between 9/22 and 10/11 that are not represented by notebook entries.
• There were no sketches, CAD model graphics, or technical drawings to support the idea that the support bar, guide, or displacement arm was actually designed or being built. It also appeared that the student was leaving room so that he/she could go back and add sketches later on in an attempt to satisfy the rubric.
• Except for wood, which encompasses a broad spectrum, no tools or materials were identified as being used.
• The student offered no explanation as to functions of the support bar, wood guide, and displacement arm.
• The entries do not show that the partners talked about their ideas or worked on their designs as a team.
• The entries do not talk about any special considerations or problems that might have been encountered during the design of the parts.
• Only fragments of ideas have been documented. There is no detail at all.
• The student used inappropriate expletives in a formal document, and was openly disrespectful to his/her teammate.
• 75 minutes of work cannot be accurately and completely summed up in one sentence.