Writing@CSU Writing Guide

Project Notebooks

Like a scientist's log, an engineering project notebook can be used to capture work in progress during a project. Scientists and engineers use project notebooks to record data as they collect it, to brainstorm explanations of data, to record details of experimental apparatus, and to make progress notes. The project notebook can be formal or informal, recorded on paper or on the computer.

Definition of a Design Notebook

A project notebook is a complete documentation of a project's details. This documentation includes sketches; information from books, discussions, and meetings; and your own thoughts. Unlike a formal report, a project notebook is more informal. In fact, you might consider it to be a journal where you also record your frustrations and successes about a project. A project notebook may also be called a design notebook. Like the project notebook, a design notebook includes similar entries, but concentrates more on design evolution.

The main purpose of a project notebook is to record your work as it progresses. This way, you can go back to the work you did months before and reconstruct, interpret and evaluate the processes you carried out to accomplish your project.

Example One

Entry One

1/23/97

Met with group in AR115 to exchange information and decide on a weekly meeting time. Here's the groups' information:

Group #: 99

name, phone number, e-mail, class schedule

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Joe Shmoe 555-1234 js@engr MWF 11, 12, 2; TR 8, 9

Jane Doe 555-2345 jd@engr MWF 11, 12; TR 8, 11, 2

John Wayne 555-3456 jw@holly MWF 11, 12, 2; TR 11, 2

Based on our class and personal schedules, we decided to meet weekly on Wednesdays at 9 am. For weeks when this doesn't work out, we will meet on Thursday at 3 p.m. We will meet in AR115 (the ASME student lounge).

Before our next meeting, we agreed to each read the entire contents of the Web page describing the ASME Student Design Contest. The Web address is:

http://www.engr.colostate.edu/~dga/asme_design.html

The design problem will be discussed at our next meeting.

Comment:

Dave Alciatore, Mechanical Engineering Professor

This entry is good because it displays the meticulous details necessary for working on a project. You should always document as much a possible, even the things you think are trivial. Phone numbers and e-mail addresses are important for group communication. Just think, in a few weeks, you may need to get in touch with a

group member and because the information is in your notebook, you can quickly flip to that page and not have to worry about searching for the number. The Web address is another important detail. Don't rely on your memory for recall. It's also good that this group listed their schedules. This way, they know when to schedule project meetings and when they can get in touch with one another.

Entry Two

1/29/97

Group Meeting (Present: Joe, Jane. Not Present: John)

Jane will call or e-mail John to remind him of the weekly meeting time and make sure he can come next week. Jane and I discussed the problem statement and rules.

We both felt comfortable enough with the problem and constraints to have a preliminary brainstorming session. I took notes, and we both made sketches on the white board. Here's a summary of some of our ideas:

Possible design concepts:

- Ski Lift Idea - shuttle the balls horizontally with a ski lift type apparatus. We still need to think about how to release the balls.

- Horizontal Swinging Arm - also move the balls horizontally, but with a swinging arm turned by the motor. We will need to experiment with the motor and think about gearing to get the right speed/torque.

- Lift and Dump (similar to method used in last year's contest per the video Dr. Dave showed us in class) - the motor will raise a fork lift with a lead screw (see class notes). The balls are dumped into an assembled trough.

- Misc Ideas:

1. We might be able to use an electrical circuit to get more energy out of the battery.
2. We think it is good not to waste a lot of energy lifting the box, balls, or parts of our system with the motor

3. Different ways to gear down the motor: belt/pulley, chain/sprocket, a purchased gear box (like Dr. Dave showed us in class), assembling our own gears.

Jane was very supportive of my ideas. I thought that some of her ideas were bizarre and out of control, but I was careful not to criticize. We decided to hold off on any detailed discussion until we could meet with John next week when we would have another brainstorming session.

We generated the following questions to which we didn't know the answers:

- Can a spring be compressed before the start as long as the motor recompresses it after the balls are delivered?

- Do the balls have to end up in the bottom of the box?

Jane agreed to see Doug, Deb or Dr. Dave to get answers to these questions. Before our next meeting (2/5/97), we agreed on the following tasks:

- Jane will go to Gart Sports to purchase ping pong balls and golf balls. We will share the cost.

- Jane will get answers to our questions.

- I will work with John to build a set of boxes (16x16/32 cm) out of wood or cardboard.

Comment:

Dave Alciatore, Mechanical Engineering Professor

It's always a good idea to document when a group member doesn't show up to a meeting. This way, you have a complete history of project work. Also, if your instructor will be reading your entries and grading you for effort, you have documentation that you are participating in the project.

Second, the diary-like statements written here are very important. This way, you can later remember your emotions and impressions. Different mind sets influence decisions and can later be responsible for a project's outcome.

The major problem with this entry is that doesn't include any sketches. What do these designs concepts look like? Each member should have been drawing these ideas as they were discussed. That way, they could have compared designs and even brainstormed which would work and which wouldn't. Further, one sketch may not have been enough for each of these. The more sketches the better. You should always depict different views or a sequences of events. This will help you remember details later.

It's good that this writer reacted to another group member's ideas. However, he could have noted why he thought her ideas were bizarre because in the future, he may not remember why he made such a statement.

Finally, this entry ends in a way that all entries should: the next plan of action. This way, everyone understands the others' expectations and can be held accountable.

Entry Three

1/31/97

I called (left message) and e-mailed John asking if he could meet me today or tomorrow to work on the boxes. John replied to my e-mail saying 3pm today would work. I replied yes. We met in the ME Shop at 3pm and talked to Walt about constructing the boxes. He had some 1/4 " plywood that he said we were welcome to use. We picked some out and Walt showed us how to use the bandsaw to cut out the sides of the boxes.

By the time we were done with the band saw, it was time to clean up and close down the shop. John asked Walt if he could come Monday to get help with the drill press. Walt agreed.

I agreed to pick up the wood pieces from John on Monday night (from his dorm room). He will be done with the cutting and drilling by then. I will try to assemble the pieces using small screws and glue I got from my uncle in town.

Comment:

Dave Alciatore, Mechanical Engineering Professor

This entry is more narrative than the others. This is good because it documents the work accomplished so far. This type of entry shows that you've done the work you were assigned. If you don't record all the details, you have, in effect, lost all your work.

Entry Four

2/5/97

Group Meeting (Present: Joe, Jane, John)

John apologized for not making the meeting last week. This made Jane and me feel better (we were worried last week). Jane reported the answers to the questions we had last time - she got the answers by rereading the Web material and by visiting Deb:

> If we use a compressed spring, it has to be recompressed before the balls come to rest in the destination box.

The second answer reported by Jane gave us the idea to incorporate a collection device in the receiving box that will contain the balls as fast as possible just below the top surface.

We had a brainstorming session (John took notes, we all made sketches on the white board). We also agreed to narrow the field of alternatives to 3 by using the prioritization method presented in class.

We also got into an argument because John really liked one of the ideas, but Jane and I didn't agree with his logic. John was really upset. Jane said we should take a couple of days to think about both sides of the argument, and we agreed to discuss the matter again later. We agreed that whenever we have a big disagreement, we should take a day or two to think about both sides of the argument and try to discuss it again. We will all try to compromise and appreciate the perspectives of others, but in the end we will decide by voting or using prioritizing methods. If there are still a lot of bad feelings, we will approach the TA's or our instructor, so they can help us resolve our conflicts.

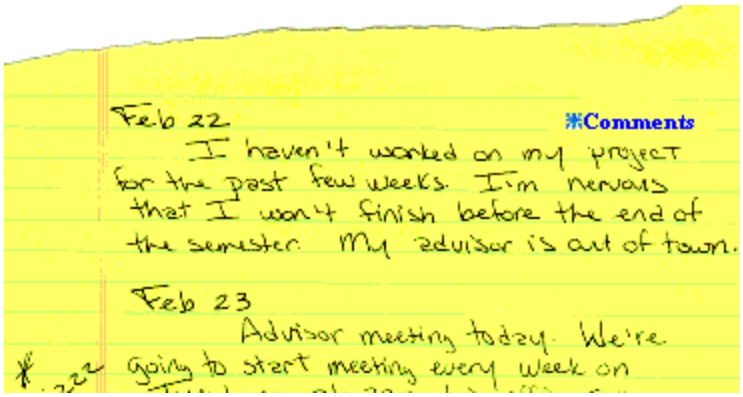
Comment:

Dave Alciatore, Mechanical Engineering Professor

More diary-like entries are here and these will help to remember how a design was decided upon in the future. It's also good that the group has a plan for how to resolve conflicts.

This entry, like the others, is missing sketches of what the device looks like. Also, the writer should have elaborated on what resulted from the summary brainstorm and what resulted from the narrowing of alternatives.

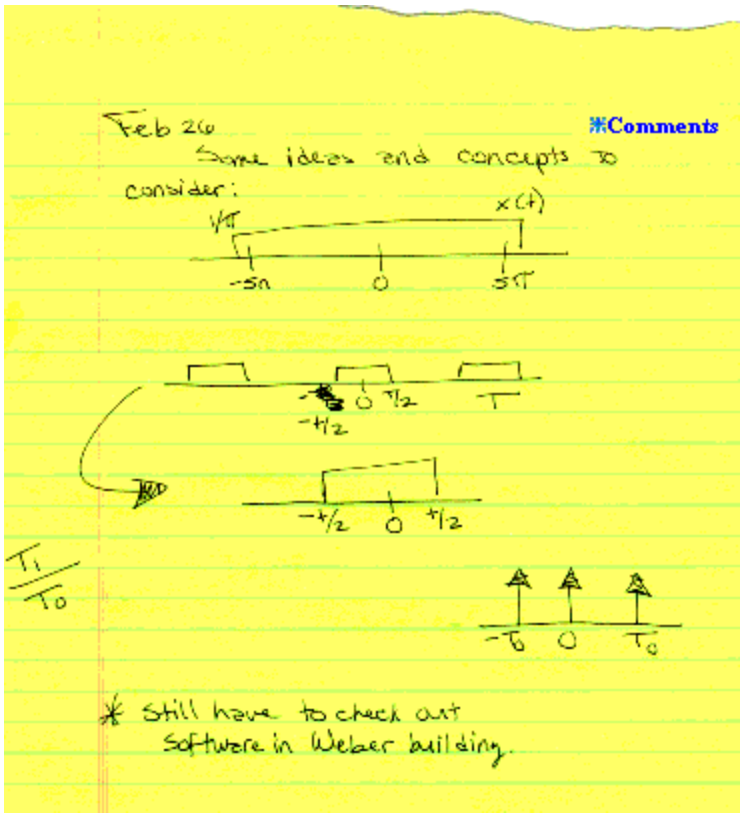
Example Two



Comments

Entry One: This entry records some good information. It captures the writer's feelings and efforts about the project. Also, it's good that the writer noted the name of the software and where it can be found.

However, many details are missing from this entry. Certainly, more of the advisor discussion should be recorded. What about the designs due the following week? Any brainstorming done in meetings should always be recorded. Also, with a pending deadline, the writer should have a proposed completion schedule for the rest of the semester.



Comments

Entry Two: The sketches drawn on this page are missing explanations and details. First, mathematical equations are necessary to clarify each sketch. Also, these sketches should be labeled and critiqued. The writer notes that these sketches should be considered, well, why should they be considered? Because the previous entry was missing details, this entry now suffers. It's quite possible that during the advisor meeting, these variables were introduced. Later, when the writer has to justify in the final report why these variables were used, he/she may have a difficult time remembering.

Patent Issues

Project notebooks serve as official documents for patenting. While working on a project or design that will have controversial or economic ramifications, you should always have a supervisor or advisor sign and date your notebook. This way, you can vouch for your project's evolution. For legal purposes, it's especially important to know that the history you've documented is in fact true and has the correct time

schedule. Legal disputes require you to prove that your work was completed within a certain time frame. When it comes to invention, timing always plays a major role.

Audience

The main audience of a project notebook is yourself. Typically, only you will read your notebook entries and use them to recall ideas. However, you may also share notebook entries with your peers during group meetings. In industry, co-workers also benefit from one another's notebooks. For example, during a project meeting, group members need to justify a design decision. They can then refer to sketches and ideas in their notebooks as evidence to support their decisions. Also, when an employee leaves a company for another job, his/her successor will use the notebooks to continue project work and understand design decisions.

Format

Project notebooks, like other notebooks, usually don't have a specific format since they are personal documents. However, you should always date your entries and make sure your notebook is well organized. A bound book and page numbering keep your notes in order.

A more specific organization option is to use two columns for each entry. One column becomes the task column, where you document what you are doing and discovering. The other column then becomes the reflection column, where you record your thoughts on what is happening and any questions you have. Using the same organizational form for each entry helps you locate specific information quickly.

You might also consider keeping an electronic notebook (on a disk or hard drive). However, you won't be able to draw sketches as you would on paper and you would have to print your entries before meetings.

Graphics

One important element of a project notebook is sketches. Drawing sketches for your designs allows you to depict complex information. In particular, sketches are

useful for portraying three-dimensional objects. Since a sketch is an informal depiction of a concept, it doesn't have to be very precise. Typically, sketches show the basic form of a concept although they can also include more detailed drawings. Sketches become more specific as a project progresses. Many sketches can then be re-drawn for a final report.

Ideas for Topic Entries

The list below presents possible topics for your project notebook. Each entry you write will usually include more than one of the following:

- Reviews of Literature/journal articles (includes reference citations & gaps /successes of previous research)
- Conference/meeting notes
- Plans for gathering data
- Experiments run (includes detailed methods/measurements)
- Report of field work
- Progress reports
- Questions for advisors
- Problematic experiments
- Problematic data
- Possible solutions of problems
- Equipment and material requirements
- Scheduling considerations
- Budget considerations
- Staff considerations
- Interesting quotations (includes source)
- Tangential thoughts/inspirations
- Possibilities of future work
- Relationships to other projects/problems
- Comments/criticisms from colleagues/advisors
- Process analyses
- Drafts of introductions, methods, results, solutions, abstracts
- Questions for discussion
- Sketches/charts
- Formulas/statistics/functions
- Limitations of research
- Dead ends (problems that didn't get solved)

- Successes (detailed accounts of solutions)
- Cross-referencing with own notes/previous readings/previous work
- Legal/ethical issues
- Implications/applications of work
- Links to cause and effect-how can they be strengthened
- Flaws in project design
- Lists of variables
- Copies of bureaucratic forms/permissions/communications that relate to the project
- Testing procedures

Perspectives on Project Notebooks

John Mahan, Electrical Engineering

Project Notebook Content

"In my project notebook, I keep all my research. That's where I work everything out and write down all my ideas. This prevents me from losing work when I invested time and effort. I also include drawings and I even clip and paste information. I always have someone sign and date my notebook so that I have a witness to my work."

Dave Alciatore, Mechanical Engineering

Project Notebooks Versus Lab Notebooks

"A project notebook is a documentation of a design or project's process. It includes many sketches and justifications. Basically, you're justifying the decisions you've made and you're presenting the results of any analyses and testing you've done, as with a prototype you've built. It fully documents a whole design evolution and everything that goes into it. "

"Lab notebooks record testing done in a lab or testing a product that's already been designed. In the lab, the product is put through different lOops, running it through

different temperature variations or putting it on a table that vibrates to see if it falls apart. The data included here includes observations about how something performs. "

Group Work and Project Notebooks

"Your entries are personal documents and may include comments or sketches you don't want to share with others. On the other hand, you might discuss your ideas and sketches with other group members because your observations will improve a project or design. In fact, after reading parts of entries to one another, you might even refer to those ideas in your own notebook."

Sketches

"Sketches in project notebooks don't have to be very precise. You want to show the basic form of an object, maybe even some rough dimensions to give an impression. You may also include some detailed drawings. As you get more specific with your project or design, your sketches will be more precise. For instance, to depict how two things fit together, you'll show how far apart the two components have to be or how large holes have to be. These don't have to be neat, but they will have more precision in them, like hard dimensions."

Kate Kiefer, English Department

Good Versus Bad Project Notebooks

"A good project notebook is useful to the researcher. If scientists/engineers record enough detail about the on-going project, they can not only complete progress and final reports with the data and ideas collected in the notebook, but they can also hand a project to a new researcher assigned to the project if that should ever be necessary. "

"A bad notebook might be less useful because it doesn't include enough detail to help write reports or recreate the way the project developed because it doesn't keep entries ordered for quick access. "

Why Keep a Notebook?

"You should keep project notebooks for two main reasons. First, on large projects, you usually work under the supervision of a faculty member or other accredited professional. Showing the work contributed to the project may be crucial to the successful outcome of the project, to the recognition of individual contributions to the team, and to the long-term accountability of the project supervisor. Grades and job recommendations, too, may depend on the project notebook as evidence of the work involved on a project. "

"The second reason for keeping a project notebook involves learning to think like a professional in the field. As you work with project notebooks, you reinforce the learning that may seem abstract in a course, but that becomes concrete through the project. Interacting daily with the ideas of the project helps you gain expertise in the field's work. "

Project Notebooks and Audience

"The scientist or engineer working alone keeps a project notebook primarily for himself or herself. The notes and speculations are largely to jog the memory and record ongoing problems and successes with the project. The project notebook is also a guide when preparing interim and final reports on the project. "

"When scientists/engineers work in groups, however, the project notebook can be a collaborative record of the project. In this case, entries must be clear and complete enough not only for the writer, but also for other team members. In many work settings, a supervisor might also look at the project notebook to gauge a project's progress. "

"As a student, you project notebook is primarily written for yourself, but it will also be reviewed by the project supervisor or faculty advisor. You should not forget this important audience for notebook entries. "

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