Figure 7.3: Possible Project Revisions

Issue	Possible Revision
Time	
The project took a lot more time than I expected.	1. Always plan for 20 percent more time than you think you need, even if you are experienced. 2. Do not give in (within reason) to requests to adjust deadlines for key tasks. 3. Reassess the overall project for repetitive or extraneous steps. You do not have to equally emphasize every step of the EDP in every project.
A specific phase took far longer than planned.	This usually occurs during the building phase. Try one of the following. 1. Require a detailed plan of the steps before building. Remind students that their planned approach needs to reflect time as a constraint. 2. Institute a limited or no modification rule before testing; constant tweaking negates the impact of planning and delays completion.
Groups	
The project did not involve all students.	1. Reassess group size based on the prevalence of the problem. 2. Assign jobs and responsibilities. This is critical.
The groups were not functioning and needed constant supervision.	1. See numbers 1 and 2 in the preceding cell. 2. Require groups periodically complete the How Are We Doing? form in figure 3.5 (page 73). 3. Institute and remind groups of peer assessment. Consider having students conduct peer assessment midway as well as at the end of the project.
Instruction	
The amount of direct instruction was too low or too high.	1. This is always a challenge; follow the general guidelines given in the section There is Always More to Learn (page 12) in chapter 1 and the section Content (page 62) in chapter 3. 2. Look for gaps or similar issues that came up in students' questions during the project. Try to proactively notice this for future adjustments.
Students had trouble gathering and making sense of the information they needed.	1. Re-evaluate the resources you gave students. 2. Does the framework you provided directly support connecting new ideas? 3. Is there a clear connection to the project? Do students have a need to know?

Assessment	
It was difficult to objectively grade.	1. Identify key engineering notebook forms you will use to evaluate, and consider using or providing exemplars. 2. Re-evaluate your rubrics and do not hesitate to modify them for each project.
I need more evidence that students understand content.	1. Consider formative and summative milestone quizzes throughout the project. 2. Make part of the individual assessment a brief discussion of how key concepts link to the project and prototype. 3. Consider pre- and post-concept (diagnostic) tests.
Materials	
Materials were too costly.	1. Available materials are a constraint; point out what they are and their limitations. 2. Consider requiring a budget constraint and putting a price limit on all materials. This will eliminate waste and poor planning—there is no scrap value!
There were safety or cleaning issues.	1. The biggest issues usually involve cutting tools, so revise your materials list to just scissors if needed. 2. Require any paint and hot glue use in designated places only; keep old plywood boards available to use as surfaces when using these materials.
Process	
There was no evidence of brainstorming.	1. At first, you should intentionally moderate brainstorming sessions and require documentation. 2. Have students participate in some divergent thinking and creativity activities at random and during non-project times. 3. Require students to make connections to brainstorming ideas in the "Final Design Summary" reproducible.
Students made too many changes or did not provide evidence of a planned design.	1. Limit modifications—three maximum—up front. 2. Require students to complete a "Design Modification Request" for each change, with the reason for and result of the change.
Not all students presented the final product.	1. Make it clear in job descriptions what everyone will present. 2. Always include time to question students and address each individual student.