



FIGHTING DRUG-RESISTANT MALARIA



7 Considering Design Decisions

Rubric: Design Decisions

Needs Improvement	Developing	Proficient	Excels
No evidence is provided to support the design decision; explanation is inadequate or missing	Uses minimal evidence to support the design decision and does not explain why the specific feature was selected over other options and/or how that feature of the design relates to the criterion	Uses some evidence to support design decision, mostly explaining why the specific feature was selected over other options and how that feature of the design relates to the criterion	Uses multiple pieces of strong evidence to support design decision, thoroughly explaining why the specific feature was selected over other options and how that feature of the design relates to the criterion

Sources of evidence include design-test results, goals, comparisons with other designs, and background research.

Types of Evidence

	Evidence	Example For Patient Side Effects
Final results	MalariaMed test results for the proposed optimal design	moderate
Design goal	Value you determined after feedback from the project director	mild or none
Comparison to another design	Examples of another design	A different design with mild side effects, but it resulted in 65% percent resistance for drug A
Background Research	Concepts learned that are related to the criteria... <ul style="list-style-type: none"> • from reading the Dossier • from isolated tests 	What does the Dossier tell you about patient side effects for each drug? What did you learn about patient side effects , using MalariaMed?



Read the Daily Message and record notes of important points and deliverables. (5 min)

Connecting to Futura Workspace

Open the [Futura Workspace](#).

1. Select Natural Selection Engineering Internship from the login page.
2. Read the new Daily Message from your project director.
3. Add to your Daily Message Notes about today's activities and deliverables

Open and re-pin Daily Message Notes

- Add **today's date** and subject of the message (**Design Decisions**) at the top of the note.
- Add (**Copy/Paste**) summary of deliverables and/or important information under heading.

Design Decisions

Hello interns,

By now, you should have picked the design that you believe is optimal. Now it's time to explain why! Today, you'll start working on your proposal. I want to know why you made each decision for this design, so you'll begin by outlining an important section of your proposal, the Design Decisions. You might also want to refer to the [Dossier](#) for information and resources to help you outline.

Engineering proposals explain how a design addresses the project criteria. Strong evidence will improve your argument, and make your design more likely to be considered by Global Health Organization. The outline you prepare today will help you organize the evidence you have that supports the argument that your selected design is an *optimal* design.

Deliverables:

- Proposal Outline

Cheers,
Ken

Ken Tapaha, Project Director
Futura | Biomedical Engineering Division

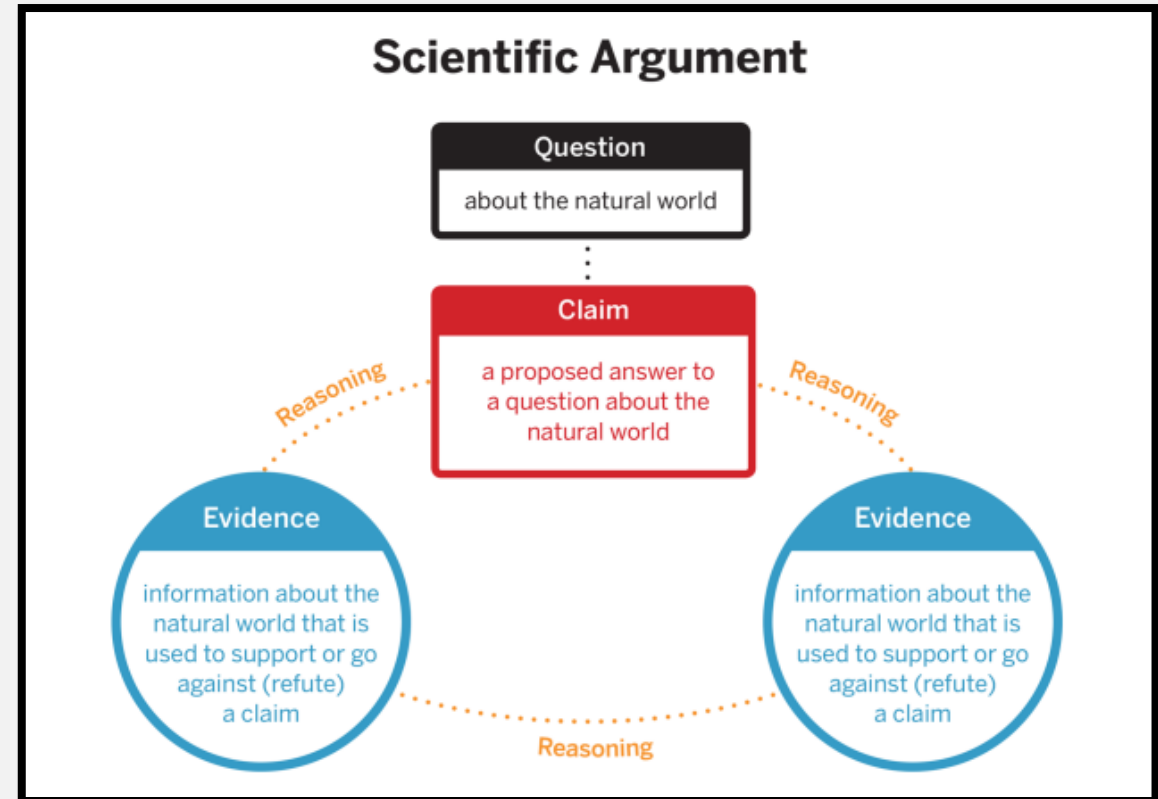


NSEI – 1.7 INTRODUCING THE PROPOSAL

Interns are introduced to the proposal you will be writing over the next few days. (10 min)

The purpose of the proposal and how the proposal is similar to a scientific argument.

- You have written scientific arguments before, and your science experience may help you write an effective proposal.
- An engineer's written proposal explains to others how and why a design solution works.
- While scientific arguments and engineering proposals are different in some ways, both use evidence and reasoning to support a claim.



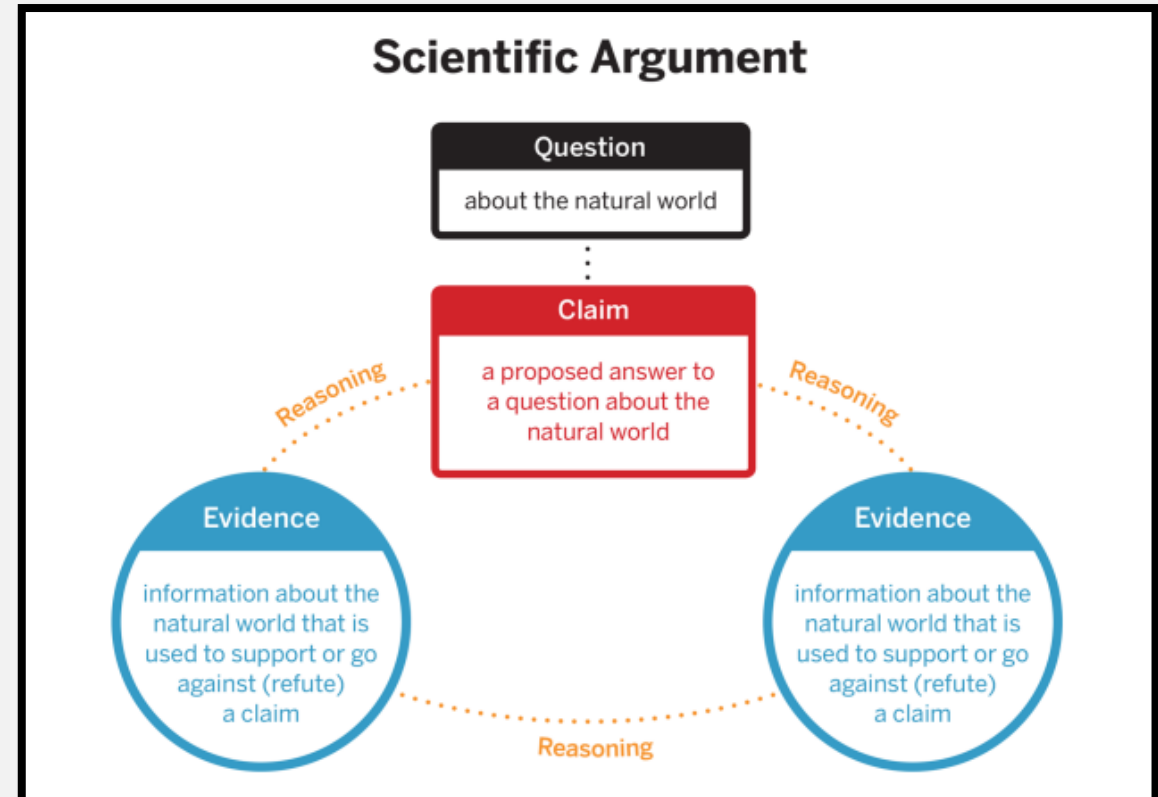


NSEI – 1.7 INTRODUCING THE PROPOSAL

Interns are introduced to the proposal you will be writing over the next few days. (10 min)

The purpose of the proposal and how the proposal is similar to a scientific argument.

- In an engineering proposal, your claim states that your design is the optimal solution to the problem.
- To support your design choices and explain how the design addresses each of the criteria, you should utilize several sources of evidence to show *how* your design is optimal.
- You will also use reasoning to connect your evidence to the claim—showing *why* your design is optimal.





NSEI – 1.7 INTRODUCING THE PROPOSAL

Proposal Rubric

	Needs Improvement	Developing	Proficient	Excels
Introduction	Introduction is incomplete; missing one or more criteria and no mention of the proposed design	Lists the criteria of the project but does not describe them; mentions the proposed design by listing the results or details but not both	Summarizes the design request and describes most criteria; describes the proposed design by listing the results or details but not both	Thoroughly summarizes the design request and describes the proposed design by listing the variables or details in the final results
Design Decisions (same for each criterion)	No evidence is provided to support the design decision; explanation is inadequate or missing	Uses minimal evidence to support the design decision and does not explain why the scientific feature was selected over other options and/or how that feature of the design relates to the criterion	Uses some evidence to support design decision, mostly explaining why the specific feature was selected over other options and how that feature of the design relates to the criterion	Uses multiple pieces of strong evidence to support design decision, thoroughly explaining why the specific feature was selected over other options and how that feature of the design relates to the criterion
Conclusion: Considering Trade-offs	Two or more of the following need attention: design priorities, summary of trade-offs in the optimal design, or a closing statement	One of the following needs attention: design priorities, summary of trade-offs in the optimal design, or a closing statement	Includes all of the following, but may lack detail: design priorities, summary of trade-offs in the optimal design, and a closing statement	Description of design priorities is clear; summary statement about the trade-offs and optimal design is thorough; includes a strong closing statement
Scientific Communication	Lacks topic-specific vocabulary; uses informal style or language	Attempts to use topic-specific vocabulary and formal writing style, but needs improvement	Uses some topic-specific vocabulary; uses formal writing style somewhat successfully	Uses topic-specific vocabulary clearly and appropriately; uses formal writing style successfully



NSEI – 1.7 INTRODUCING THE PROPOSAL

The Rubric defines what Ken Tapaha and Futura are looking for in strong proposals.

Your final proposals will be evaluated using this rubric.

Let's review specific sections of the proposal:

- the Introduction,
- the Design Decisions, and
- the Conclusion: Considering Trade-offs.

The proposal and the proposal writing process.

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NSEI – 1.7 INTRODUCING THE PROPOSAL

The proposal and the proposal writing process.

The Rubric describes what's expected for each section.

To support the proposal process, you will focus on one section of the proposal at a time.

Engineers don't just sit down and write amazing proposals all at once.

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NSEI – 1.7 INTRODUCING THE PROPOSAL

The proposal and the proposal writing process.

They often focus on a specific section and create an outline of key ideas and evidence.

This workday, we'll focus on the design decisions and how they affect each of the project criteria.

Design Decisions is the most important part of the proposal.

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NSEI – 1.7 INTRODUCING THE PROPOSAL

Today, interns will gather multiple pieces evidence to make a strong proposal.

Rubric: Design Decisions

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Sources of evidence include design-test results, goals, comparisons with other designs, and background research.



Proposal-Writing Strategies

In order to write strong proposals, you will make use of some writing strategies, which may include:

- **focusing on specific proposal sections** instead of trying to write the entire proposal at once.
- using an **outline to write key ideas** for the Design Decisions section.
- using the **Proposal Rubric as a guide** or checklist.
- **reviewing a Sample Proposal** to understand how all the pieces fit.

The purpose of beginning with an outline for Design Decisions.

You read in your Daily Message that the outline will help organize the evidence you have for supporting your claims about why your design is optimal.

A well-organized outline will prepare you to write an excellent proposal.

Ken will send feedback about your outlines that will help you to select and include the strongest evidence.



NSEI – 1.7 OUTLINING DESIGN DECISIONS

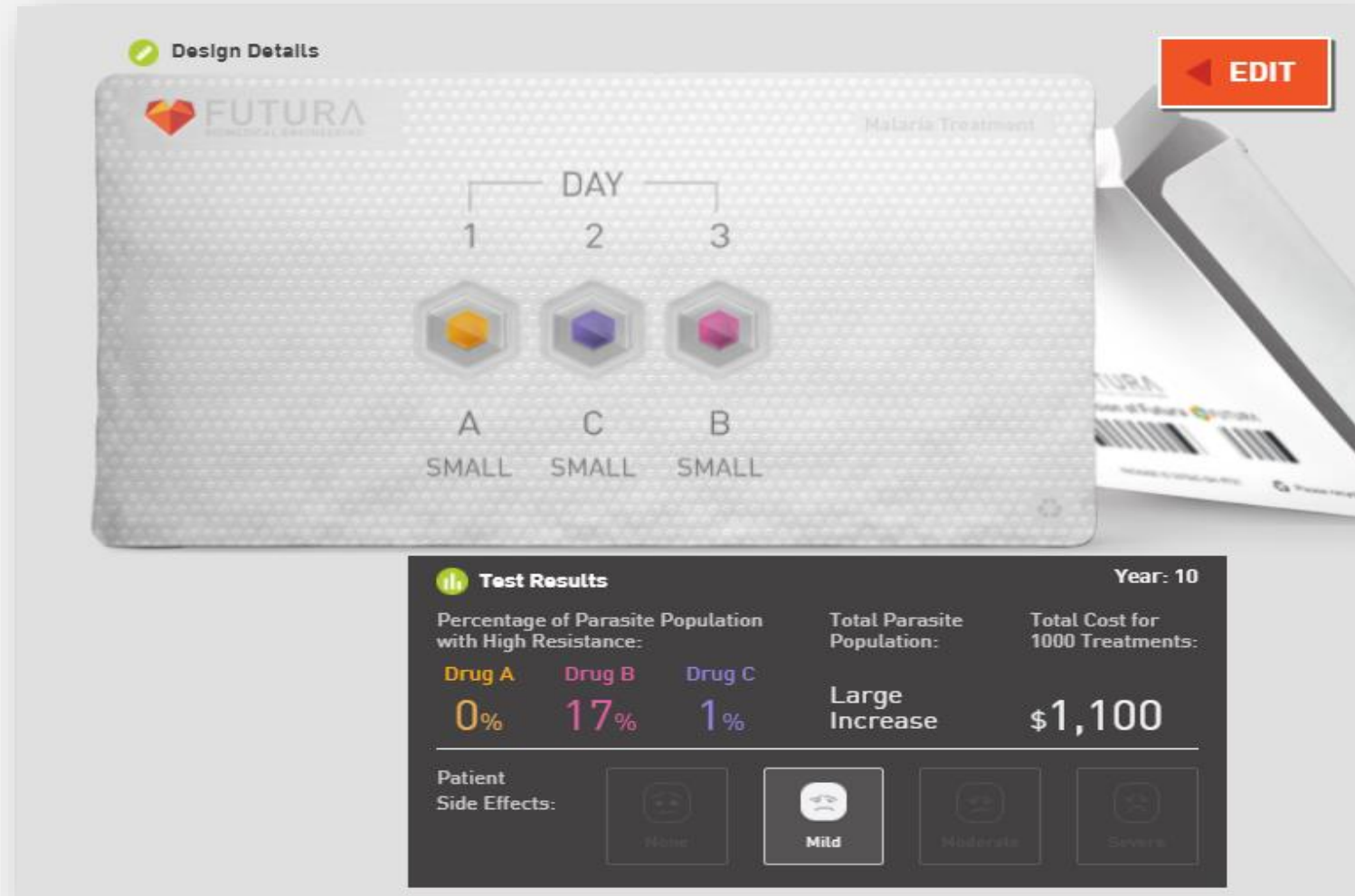
You will gather evidence and complete the Proposal Outline in order to get feedback on the strength and relevance of your evidence. (30 min)

Locate the design you identified as optimal.

At the end of the previous workday you chose one design you believe is your strongest.

You will use this design to prepare an argument to deliver to Ken.

This argument is the proposal, where you use your strongest evidence to support why the design is optimal.





NSEI – 1.7 OUTLINING DESIGN DECISIONS

Reviewing the different types of evidence used to make a strong argument.

The “Excels” quality on the Proposal Rubric describes successful proposals as using *evidence* to support interns’ design decisions.

Including all of these sources of evidence ensures you will have a strong body of evidence for your claim about your design being optimal.

Types of Evidence

	Evidence	Example For Patient Side Effects
Final results	MalariaMed test results for the proposed optimal design	moderate
Design goal	Value you determined after feedback from the project director	mild or none
Comparison to another design	Examples of another design	A different design with mild side effects, but it resulted in 65% percent resistance for drug A
Background Research	Concepts learned that are related to the criteria... <ul style="list-style-type: none"> • from reading the Dossier • from isolated tests 	What does the Dossier tell you about patient side effects for each drug? What did you learn about patient side effects , using MalariaMed?



NSEI – 1.7 OUTLINING DESIGN DECISIONS

Final results:

List the value or result of the optimal design for this criterion.

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NSEI – 1.7 OUTLINING DESIGN DECISIONS

Design goal:

The design goal is the value the interns set after they received feedback on their first submitted design as part of the data analysis. The goal may be specific or a range.

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Comparison to another design:

Interns analyze your data to identify another design that was stronger or weaker for this criterion.

Types of Evidence

	Evidence	Example For Patient Side Effects
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Background Research:

This is where you really show Ken that you understand how and why your design features address this criterion using information from the Dossier or results from the isolated tests during the Research phase.

We will go into this in more detail in a moment.

Types of Evidence

	Evidence	Example For Patient Side Effects
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NSEI – 1.7 OUTLINING DESIGN DECISIONS

The Proposal Outline: Minimize Patient Side Effects.

Today you will be focusing on the Design Decisions in your outlines.

In the Final Proposal, there is one paragraph for each criterion, but the outline is divided into a few different sections to help make sure that many sources of evidence are included.

Proposal Outline Minimize Patient Side Effects

DATA ANALYSIS

Final result:

moderate

Design goal:

mild or none

Comparison to another design:

- Another design with mild side effects, but a high percentage of resistance (65% for Drug A).*

BACKGROUND RESEARCH

Think about how your design choices affected the patient side effects. How did dose size, number of days, or the combination of drugs used in the treatment affect patient side effects?



NSEI – 1.7 OUTLINING DESIGN DECISIONS

The Proposal Outline: Minimize Patient Side Effects.

The categories for the minimize patient side effects criterion are being projected here, but you will complete the same series of information for all three criteria.

Completing the Data Analysis section (results, goals, and comparison) is a straight forward process of recording the appropriate numbers from your MalariaMed Data sheets and from the Design Feedback Summary.

Proposal Outline Minimize Patient Side Effects

DATA ANALYSIS

Final result:

moderate

Design goal:

mild or none

Comparison to another design:

- Another design with mild side effects, but a high percentage of resistance (65% for Drug A).*

BACKGROUND RESEARCH

Think about how your design choices affected the patient side effects. How did dose size, number of days, or the combination of drugs used in the treatment affect patient side effects?



NSEI – 1.7 OUTLINING DESIGN DECISIONS

How to outline the Background Research section.

Proposal Outline Minimize Patient Side Effects

DATA ANALYSIS

Final result:

moderate

Design goal:

mild or none

Comparison to another design:

- Another design with mild side effects, but a high percentage of resistance (65% for Drug A).

BACKGROUND RESEARCH

Think about how your design choices affected the patient side effects. How did dose size, number of days, or the combination of drugs used in the treatment affect patient side effects?

The Background Research is the part Ken cares about most.

Choosing which information is most relevant is also challenging.

Ken will evaluate this part of the outline by looking for multiple pieces of strong evidence that are directly related to the criterion.



NSEI – 1.7 OUTLINING DESIGN DECISIONS

How to outline the Background Research section.

Proposal Outline Minimize Patient Side Effects

DATA ANALYSIS

Final result:

moderate

Design goal:

mild or none

Comparison to another design:

- Another design with mild side effects, but a high percentage of resistance (65% for Drug A).

BACKGROUND RESEARCH

Think about how your design choices affected the patient side effects. How did dose size, number of days, or the combination of drugs used in the treatment affect patient side effects?

Including two or more examples is important and any examples you wrote down were specific to the patient side effects criterion.

What does the Dossier tell you about patient side effects for each drug?

The expected range of side effects; Drug C had the worst side effects; Drug B had the fewest side effects.

What did you learn about patient side effects using MalariaMed?

Using fewer days reduced the side effects, using a combination of drugs could help keep side effects mild or moderate, avoiding the use of large doses of drug C helped keep side effects lower.



NSEI – 1.7 OUTLINING DESIGN DECISIONS

Open the Proposal Outline from your Futura Workspace inboxes.

Begin to work on your outlines.

Remember to access your internship resources...

- data sheets,
- research notes,
- the Dossier, and
- the Proposal Rubric.

Submit your proposal outlines when finished.

DAY 7

Proposal Outline (Individual)

For this outline, you need to list important information for the Design Decisions for each criterion. Refer to your MalariaMed Data and the Dossier.

Optimal Design

List the design details of your proposed optimal design.

Version:

[1 - 99]

Day 1

Day 2

Day 3

Day 4



NSEI 1.7.2 HOMEWORK

HAND IN

After-Hours Work:

Revisit the Daily Message Notes in Futura Workspace to determine if you have unfinished tasks you need to complete.

Completing the Proposal Outline

Return to the [Futura Workspace](#) and be sure you've completed all internship tasks for the day.

- Confirm you have submitted your Proposal Outline, which you can find in your inbox. After you have filled out the form, make sure to select SUBMIT.
- Your internship coordinator may have asked you to complete additional tasks. Double check your Workspace inbox and Daily Message Notes to see if there are other deliverables that need to be completed after-hours.