

Product Proposal

- **Introduction and Statement of Purpose**

In current times, it is urgent that research in the field of nerve conduits is done for the rehabilitation of patients suffering with spinal cord injuries. Furthermore nerve conduits are tubes made from different polymers, synthetic, natural and composite, that are implanted at the site of injury to create an environment for the nerve to repair itself. My product will be a combination of a virtual prototype of an efficient neural conduit and write a comprehensive literature review overlooking at least 22 publications regarding the efficiency of nerve conduits. In conclusion my purpose is to create a product that can make an impact in the field of nerve conduits and provide insight into potential next steps that need to be taken to advance the field.

- **Review of Skills and Research**

In order to complete my product I will need to gain a deep understanding of the different types of nerve conduits. Furthermore, I will need to learn about the nerve guide conduits used to protect the nerve growth factors and regenerative medicine to repair the nerves. I will be judging the efficiency of the nerve guide conduits based on their mechanical properties, their rate biodegradability and their biocompatibility within the body. Also I will need to delve deeper into the efficiency of different growth factors substances that can have the best effect on the recovery rate of the nerves.

During the process of working on my original product, I will accumulate essential skills such as critical thinking and qualitative reasoning. To continue, as a biomedical engineer I will be required to be able to assess various publications to build an educated profile for the information and will be required to have advanced research skills. Fortunately through my original work project I was introduced to research methods and moving forward I will be able to build on that skill to learn more about how to write an educated scientific research paper.

- **Methodology**

- **Materials**

- 1) Computer
- 2) Mendeley database to store reviewed publications
- 3) Google Document and Word for writing research paper
- 4) Mackinvia Database to find articles
- 5) Online designer applications to create virtual prototype of nerve conduits

- **Description of Process and Procedures:**

First I will set up a Mendeley database so that I can keep track of my articles. Then I will research various articles related to nerve conduits until I have at least 15 informative publications that I can learn information from in my research paper. While I am researching different publications, I will also work on my comprehensive literature review by dividing the process into steps such as outline, introduction, creating tables, writing conclusions, etc. Once I have finished my research paper I will use my final thought to create an efficient virtual prototype of nerve conduits using online applications to finish my original product.

- **Utilization of Higher-Level Thinking Skills**

This project will push me out of my comfort zone and allow me to think like a professional scientist. It will teach me to work under my own deadlines and help me gain time management skills. In addition, as a professional scientist I will have to read multiple publications and have the ability to connect the similarities between articles and create an educated opinion of the information accumulated. Also I have to be able to present the information that I learned and educate others about my findings which will require critical thinking and immense analytical skills. Lastly, as I am completing this entire project virtually I may face problems fully comprehending the material because I will not be able to interact with any machines but I will diligently work to replace the interactions with machines through conducting background research about the technology used making the nerve conduits and collaborate with my mentor to gain more in-sight into the information I am exposed through the articles.

- **Conclusions**

Although I understand that my product may not have the opportunity to be officially published due to the lack of funding and the lack of exposure to multiple professionals. My product can be a stepping stone for me in the future as I can use it to build on nerve conduits in college. In addition, once more research is conducted from my findings, neural engineers and neuroscientists could have a blueprint to efficient systems of nerve guide conduits which they can add on to by conducting clinical trials and professional experiments.

III. Development of Product Calendar/Timeline

This is a step-by-step overview of the tasks that must be done for your product to be completed. At the minimum, you need to plan out what you will need to do/accomplish each week from the time the Product Proposal is due until the due date of the Final Product. This is to ensure that you have sufficient time to complete the product by the due date. Place each task on a calendar or in a timeline.

<p>Week 1 (Jan. 18-24)</p>	<ul style="list-style-type: none"> *On my mentor visit, discuss plans and talk about the viability of the experiment. *Conduct independent research on types of neural conduits *Complete a research assessment over nerve guide conduits (due 22nd). *Log hours worked on Product Log
<p>Week 2 (Jan. 25-31)</p>	<ul style="list-style-type: none"> *Email product proposal & calendar to my mentor (by the 25th). *Continue independent research on efficiency of nerve conduits *Complete a research assessment over mentor visit (due 29th). *Log hours worked on Product Log
<p>Week 3 (Feb. 1-7)</p>	<ul style="list-style-type: none"> *Use feedback from mentor to update product proposal and calendar. *Continue independent research on composite nerve conduits and nerve growth factors

	<ul style="list-style-type: none"> *Complete a research assessment over nerve growth factors (due 5th). *Log hours worked on Product Log
Week 4 (Feb. 8-14)	<ul style="list-style-type: none"> *Finalize product proposal & calendar (by the 8th). *Have reviewed at least 8 publications concerning nerve conduits *Complete a research assessment over mentor visit (due 12th). *Log hours worked on Product Log
Week 5 (Feb. 15-19)	<ul style="list-style-type: none"> *Submit a picture with Mentor after visiting campus. (due 15th) *Continue independent research on specific materials used for conduits depending on shape *Create outline of research paper *Complete a research assessment over nerve conduit shape (due 19th). *Log hours worked on Product Log (6 hours logged)
Week 6 (Feb. 22-26)	<ul style="list-style-type: none"> *Finish 1st half of research paper *Have reviewed at least <u>12 publications</u> concerning nerve conduits *Complete a research assessment over mentor visit (due 26th). *Log hours worked on Product Log (10 hours logged)
Week 7 (Mar. 1-5)	<ul style="list-style-type: none"> *Finish 1st draft of research paper. *Have reviewed at least 16 publications concerning nerve conduits * Submit Product Progress assessment (due by 5th) *Log hours worked on Product Log (14 hours logged)
SPRING BREAK (Do some work)	
Week 8 (Mar. 15-19)	<ul style="list-style-type: none"> *Use feedback from mentors about the 1st draft of the research paper and make edits. *Have reviewed at least 20 publications concerning nerve conduits *Finish 2nd draft of research paper *First draft of a virtual prototype *Log hours worked on Product Log (20 hours logged)
Week 9 (Mar. 22-26)	<ul style="list-style-type: none"> *Use feedback from mentors about the 2nd draft of the research paper and make edits. *Have reviewed at least 22 publications concerning nerve conduits *Finish virtual prototype *Log hours worked on Product Log (25 hours logged)
Week 10 (Mar. 29-Apr. 5)	<ul style="list-style-type: none"> *Finish 3rd draft of research paper *Finish research paper and references *Use feedback from mentors about virtual prototype and make final edits *Log hours worked on Product Log (28 hours logged)
Week 11 (Apr. 5-9)	<ul style="list-style-type: none"> *Use feedback from mentors about the 3rd draft of the research paper and make edits.

	<ul style="list-style-type: none"> *Complete full product and have evaluations ready *Fully update digital portfolio *Receive mentor evaluation on student *Log hours worked on Product Log (32 hours logged)
Week 12 (Apr 12-16)	<ul style="list-style-type: none"> *Submit final product with all documentation *Complete self-evaluation of final product

Mentor Comments:

Do you feel that the completed product will be a professional level product that reflects several months of research and learning?

Yes, I believe it will.

Based on the list above, what real world learning purpose/purposes will this product serve?

I think it will serve two purposes: (1) It will be helpful to the community of biomedical researchers, and (2) it will set the foundation for Manogna' s future career.

What do you see as the positives of this product?

This literature review will summarize the current state of the field of nerve conduits and will therefore help scientists to identify current limitations. This is essential to advance the field and to find solutions that improve current technologies and ultimately improve patient care. It will also be of interest to the broader society, as they can learn about the research in this emerging field.

What suggestions do you have to improve the quality of this product?

I would suggest including more than just 15 research articles. This will help to get a broader overview of the current research efforts in this area.

In your opinion, what will the student learn through the process of developing/creating this product?

Manogna will learn how to find, organize, read, and understand scientific literature. This will help her in her future career if she is going to study biomedical engineering or another STEM discipline. She will also learn how to critically assess the contents of these articles and to make connections to other related fields, and to put it into the broader context. In addition, by writing this literature review, she will also learn how to write a scientific product, which includes the general structure, writing style, and how to properly reference. The virtual prototype that she is going to create will also foster her understanding of the literature that she will study throughout this project.

Are there adjustments you would suggest so the proposed product can be comfortably completed according to your student's suggested product calendar?

There should be at least 8 publications to be reviewed before the outline of the research paper is created. The more literature is reviewed, the clearer it becomes what outline the paper should have. Otherwise, the outline may change a lot while collecting more data/information.