To: All Educational Toy Division Engineers

From: Claude Shannon
Vice President for Toy Development

Subject: Educational toy project proposals

Date: January 30, 2019

Initial Funding Opportunity
As you know, several of our engineers have been conducting research into existing educational toys in preparation for Little Toy Blue’s entry into this market. In your prior report, you were asked to come up with innovative ideas for educational toys. Although your initial suggestions ignored traditional business matters such as engineering feasibility, manufacturing costs, and market demand, they were critical first steps in helping Little Toy Blue understand a product category that is new to us.

Now we must move beyond investigation and speculation to a systematic consideration of the best ideas proposed by our engineers. First, you should be aware of certain business realities. According to Frances Allen, our Chief Financial Officer, funding for this initial product development will extend only until April 20, 2019. By that date we must report our best ideas and demonstrate working prototypes—*proofs of concept*—of these ideas. We will also present plans for proceeding, should we choose to manufacture the toy. Following these final presentations and reports, we will select a few prototypes and develop final products during the summer.

Your Current Task
Your next assignment is twofold:

1. You will propose a microprocessor-based, educational toy that Little Toy Blue can develop and produce.

2. You will propose a *prototype* of this product. Your team will build the prototype this semester and demonstrate it on April 20, 2019.

The production version of this toy, if selected, will be developed by a full team of Little Toy Blue engineers and built at Little Toy Blue’s production facilities. We want you to be creative in your ideas—a wide range of devices will be acceptable,
as long as they allow for interesting and fun interaction with the child. However, keep in mind that the product must be simple and inexpensive enough to be incorporated into a mass-produced toy.

At this point, you need not describe a detailed plan for how to implement the final version of this toy. Our engineering teams will review these proposals and recommend one design for the final product. If your proposal is accepted, your product will be developed by the full engineering team.

The prototype should demonstrate the feasibility of the key features of your proposed product, but it need not implement all features fully. When designing your prototype, keep in mind the following constraints:

- You will implement your prototype on an E100 processor and a DE2-115 development board. The E100 supports a wide variety of input devices (keyboard, mouse, microphone, camera, SD card, serial port, switches) and output devices (VGA, LCD, LEDs, serial port); see the Lab 7 handout for more details. The E100 implementation on this board executes an instruction in about 150 nanoseconds (assuming a clock frequency of 100 MHz) and can store 16384 32-bit words in memory.
- Your team will have approximately one month to implement, test, debug, and demonstrate the prototype.
- Your team members have other responsibilities at work. Plan for each team member to work 10 hours per week on this project.

Proposal Format
We would like your proposal in memo format. You should describe the prototype's proposed features in detail and explain how the prototype demonstrates the main features of the final product as well as how your product addresses Little Toy Blue's needs. Your proposal should contain a detailed plan for how your team will build and demonstrate the prototype, including how you will partition the work among team members and how team members will coordinate their work. Your memorandum will likely need to be at least four pages long to cover the necessary areas in sufficient depth.

Use the structure below as a guideline and use enough headings and subheadings to help the reader make mental transitions from one topic to another.

- Memo heading
- Informational abstract (4 to 5 sentences)
  - Problem
  - Very brief statement of proposed solution
- Introduction
  - Problem addressed, with criteria and constraints
Purpose of proposed project
Significance of proposed project

Description of proposed project and product
- Description of the appearance and structure of both the final product and the prototype
- Description of the functionality of both the final product and prototype
- Clear explanation of how your product meets the client's needs
- Constraints on the project (and how dealt with)

Work plan
- Plan for accomplishing objectives
- Proposed schedule for completion

Qualifications of team

Attachments (if necessary)

Feel free to contact Dr. McCaffery or Mr. Montgomery with questions.

Submit your proposal as a PDF in Canvas by 6:00 p.m. on Friday, February 15 (counted late after 11:59 p.m.).