

### **The Computer Keyboard**

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**Type:** Design Problem  
**Time:** Three weeks research  
**Location:** 30 minutes class time to discuss the assignment - library/home

### **Summary**

This is intended to be used with first year engineering students to introduce some aspects of design such as research into alternate designs of existing products, ergonomics, and statistics.

Students will be required to produce a paper design of an improved computer keyboard. This project could be used as a group design project or an individual design project. Optimal group is three to four people.

Report: Two or more pages plus a sketch of the new design. The length of the report depends on the amount of research required by the individual or group.

### **ABET Descriptors**

**Engr Sci Content:** First Year Engineering  
**Type:** Component  
**Elements:** Ergonomics, synthesis, design evaluation  
**Features:** Development of student creativity, use of open ended problems, consideration of alternative solutions, feasibility considerations

**Constraints:** Time, economic factors, social factors, aesthetics  
**Effort:** Individual or team

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The estimated cost to industry from Carpal Tunnel Syndrome is \$25 million dollars a year. If the largest percentage of Carpal Tunnel Syndrome is found in workers that use the computer / typewriter, how would you redesign the computer keyboard so that it would be less likely to contribute to Carpal Tunnel Syndrome?

What improvements would you make to the computer keyboard so workers would be less likely to develop Carpal Tunnel Syndrome? (This will take some library research)

**REPORT:** Individual reports (two to five pages) are due in three weeks. An oral presentation of the design is required.

Reports should include the following :

**Problem Statement:** What is the problem?

**Background:** Outline relevant theory. Include references for sources of information.

**Evaluate results:** Analyze data collected. Plot a graph of data if appropriate. Why would your new design be better at preventing Carpal Tunnel Syndrome? Sketch the new design.

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### Engineering Notes:

Some key issues that could be brought out in class by the professor when the assignment is given.

- Size of keyboard: What size does the keyboard have to be in order to fit the average human hand? Statistically, how big is the average hand?
- Shape of keyboard: Should the keyboard be straight or curved in order to help prevent Carpal Tunnel Syndrome? If it should be curved or angled what is the optimal angle? Should the angle be fixed or adjustable?
- The keys of a keyboard have the same alphabetic order as a typewriter. Is this the optimal layout for typing speed? If the keys had a different letter arrangement could a significant increase in data entry speed be obtained? Have alternative keyboard layouts already been identified? If so what are they?
- What type of keys are most comfortable? How much resistance to pressure is necessary? Should the keys “click” when they are pressed ?
- Should a roller ball or some other kind of mouse device be integrated into the keyboard?
- Should the keyboard have a wrist rest?
- Cost of new design?
- Should keyboard be capable of both standard and non-standard letter layout? (switchable)
- Is there an industry or IEEE standard for keyboards?
- Could the keyboard be left unchanged and a device designed to be worn by the typist that would accomplish the same results?
- What kinds of products are already on the market and what kind of research has already been done about the problem?

Oral presentations should be given by all the designers or design teams.

Students could be allowed to vote for the best designs.

## **The Computer Keyboard**

### **Discussion / Follow up:**

Discussion about engineering constraints, limited time, social / medical implications of new design.

Discussion about creativity.

Discussion about research techniques.

Discuss the history of attempts to change the keyboard design, and market resistance to those changes.

Later classes in digital logic or microcontrollers could investigate how the microcontroller in the keyboard functions. DOS interrupts etc. If possible the instructor could gather two or three old computer key boards that can be disassembled. Divide the students into groups and allow each group to take a keyboard apart. Tell the students to identify the components of the keyboard. (size, material, power consumption, microcontroller type, key type, connection to PC, etc.)