Chapter 1 Homework

Jeremy Morris

January 18, 2006

1. *Why must the experimenter be extremely careful about implementing the results of a laboratory experiment to a production process?*

   The experimenter must be sure that the results lead to a better production process. Often there will be many factors involved in defining the new process, some of which may not have been tested during the experiment. This is why the text recommends setting up a prototype/development process in order to test the recommendations outside the production environment.

6. *An experiment was conducted for several different years on a certain section of highway. Describe the inference space for this experiment. If the results of the experiment were to apply to the entire highway, what would have to be done differently?*

   The inference space for the experiment would be the section of highway where the experiment was carried out. To apply the results of the experiment to the entire highway, the experiment would have to use the entire highway in the first place. In other words, the exerimenters would have to take their samples from the entire highway to begin with. This could probably be done by taking random samples from the length of the highway.

8. *An experiment concerning the baking of cakes was run in the kitchen of a house. The number of eggs used was varied, the baking time and temperature were varied, and the amount of butter was varied.*

   (a) *What are some possible dependent variables and how would they be measured?*
   Some of the dependant variables could be

   - Volume : measured by the size of the container needed to fit the batter.
   - Texture : measured on some kind of scale, this would be a relatively subjective measure. The levels would range from Very Dry to Very Moist.
   - Color : measured by looking at the cake and deciding what shade it is. There would be a base color depending on some of the ingredients that are held constant.

   (b) *What are the factors for this experiment?*
   The factors are the ingredients that are being varied. These are the number of eggs, baking time, temperature and amount of butter.

(c) *What are some factors not in this experiment that could have been in this experiment?*

These could have been amount of dry ingredients, for example, flour, salt or sugar. Other wet ingredients could have been factors as well, such as milk. Elevation is another factor that should probably be included since this will change the consistency of the cake.

(d) *What are typical levels for each factor?*

Typical levels for factors :

- Eggs : 2,3,4
- Baking Time : 15 min, 25 min, 30 min
- Temperature : 275, 300, 325, 350
- Butter : 2 tbl spoons, 4 tbl spoons, 8 tbl spoons

(e) *What is the inference space for this experiment?*

The inference space would include only the kitchen/stove the cake is cooked in along with the levels for each factor included in the experiment.

(f) *How can this inference space be expanded?*

The inference space could be expanded by adding more environmental factors to the experiment. For example, changing the location (i.e. in various cities/states), change stoves in the same kitchen. You could also use different brands of the ingredients to expand the inference space.