"Simple Experiment" Instructions

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This is a description of a simple but useful experiment that has been conducted many times in classroom lectures for courses on Human-Computer Interaction. It is an in-class version of Student Exercise 8-3.

The experiment has also been used in my course "Empirical Research Methods for Human-Computer Interaction", which has been offered many times as a CHI Course at the ACM's annual SIGHI conference.

As well as this file, two additional files are included herein:

File	Contents
`SimpleExperiment-handout.doc`	two-page handout, distributed to students
`SimpleExperiment-results.xls`	boilerplate spreadsheet for the data, with auto-generated charts, etc.

The experiment is a "real experiment" in that it includes all the basic ingredients of typical HCI user study. However, it is rather simplistic and not to be taken too seriously. The main benefit is that it engages students: They are "in the experiment" – both as a participant and as an investigator. This is extremely valuable, particularly if the experiment is administered prior to classroom lectures for Chapter 5 in the book ("Designing HCI Experiments"). Students have an immediate understanding of topics such as independent variables (factor and levels of factors), dependent variables, within-subjects/between-subjects, counterbalancing, Latin squares, etc. – because they were just *in* an actual experiment where these concepts are found.

The experiment is administered during a classroom lecture. It takes about 20 minutes.

Students are divided into groups of two. Each group is given the two-page handout.

An even number of students is required. If there is an odd number of students, a TA or the course instructor can join-in as well.

When the experiment begins, one student in each group of two is the *investigator*, the partner is the *participant*.

The task for the experiment is very simple. The participant enters the phrase

`the quick brown fox jumps over the lazy dog`

five times on one keyboard layout, then five times on the other layout. Entry is timed by the investigator and entered in the Results handout sheet after each phrase. The following instructions are given (and appear in the handout):

> Study and memorize the phrase below. Enter it by tapping with a non-marking stylus on the keyboard image. Proceed as quickly as possible while trying not to make mistakes. Don't forget to tap SPACE between words. Your partner will time you with a watch. Begin when your partner says "start". So that your partner knows when you finish, please say "stop" when you tap the last character (the "g" in "dog"). Repeat five times on Layout "A", then five times on Layout "B". Then switch roles with your partner. Your partner should do Layout "B" first, Layout "A" second.

It is extremely important that when the students switch roles, entry with the second participant begins with Layout "B". This, of course, is an example of counterbalancing using a Latin Square for a within-subjects factor.

Independent Variables

There are two factors or independent variables: Layout (Opti, Qwerty) and Trial (1, 2, 3, 4, 5). Both factors are within-subjects. The handout sheet shows Opti and Qwerty as the layouts but other layouts may be used. (Feel free to edit the handout, as appropriate.) Each trial is the input of the phrase. There are five trials for each layout.

Since the Layout factor is within-subjects, "Group" is nominally a between-subjects factor.

Dependent Variable

There is one dependent variable: Time (seconds). As customary for text entry research, time is converted to Entry Speed (words per minute). This conversion is done automatically in the boilerplate spreadsheet.

After the experiment is conducted, the instructor collects the Results handout sheets. Each Results sheet has the data for two participants. The results for the 1st participant are in the top half. The results for the 2nd participant are in the bottom half.

Concerning counterbalancing, the participant for the top data set is in "group 1". The participant for the bottom data set is in "group 2".

When convenient, the data are transcribed into a spreadsheet. The spreadsheet is then used to support classroom lectures on the design of an HCI user study. Some discussion on the soft keyboard layouts is also interesting and worthwhile. Rest assured, the students will have some opinions which they will be happy to share. Have fun!

Spreadsheet

A boilerplate spreadsheet is provided. It can be used with just a few modifications. The main modification is to adjust for the number of participants. The enclosed version of spreadsheet is for a run of the experiment with eight (8) participants. The same spreadsheet (with adjustments) has been used for runs of the experiment with up to about 60 participants.

The data tables in the spreadsheet are organized with the group 1 participants in the top half and the group 2 participants in the bottom half. See, for example, column N in the Data Tables worksheet. In the example spreadsheet, participants P1 to P4 are in group1 and participants P5 to P8 are in group 2. Bear in mind that when the experiment was run, the students worked in pairs, with one student in each group. For the example, there were eight students, so the pairings were P1-P5, P2-P6, P3-P7, and P4-P8.

To use this spreadsheet for your own in-class experiment, rows must be inserted or deleted to accommodate the number of participants. This is done in four places: in the Data Tables worksheet (2 tables), in the Questionnaire worksheet (1 table), and in the Relationships worksheet (1 table). For example, if there were 24 participants, you'll need to insert 16 new rows. To ensure the cell formulae remain intact in the grey cells, do the insert operations from any row other than the top row. When finished, select the top-row data cells and drag through to the bottom row.

Once the number of rows is adjusted, the raw data (time, in seconds) are transcribed by hand from the Results handout sheets into the spreadsheet. The cells to transcribe appear in the example spreadsheet in blue with a white background. See C5:N12 in the Data Table worksheet and D4:J11 in the Questionnaire worksheet.

Once the raw data are entered in the top table in the Data Tables worksheet, entry speed automatically appears in the bottom table. Note that the data in the bottom table are calculated from the data in the top table. Make sure the formulae along the top row are extended through to the bottom row for all tables.

Results in the form of summary statistics, a bar chart, a line chart, and a power law immediately appear at the bottom of the Data Tables worksheet. Some minor adjustments to the charts may be necessary.

A similar process is used for the questionnaire data, which are entered in the Questionnaire worksheet. Various results appear in the Questionnaire and Relationships worksheets. These results are likely to be interesting only if there were a lot of participants (e.g., > 30).

The Anovas worksheet is just a placeholder for some Anova analyses, which are done separately. In the spreadsheet provided, the Anova analyses are shown as images, copied from runs of the `Anova2` utility software available on the book's web site. See the Anovas worksheet for further information and instructions.

And that's about it. Good luck.

A paper by myself and Janet Read (who also uses this simple experiment in classroom lectures) was presented at *CASCON 2007*. Several iterations of the experiment are described. There is also some discussion on the merits and limitations of the methodology. The paper is accessible at

http://www.yorku.ca/mack/cascon2007.html

If you have any questions or comments, please get in touch. Thank you,

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