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## **E-nstructions: Using Electronic Instructions in Laboratory Experiments**

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# E-nstructions: Using Electronic Instructions in Laboratory Experiments\*

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## Abstract

E-nstructions facilitates the use of electronic instructions in computerized laboratory experiments. This tool has been primarily designed to be used in combination with z-Tree (Fischbacher, 2007), but it should work in combination with other experimental softwares which help developing and conducting experiments. This article provides a set of guidelines for the installation and the use of E-nstructions.

KEYWORDS: Experiments, Experimental software, instructions

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## 1 Introduction

E-nstructions facilitates the use of electronic instructions in computerized laboratory experiments. This tool has been primarily designed to be used in combination with z-Tree (Fischbacher, 2007), but it should work in combination with other experimental softwares which help developing and conducting experiments. This article provides a set of guidelines for the installation and the use of E-nstructions.

A computerized laboratory for running experiments with human participants consists of a set of computers connected together through a network. Henceforth, I denote by “server” the computer operated by the experimenter and by “clients” the computers used by participants.

E-nstructions consists of two small programs. First, a settings program allows the experimenter to easily configure how to assign instructions to participants and how participants can navigate through the instructions. Second, the E-nstructions program enables participants to toggle between their instructions and the client application of the experimental software (e.g. z-Leaf) according to the configured settings.

## 2 How to get E-nstructions

E-nstructions will be available for free presumably in September 2010. The following web page

[www.econ.mpg.de/english/e-nstructions](http://www.econ.mpg.de/english/e-nstructions)

will host the installation software of E-nstructions. In the future, this web page will also provide additional information (E-nstructions Wiki, troubleshooting etc.).

## 3 Installation

In this section, I assume that you have the latest version of E-nstructions (see Section 2). After some preliminaries, I explain how to install E-nstructions first on a personal computer as a test version and second in a computerized laboratory.

### 3.1 Preliminaries

- E-nstructions displays the experimental instructions in Pdf format. A Pdf reader has therefore to be installed on the clients.
- E-nstructions is optimized for a screen resolution of  $1280 \times 1024$  pixels.
- E-nstructions can be used on at most 32 clients simultaneously.
- E-nstructions functions properly under Microsoft Windows XP. Compatibility with other operating systems is unknown, feedback is appreciated.

### 3.2 Installation on a personal computer (test version)

The following steps describe how to install a test version of E-nstructions on your personal computer.

- Double click on the file `E-nstructions.exe` that you downloaded. The installation procedure creates two folders: `Experimenter` and `Participants`.
- Open the file `conf_P.txt` which is located in the folder `Participants`. Modify the second and fourth rows of the file as indicated below and save your changes.

1. Enter in the second row the full path of the location of the file `conf_E` which is located in the folder `Experimenter`.
2. a) If you want to use the English version of E-nstructions, enter in the fourth row the full path of the location of the folder `buttons_english` which is located in the folder `Participants`.  
b) If you want to use the German version of E-nstructions, enter in the fourth row the full path of the location of the folder `buttons_german` which is located in the folder `Participants`.

Example: Assume that the folders `Experimenter` and `Participants` are located in the root of the `C:` drive of your personal computer. In this example,

1. The full path of the location of the file `conf_E` is  
`C:\Experimenter\conf_E`; and
2. a) The full path of the location of the folder `buttons_english` is  
`C:\Participants\buttons_english`; and  
b) The full path of the location of the folder `buttons_german` is  
`C:\Participants\buttons_german`.

### 3.3 Installation in the laboratory

- Double click on the file `E-nstructions.exe` that you downloaded. The installation procedure creates two folders: `Experimenter` and `Participants`.
- Save the folder `Experimenter` on the server. Ideally, the server is the computer where z-Tree is installed.
- In the folder `Participants`, you can delete the buttons folder of the language you do not need. Save the folder `Participants` including the buttons folder you want to use (either `buttons_english` or `buttons_german`) on each of the clients.
- On each client, open the file `conf_P.txt` which is located in the folder `Participants`, modify the four rows of the file as indicated below and save your changes.
  1. Enter in the first row the cabin number of the client.
  2. Enter in the second row the full network path of the location of the file `conf_E` which is located in the folder `Experimenter` on the server.
  3. The third row is optional. If the clients fail to access the location specified in the second row, E-nstructions follows the path of the third row. Save the folder `Experimenter` on an alternative server and enter the alternative network path of `conf_E.txt` in the third row. If you do not want to use this option, you can enter `'...'` in the third row.
  4. Enter in the fourth row the full path of the location of the buttons folder you want to use (either `buttons_english` or `buttons_german`).
- Note that usually the local path starts with `C:` or `D:` and the network path starts differently (e.g. `X:`). However, the network path of the folder `Experimenter` has to equal the path of the folder `Experimenter` on the server. To match the path names, either rename the partition where you saved the folder `Experimenter`, or open the folder `Experimenter` with a link assigning a new partition name.
- Grant reading rights to the clients for the folder `Experimenter`, its subfolders and the location where your instructions will be saved.

## 4 Using E-nstructions

### 4.1 Elements of E-nstructions

The folder `Experimenter` contains the program `Settings.exe` and the two files `path` and `conf_E`. The program `Settings.exe` facilitates the configuration. Your entries in `Settings.exe` are saved in the files `path` and `conf_E`.

The folder `Participants` contains the program `E-nstructions.exe`, a file `conf_P.txt` and a folder `buttons_english` or `buttons_german`. The program `E-nstructions.exe` is the client application of the instructions software. `E-nstructions.exe` gets directions for the settings from the file `conf_P.txt`. The `buttons` folder contains the graphical elements participants can use for navigation.

### 4.2 Properties of your instructions

E-nstructions is designed to display Pdf files. Therefore, you have to create your instructions in Pdf format. You can use the usual paper format A4. To optimally exploit the instructions frame on a monitor with a resolution of  $1280 \times 1024$  pixels, produce a Pdf file in the format  $34.8 \times 29.7$  cm.

E-nstructions offers navigation options for Pdf files with several pages and it is compatible with links in Pdf files. If your instructions consist of more than 10 pages, it is recommended to create links within your Pdf file for participants' navigation.

### 4.3 Experimenter: Configuring the settings

This section explains how to configure required and optional settings before starting the program `E-nstructions.exe`. Open the folder `Experimenter` and double click on `Settings.exe`. Now you should see the *Settings - Main screen*:

Figure 1: Settings - Main screen

#### 4.3.1 Assign instructions

Define on the *Settings - Main screen* how to assign your instructions to the clients. As explained in this section, the following four assignment options are available: (1) One type of instructions; (2) Two types of instructions; (3) Two or more types of instructions assigned manually; (4) Two or more types of instructions assigned according to z-Tree's subjects table.

For each type of instructions you want to implement in your experiment, perform the following two steps:

- Browse for the directory of the Pdf file with your instructions.
- Enter the number of pages of this Pdf file.

**Option 1: One type of instructions.** Select this option to assign the same instructions to all clients.

**Option 2: Two types of instructions.** Select this option to assign Instructions A to the first  $n$  clients and Instructions B to the remaining clients.

These two options should suffice for most experiments. If you want to use the third or fourth option, the clients in z-Tree have to be sorted according to the cabins in your laboratory (subject 1 corresponds to client 1, subject 2 to client 2 etc.).

**Option 3: Two or more types of instructions assigned manually.** Select this option to define an assignment of two types of instructions different from the one offered by the second option, or to assign more than two types of instructions. By clicking the corresponding radio button, you are redirected to the screen *Settings - Assign instructions manually*:

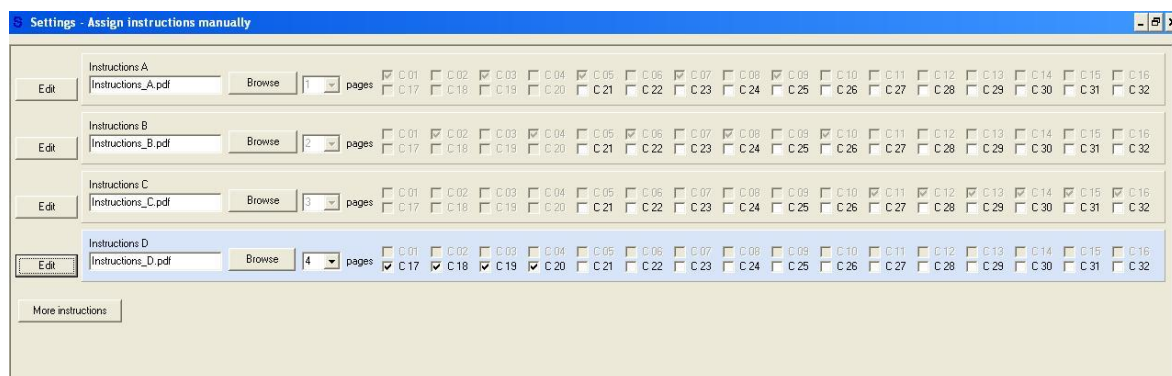


Figure 2: Settings - Assign instructions manually

On this screen, you can select up to 32 different instructions and define any assignment. Note that C 01 corresponds to client 1, C 02 to client 2 etc.

By default, three panels are displayed on this screen, each corresponding to one type of instructions (Instructions A, B and C). The panel you are about to edit is highlighted. In the first panel, browse for the directory of your `Instructions_A.pdf` and enter the number of pages. Select all clients to whom you want to assign `Instructions_A.pdf`. The checkboxes you have ticked become inactive for all the other types of instructions in the remaining panels.

To edit Instructions B, click the `Edit` button in the second panel and proceed as described above. Repeat this procedure for all types of instructions you want to implement. You can add panels for more types of instructions by clicking the `More instructions` button. To make changes in a panel, click the `Edit` button first.

Click `OK` to save your input. You can re-access your settings on this screen by selecting the third button on the *Settings - Main screen*.

**Option 4: Two or more types of instructions assigned according to z-Tree's subjects table.** Select this option to assign different types of instructions according to a random role assignment in z-Tree. By clicking the corresponding radio button, you are redirected to the screen *Settings - Assign instructions according to z-Tree*:

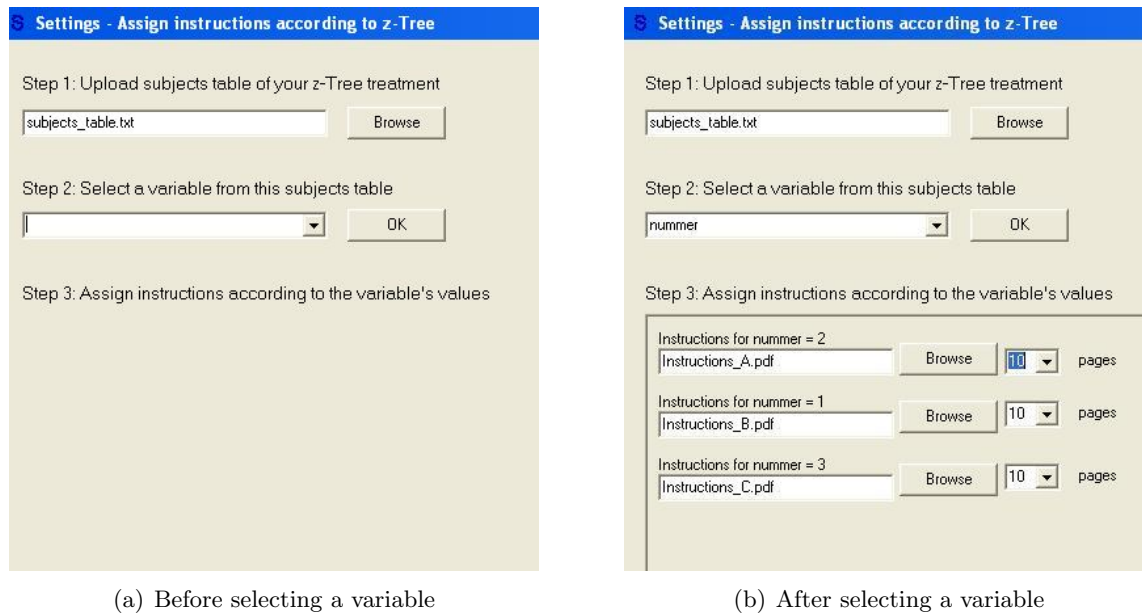


Figure 3: Settings - Assign instructions according to role assignment in z-Tree

First, export and upload the subjects table of your z-Tree treatment<sup>1</sup>. Second, select a variable from this subjects table. Note that only variables with integers are valid. Once you have entered a variable, an assignment panel for each value of this variable is generated. In each panel, browse for the directory of `Your_instructions.pdf` and enter the number of pages. Click `OK` to save your input. You can re-access your settings on this screen by selecting the fourth button on the *Settings - Main screen*.

### 4.3.2 Optional settings

On the screen *Optional settings*, you can specify how the instructions are displayed on the clients and how participants may use their instructions (see Figure 4).

**Navigation.** You can define how participants will be able to navigate through their instructions.

- E-nstructions offers number buttons for instructions with up to 10 pages. If your instructions have more than 10 pages, this option is not available.
- If you activate the arrow keys of the clients' keyboards, participants can use them to flip pages and to scroll through the pages of the instructions continuously. This option still works if you use a tool to lock the clients' keyboards.
- Disable number buttons and arrow keys to only rely on links within your Pdf file for navigation.

<sup>1</sup>How to get the subjects table from z-Tree: Start your experiment in z-Tree and click `Run` → `subjects table`. Export the table via `File` → `Export` → `Table` and enter a file name. The table will be saved in a \*.txt format.

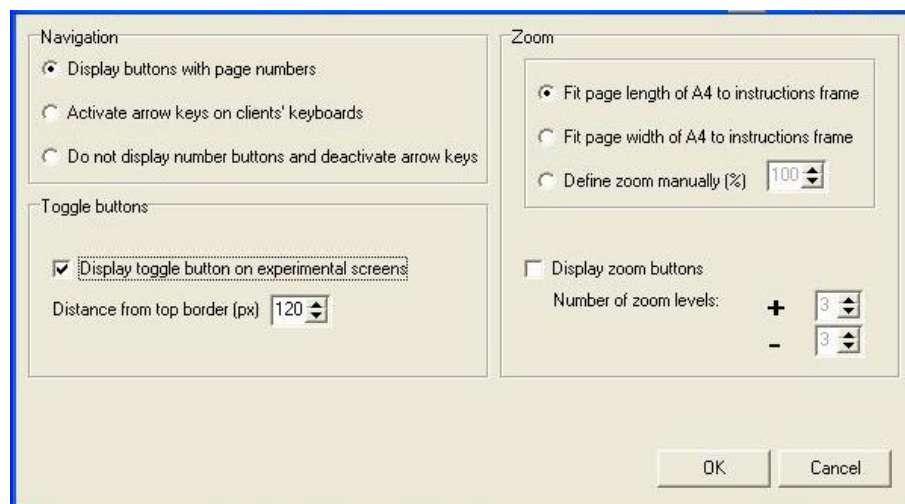


Figure 4: Optional settings

**Toggle buttons.** By default, a toggle button **Experiment** is displayed on the E-nstructions screen and a toggle button **Instructions** is displayed on the experimental screen (e.g. z-Leaf) so that participants can toggle between both screens during the experiment (see Figures 5 and 6).

- If you do not want the toggle button **Instructions** to be displayed on the experimental screen, deselect this option. Participants can then access their instructions from the experimental screen by pressing **[ctrl]+[T]**. The toggle button **Experiment** on the E-nstructions screen is shown anyway.
- If you want the toggle button **Instructions** to be displayed on the experimental screen but it coincides with an element of the experimental screen, you can move it up or down. The default value is 120 pixels distance from the top border of the screen. The position of the toggle button **Experiment** will not change.

**Zoom.** The default zoom is optimized to client screens with a resolution of  $1280 \times 1024$  pixels.

- Fit the page length of A4 (portrait) to the instructions frame if you want one entire A4 page (portrait) to be displayed on the clients' E-nstructions screens. This option is also recommended if you create instructions in the format of the instructions frame.
- Alternatively, you can choose to fit the width of A4 (portrait) to the width of the instructions frame.
- If the resolution of your client screens is not  $1280 \times 1024$  pixels or if the two previous options do not suit the format of your instructions, you can define the default zoom manually.
- Display zoom buttons if you want to offer your participants the option to zoom in/out their instructions. If this option is selected, define the number of zoom levels. If the format of your instructions is optimized to fill the entire instructions frame, I recommend to not display the zoom buttons.

Once all settings are configured, click the **Confirm settings** button, and the message “Your settings have been saved...” should pop up.



#### 4.4 Participants: E-nstructions on the clients

This section details the appearance of E-nstructions on the clients. When E-nstructions is started, the E-nstructions screen appears:



Figure 5: E-nstructions screen on a client (full screen instructions)

The E-nstructions screen consists of two parts, a large instructions frame and a navigation bar. The instructions frame displays the PDF file you selected according to the zoom you defined in `Settings.exe` (see Subsection 4.3). If you assigned more than one type of instructions to the clients, different PDF files are shown in the instructions frame depending on the client number.<sup>2</sup> The navigation bar as shown in Figure 5 entails all button classes you can activate:

- On the E-nstructions screen, the **toggle button Experiment** is always displayed in the language you selected. When clicking this button, the experimental screen is shown.
- A column of **buttons with page numbers** and two arrows above these buttons are shown if you selected the first option in the *Navigation* box of the *Optional settings* screen. When clicking the arrow to the right (left), the next (previous) page is shown. When clicking one of the number buttons, the corresponding page is shown. The button with the number of the current page is highlighted. To hinder participants from skipping pages when they read their instructions for the first time, not all page numbers are shown immediately. Instead, they appear one after the other by clicking the arrow to the right.
- The two buttons + (zoom in) and - (zoom out) are shown if you selected **Display zoom buttons** in the *Zoom* box of the *Optional settings* screen. Participants can zoom according to the number of zoom levels you entered.

<sup>2</sup>To test this feature on your local PC, change the cabin number in the first row of `conf.P.txt`.

On the client application of the experimental software (e.g. z-Leaf), only a button **Instructions** is displayed without a navigation bar:

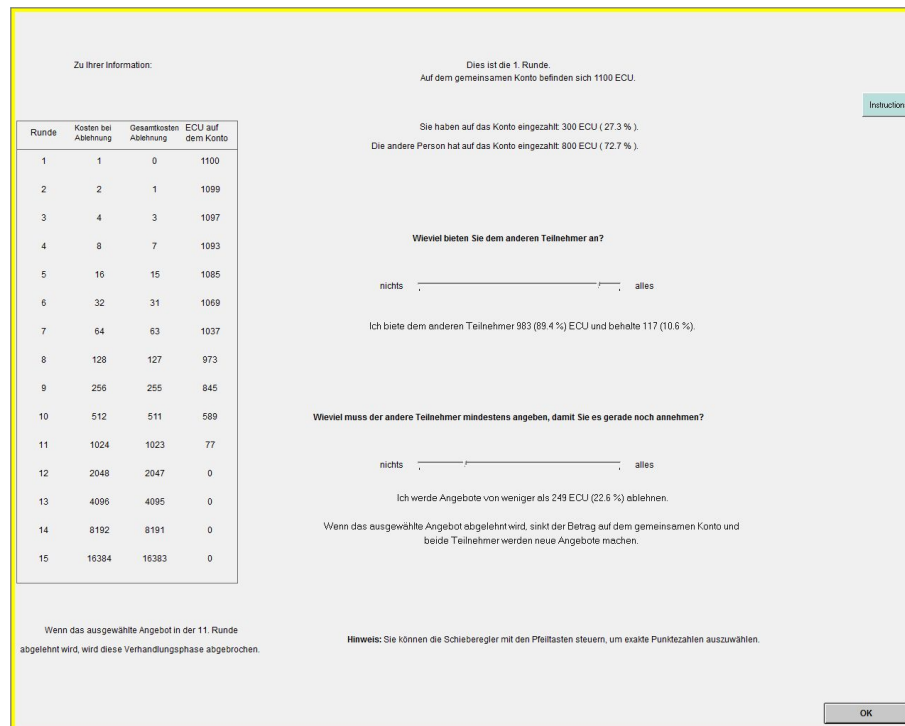


Figure 6: z-Leaf with toggle button on a client

When clicking the **Instructions** button, the **E-nstructions** screen is shown. If you deactivated the toggle button on experimental screens in the box *Toggle buttons* of the *Optional settings* screen, no **Instructions** button is displayed on the experimental screen.

## 5 Final remarks

In order to change the settings of your instructions (e. g. to run sessions with different treatments or to assign more/new instructions during your session), first close the program **E-nstructions.exe** and then repeat the procedure as described in this document. You can close **E-nstructions.exe** by pressing **[alt]+[F4]**.

## References

FISCHBACHER, U. (2007): "z-Tree: Zurich Toolbox for Ready-made Economic Experiments," *Experimental Economics*, 10(2), 171–8.