## Title

## An interactive debugger to improve the usability of syntax error messages for novice programmers

## CRSid of project leader

lm615

## Names of applicants

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## Start date

21/03/16

## End date

25/03/16

## Type of study

‘Controlled experiment…’

## Brief description

Provide a brief description of the research objectives and how the study will be carried out, including how participants will be recruited.  
Supporting material which might include questionnaires which will be used, or user manuals given to study participants should be uploaded later in reply to the confirmation email you receive after you click submit.

The objective of the research is to determine whether my system is useful for novice programmers, and the extent to which it helps them learn to program.

The study will be carried out as follows:

* The participants will complete a short questionnaire.
* They will be asked to complete four short programming tasks.
  + The tasks will revolve around using a turtle graphics module for Python. Participants will have to instruct the turtle to draw various shapes, using various different programming constructs.
  + Each task should take no more than 15 minutes. Task sheets, which explain the task, will be given to participants in a specific order.
  + Each task must be either completed or abandoned by the participant before moving on to the next.
* The participants will complete another short questionnaire.

Participants will be using their own laptops. The system will be loaded onto a USB stick, ready for the participants to use. They will not need to install anything, and the system will not be left on their computers after the end of the experiment.

While the participant is using the system, their actions will be logged. This log will store interactions with the system, such as clicking the interface buttons. Each time an action is logged, a copy of the code will be stored. The log will be analysed, looking at the difference between each successive entry. This will be used to track how a user fared with each task, and how much they used the features offered by the interface.

Interactions logged:

* When the log is first started.
* When the log is loaded from the browser’s local storage. This is to detect when the page is refreshed or closed and opened. This will be used to detect when the user may have made an infinite loop.
* When the run button is pushed. A copy of the code is also stored.
* When the code completes successfully. A copy of the code is also stored.
* When the code stops with an error. The log will differentiate between runtime and syntax errors, and will also indicates whether it was possible to make an alternative suggestion.
* When the user chooses one of the fix suggestions made.

Participants will be given two short questionnaires.

The first questionnaire will be used to try and gauge the participants previous programming experience. This will be used possibly to screen out participants who have had too much experience. It may also be used in the evaluation as context for how the user interacted with the system.

The second questionnaire will be used to evaluate the user’s experience with the system. It will be looking for areas in which it may be improved. This may also be used to justify why a user was having trouble with some of the tasks.

In order to connect the questionnaires to the logs, at the start of the experiment each user assigned a logging number. This will be the only way in which participants will be identified.

Participants will be recruited from my college, Peterhouse. As compensation, I will be offering free food and drink during and after the study.

## Precautions taken

A pilot study will be done to ensure that the task sheets are clear and well written , to debug any problems with the logging or questionnaire, and to find any serious usability bugs to be fixed before the main study.

Each participant will be arbitrarily assigned a logging number at the start of the experiment which will be used to connect their questionnaires and log. I will not record which participant number was assigned to each name in order to keep the data anonymous.

As I will be taking a snapshot of the code at regular intervals, there is a possibility that participants may identify themselves through variable names or comments. I will warn participants not to leave their name anywhere in the code.

Logs must be manually saved to disk by the user. The logs will be saved to the USB sticks, which will be removed from the user at the end of the study. They will be instructed to save the log after each task. In order to prevent log data being lost in the case of the user refreshing the page or closing the window, the log will be temporarily stored in the browser’s local storage until it is saved. At the end of the session, I will ensure that all traces of the log will be removed from the local storage. These logs will be copied to my computer and uploaded to dropbox immediately after the study has finished to prevent data loss.