Practical Work 2 ESE: Understanding a Controlled Experiment

The didactic objective of this work:

- To allow the student to identify the concepts learned related to Controlled Experiments in the subject of Experimental Software Engineering. This work focuses mainly on the concepts presented in Chapters 6, 7, 8, 9, and 10 of the book Experimentation in Software Engineering (Wohlin et al., 2012).

General Instructions:

- **For Graduate Students:**
  - **Individual work, with analysis of an article in English;**
  - **Any copying between graduate students' work will result in a zero grade for all students involved. Work must be done individually (all graduate students are expected to be ethical in their work!).**

- **For Undergraduate Students:**
  - **Work in teams of 3 to 6 students, analyzing an article in English or Portuguese**.
    - Each team must send an e-mail to the teacher and monitors (with all team members in a copy), confirming the team members by **05/06 at 23:45**.
    - In this e-mail, the team must present which article they intend to analyze.
  - Undergraduate students who want to do the work individually do not need to send an e-mail with the article to be analyzed.

- **Choice of articles:**
  - Each graduate student or team of undergraduate students must choose one of the articles available in a folder of the respective topic on the platform.
  - **Graduate students must decide an article in English**.
    - Two articles in the folder can only be decided by undergraduates (as a team or individually).
  - In case the graduate student or team wishes to analyze a different article from those provided, they should email the professor and the teaching assistants, specifying the article they would like to analyze and attaching the article. This email should contain the following information:
    - Whether the article provides the "raw data" (in the article or in a technical report),
      making it possible to reproduce the statistical tests;
    - What statistical tests are carried out.
    - Deadline for sending an e-mail with an article other than those provided: **05/06 at 23:45**.

Work items:

- Prepare a **presentation** containing:
  - Your own summary of the article read, presenting the main ideas of the article
    - You don't want to copy the abstract of the article.
  - Possible Objective (Scoping) for the study carried out in the article (describe the objective according to the GQM standard suggested in Chap. 7)
    - If the article presents more than one study, each study may have a different objective.
  - Possible study planning (if not described directly in the article, please include your analysis), containing the following items:
    - Null and alternative hypothesis(es).
    - Independent and dependent variables.
    - Participants (subjects) and contexts.
    - Experimental Design adopted.

  - Regarding data analysis:
    - Present descriptive statistics - mean, standard deviation, boxplots -

for each dependent variable (of each study).
- Present statistical tests and their results.
  - Perform the normality test for the samples (even if the article's author has not done so).
  - Save screens showing the step-by-step of each statistical test performed.
  - Present and discuss the results obtained.
- Compare the results with those of the selected article.

o Reflection on learning:
- What each student has learned from doing this work.
- If they wish, students can also present what they would do differently if they were to carry out a similar study.

o Sources and materials consulted:
- List all materials consulted for the assignment (including tutorials, YouTube videos, etc.), with the date of consultation and the link or full reference to the material;
- If you had any questions with one of the monitors and/or other students, list the questions and who answered them (also list the question and the date).

o For teamwork: Minutes showing who did what and when.

Important comments:

- The student (or team) can choose any tool to carry out the statistical analysis (SPSS, R, JASP-Stats, Sigmaplot, among others). But the student must clarify in their presentation which tool they have chosen.
- Monitors are available for questions. However, the tutors can ****NOT**** do the work for the student! Each student should look for tutorials, books, and websites on how to perform the statistical tests. Doubts raised with the tutors must be specific and must be sent to the tutors by: **09/06** .
- Remember: **be ethical!**

Deadline:

- Deadline for submitting the file to the platform:**11/06 until23:45 (after that, the platform will not allow file submissions)**.
- Assignments submitted after the deadline will not be accepted – the **team or graduate student** will **receive a zero mark.**

Delivery via the platform - only one member per team should deliver.

- File on the platform - named: Fulano_Trab2_ESE* (*Fulano = student's name) or Beltrano_Fulano_Sicrano_Trab2_ESE (with the names of the team members)
- If the platform is down, the team can send an e-mail to the teacher and tutors with the work attached, respecting the deadline. Only one team member needs to send the email, but they must copy all team members on the email.

The didactic objective of Practical Work 3:

- To allow the student to apply the concepts learned about Controlled Experiments in Experimental Software Engineering to their own research. This work focuses mainly on the concepts presented in Chapters 6, 7, 8, 9 and 10 of the book Experimentation in Software Engineering (Wohlin et al., 2012).

- This work focuses on **scoping** and **designing** a **controlled experiment – with** a comparison between two or more treatments.

General Instructions:

- **For Graduate Students:**
  - **Individual work.**
  - **It should focus on the student's research topic.**
  - **Any copying between graduate students' work will result in a zero grade for all students involved. Work must be done individually (all graduate students are expected to be ethical in their work!).**

- **For Undergraduate Students:**
  - **Working in teams of 3 to 6 students**.
    - Each team must e-mail to the teacher and monitors (with all team members in a copy), confirming the team members by **14/06 at 23:45**.
    - In this email, the team should present the theme of the controlled experiment they would like to plan (the teacher or monitors will check that the theme is appropriate).
  - Undergraduate students who want to do the work individually do not need to send an e-mail with the topic.

Work items:

- Prepare a **technical report** containing:
  - An introduction to the purpose of the study, showing the motivation/importance of the study.
  - Scope of the study, with the definition of the objective following the GQM template (see Chapter 7 of the book by Wohlin et al.).
  - Planning the study, with the items presented in Chapter 8 of the book by Wohlin et al:)
    - Context selection (really describe how you plan to carry out the study, go beyond the context items listed by Wohlin et al.)
    - Variables (independent (and treatment), dependent);
    - Hypotheses (null and alternative hypothesis(es));
    - Selection of Participants;
    - Experimental Design – with a description of the treatments;
    - Instrumentation – with a brief description of all the instruments that will be used;
    - Threats to Validity – described according to the types of threats: Internal, External, Construct, and Conclusion;
    - Which statistical tests do you intend to apply for quantitative analysis?
  - Reflect on what you want to achieve with this controlled experiment:
    - How the student intends to discuss the results of the experiment.
  - Sources and materials consulted:
    - List all the materials consulted for the work (including articles from related work, tutorials, YouTube videos, etc.), with the date of consultation and the link or full reference to the material;

        - If you had any questions with one of the monitors and/or other students, list the questions and who answered them (also list the question and the date).
    - For teamwork: Minutes showing who did what and when.

Important comments:

- Note: this study must be a CONTROLLED EXPERIMENT, comparing treatments!
    - If the student or team presents a study plan without comparing treatments, **the grade will be zero**.
- Monitors are available for questions. However, the tutors can ****NOT**** do the work for the student! Doubts raised with the tutors must be timely and must be sent to the tutors by: **07/06** .
- Remember: **be ethical!**

Deadline:

- Deadline for submitting the file to **the** platform: **23/06, until 23:45 (after that, the platform will not allow file submissions)**.
- Work submitted after the deadline will not be accepted – the **team or graduate student** will **receive a zero mark.**

Delivery via platform - only one member per team should deliver.

- File on the platform - named: Fulano_Trab3_ESE* (*Fulano = student's name) or Beltrano_Fulano_Sicrano_Trab3_ESE (with the names of the team members).
- If the platform is down, the team can send an e-mail to the teacher and monitors with the work attached, respecting the deadline. Only one team member needs to send the email, but they must copy all team members on the email.