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Can gamification help in software testing education? Findings from an empirical study

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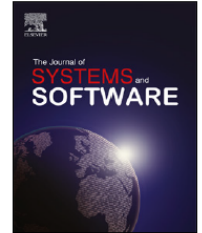
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Raquel Blanco [a,*], Manuel Trinidad [b], María José Suárez-Cabal [a], Alejandro Calderón [b], Mercedes Ruiz [b], Javier Tuya [a]

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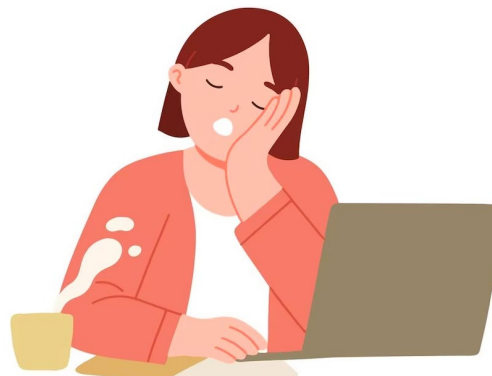
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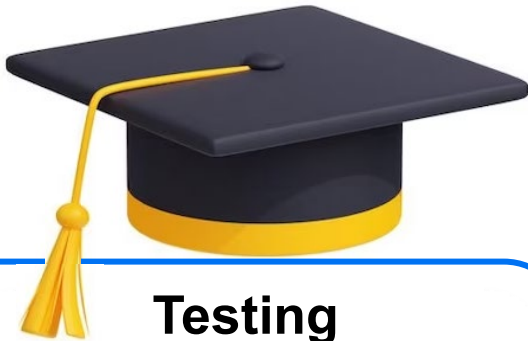
OPEN ACCESS

SCAN ME

Introduction

Testing

Testing is boring

Testing is destructive

Engagement

Slides images: www.freepik.es

Introduction

Testing

Improve engagement   Improve performance

Gamification

Software Verification and Validation

4th year, Software Engineering Degree
(University of Oviedo, ES)

Lectures

- **Software testing**
    - Testing techniques
    - Software testing process

Labs

- **System testing**
    - Software testing project
    - Real-life application
    - Students work individually

Seminars

- **Unit testing**
    - Test design applying testing **techniques**
    - **Effective** test suites
    - 4 programs with **injected** defects
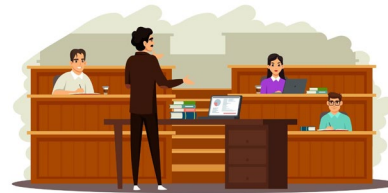   - Students work in teams and individually

Software Verification and Validation

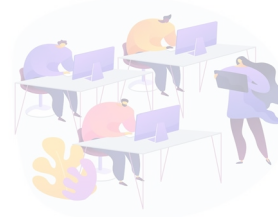**4th year, Software Engineering Degree
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Lectures

- **Software testing**
  - ☐ Testing techniques
  - ☐ Software testing process

Labs

- **System testing**
  - ☐ Software testing project
  - ☐ Real-life application
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Seminars

- **Unit testing**
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  - ☐ **Effective** test suites
  - ☐ 4 programs with **injected** defects
 - ☐ Students work in teams and individually
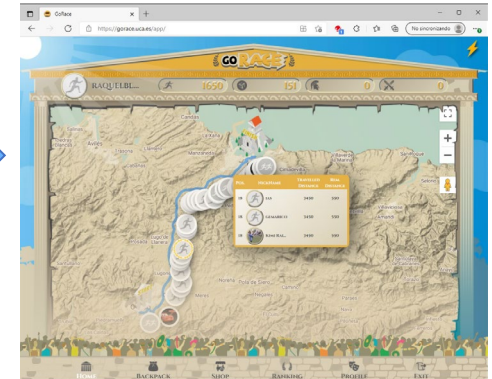
**Gamification
Experience**

Gamification experience

Experience

- **15 weeks**
- **Tools**
  - **SQLTest**
    - Test suites execution
    - Effectiveness evaluation
  - **GoRace**
    - Gamification tool
    - Olympic race for immortality
- **Narrative-based gamification experience**
  - Olympic race from Oviedo city to Gijón beach
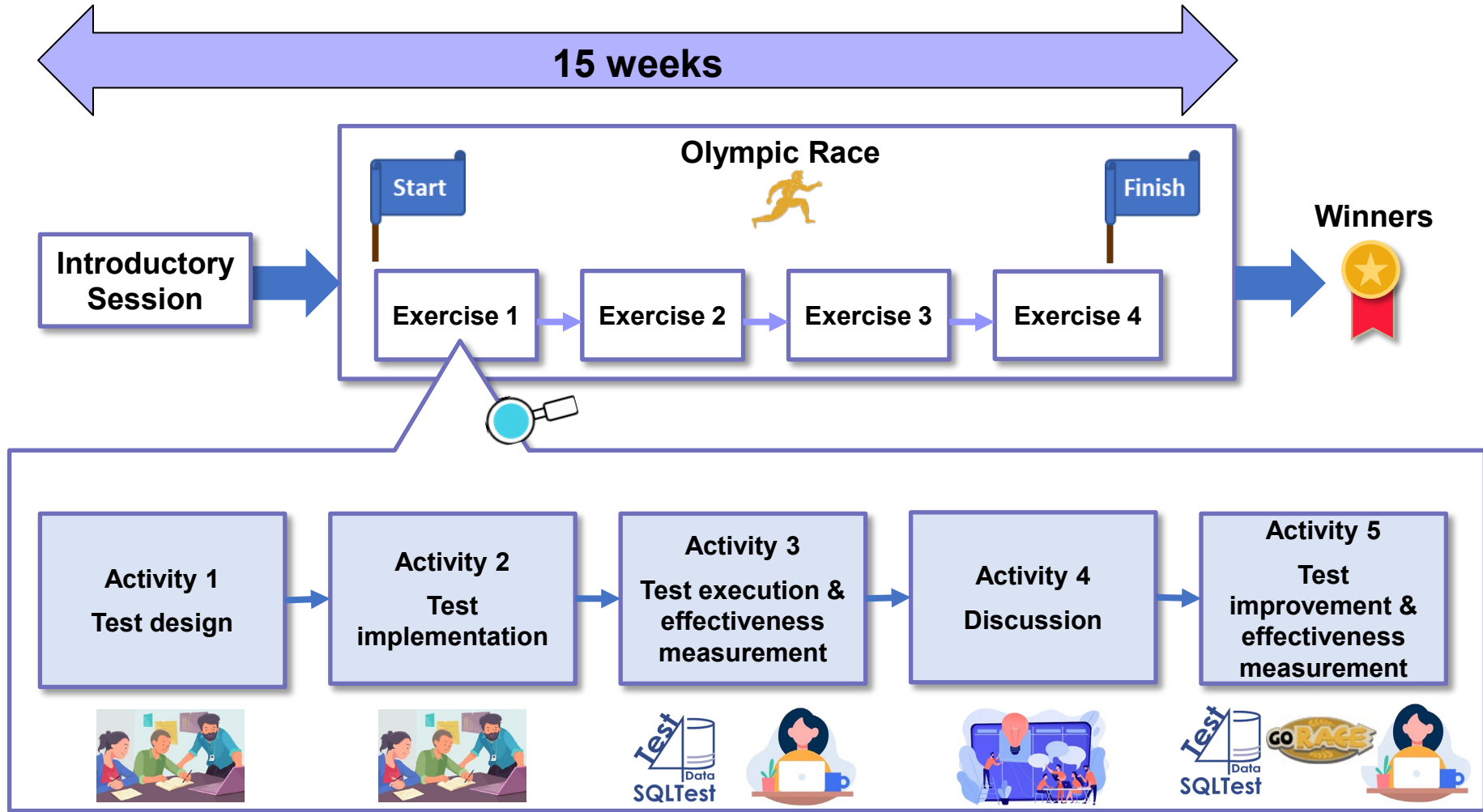 - Test suites **effectiveness → progress** in the race
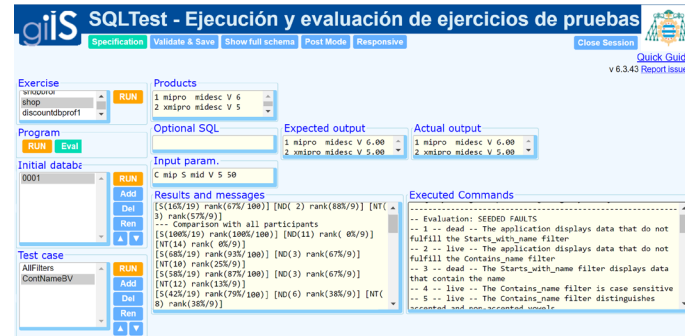
Effectiveness

Participants

- **Experimental group (Gamified)**
  - 135 students
  - Academic year 2020-2021

- **Control group (Non-gamified)**
  - 100 students
  - Academic year 2019-2020

Procedure

15 weeks

Olympic Race

Start — Finish

Winners

| Introductory Session | → | Exercise 1 → Exercise 2 → Exercise 3 → Exercise 4 | → | (medal) |

Activity 1
Test design

Activity 2
Test implementation

Activity 3
Test execution & effectiveness measurement

Activity 4
Discussion

Activity 5
Test improvement & effectiveness measurement
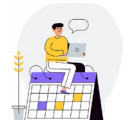
Results

RQ1: Engagement

Is it higher in the experimental group (gamified) or in the control group (non-gamified)?

- **Metrics**
  - ☐ Number of Test Suite Executions
  - ☐ Active Time
  - ☐ Participation Rate
  - ☐ Dropout Rate

- **Findings**
  - ☐ **Sequence of 4 exercises (Olympic race)**
    - Better results in the experimental group
  - ☐ **Individual exercises**
    - Better results in the experimental group in the first three exercises
    - Students dropped out mainly in the last exercise

Overall, the engagement is higher in the students who perform gamified software testing activities

Results

RQ2: Performance

Is it higher in the experimental group (gamified) or in the control group (non-gamified)?

- **Metrics**
  - Effectiveness

  - Effectiveness Increase

- **Findings**
  - **Sequence of 4 exercises (Olympic race)**
    - Better results in the experimental group
  - **Individual exercises**
    - Better results in the experimental group
    - Downward trend, mainly in the last exercise

The performance is higher in the students who perform gamified software testing activities

Conclusions and future work

Conclusions

- The gamification **benefits** the improvement of both student engagement and performance

- **Design** of the gamification strategies
    - □ **Crucial** to ensure success
    - □ **Motivating stimuli should** be distributed during the **whole experience**

Future work

- **Readjust the design** of the gamification experience to increase the student engagement in the last exercise
- **Study** the effects of gamification **during several academic years**

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Thank you for your attention

Questions