Bridging the gap between industry and academia and raising awareness of software testing bias through ENACTEST

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ABSTRACT
This poster presents the ENACTEST project that aims to improve testing education for computer science students, taking into account the learning needs and cognitive models of students, the needs of industry for testing skills, and the needs of academia to improve the practice of teaching testing. By improving testing education, the ENACTEST project also aims to reduce bias in testing approaches and incorporate inclusive teaching materials to promote gender equity and inclusion in testing practice.

KEYWORDS
Software testing, industry needs, cognitive models, education

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1 STRUCTURED ABSTRACT
Context: Nowadays, software systems are widely used in many different fields, which makes the consequences of their failure significant and damaging to society. Software testing is a crucial approach used to ensure software quality and reduce the risks associated with software failures. However, there is a lack of testing culture in organizations, where testing is relegated to second-class citizen status in the development process due to the pressure on practitioners to deliver rapid updates and the increased complexity of modern software systems. Moreover, software testing in industry needs to face several challenges [3], [5], [1], mainly related to the knowledge of testing methodologies, biases in the assumptions used to design test cases, proper selection of tools to make the process efficient, among others.

In order to have better prepared practitioners in the industry, we advocate that we need to intervene in the education of software testing. Several efforts have been made in academia to improve testing education, as can be observed at the systematic literature reviews published in [8] and [4]. Nevertheless, there still are many problems of teaching testing, such as: disconnection of theory and practice leads to less interest by students, the classroom examples are far from real projects, the lack of testing experience by the students may lead that they are unable to perform the testing process with all the steps at industry, students are not confident of their testing skills, etc.

Our hypothesis is that integrating different teaching techniques adapted to students’ learning needs and aligned with industry needs for testing will improve students’ testing skills and confidence, and at the same time, it is possible to empower students to advocate for gender equity in testing practices within their academic and professional communities.

Objective: The main goal of ENACTEST is to explore the feasibility of integrating fresh teaching/learning techniques for testing at higher education in order to improve the testing capabilities of students and consequently the capabilities of future computing professionals. This goal can be summarized as to reduce the gaps of testing education from three perspectives of key actors in the computing connecting world: students, industry and academia, as is shown in Figure 1.

Figure 1: ENACTEST project. (https://enactest-project.eu).
Methods: To reach this main goal, in this project we are using a design-science [10] based methodology. From the awareness of the problem stated in the context subsection, we are performing interviews with key actors and performing literature reviews to properly identify the gaps as broadly as possible. Then, in a design and evaluation phase, we are researching about learning styles and cognitive models of students in order to conceptualize and characterize how the students learn how to test.

Also, we are investigating about novel teaching techniques, such as gamification, modeling, and early examples, that will be used to develop the capsules for teaching testing taking into account the learning needs of students and the industry needs.

Finally, we plan to perform empirical studies in order to analyze the improvements, benefits and drawbacks of the capsules. We plan to follow this methods iteratively during the project in order to follow a continuous improvement cycle connecting students, academia and industry around software testing improvements.

Ongoing research: To reach the objectives of the ENACTEST project we have started with the specification of a case and the design of a protocol to be used in different experiments at higher education and vocational centers to reveal the sensemaking of students [2]. Also, we have started the focus groups to decode the testing industrial needs and the voids about knowledge transference in testing teams.

We have performed a mapping review of testing courses in the countries of the innovation alliance, and we have started interviewing professors to understand the problems and needs about teaching testing in practice [9].

Taking into account the preliminary results of students sense-making, industrial needs and academic needs, we have designed the following capsules:

- **GIPPPY**: Online game for the early introduction of testing in computational thinking for initial programmers [6].
- **INCITE**: Semi-structured clinical interviews to teach testing and promote the A-HA moments, fostering a diverse and inclusive gender background in the development of testing algorithms, tools, and methodologies.
- **GADGETS**: Collection of analogue games for practicing essential testing skills of testing while being aware of assumptions that can bias the testing process.
- **GUI change detection by using an open-source tool to help to learn regression testing and to validate that no unintentional changes affect the end-user experience** [7], which can be useful for emphasize the importance of inclusive design practices that accommodate the diverse needs and backgrounds of users.

GIPPPY and GADGETS capsules correspond to gamified approaches. Figure 2 shows an excerpt of GIPPPY. The main goal is that the robot reach the final of the grid avoiding the obstacles. As can be observed, GIPPPY has several gamified elements to improve the motivation of students when learn testing and basic programming structures. GIPPPY is freely available at robot.testar.org.

Figure 3 shows an excerpt of the game GADGETS, which correspond to a concrete game with a wheel of assumptions that allows students be aware of biases they can have when testing.

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