Subsidies to the Integration of Assessment Tools for Programming Assignments and Learning Management Systems

Draylson Micael de Souza
Prof.ª Dr.ª Ellen Francine Barbosa

February 6
Context and Motivation

Teaching and Learning of Programming
- Shortcomings in the analysis and understanding of programs
- Wrong views about the programming activity
- Lack of an adequate feedback
- Much effort and time spent on the assessment of the assignments

Software Testing Basic Concepts
- Development of programming analysis and understanding skills among students
- Encourages a more proper conduction of the programming activity
- Higher need for adequate feedback
- Higher effort and time spent on the assessment of the assignments

Assessment Tools for Programming Assignments
- Support programming analysis and understanding
- Support the conduction of the programming activity
- Provide a more adequate feedback
- Reduce effort and time spent on the assessment of the assignments

Draylson Micael de Souza
ICMC/USP
February 6
**Context and Motivation**

- **ProgTest**: General Functioning

![Diagram of ProgTest system]

- Instructor provides Program and access to Tests.
- Student receives Tests and Program, accesses Reports.
- Testing Tools facilitate the interaction between Instructor and Student.

---

Draylson Micael de Souza  
ICMC/USP  
February 6
Access to Assessment Tools for Programming Assignments
Goals

• Integration of Assessment Tools for Programming Assignments and Learning Management Systems
Learning Management Systems (LMSs)
Assessment Tools for Programming Assignments

Assessment Types
- Manual (7%)
- Automatic (70%)
- Semi-automatic (23%)

Specialties
- Specialized in Quizzes (7%)
- Specialized in Contests (13%)
- Specialized in Testing (20%)
- Non Specialized (70%)

Approaches
- Instructor-centered Approach (27%)
- Student-centered Approach (47%)
- Hybrid Approach (27%)
Features To Be Supported: Instructor Use Cases
Features To Be Supported: Student Use Cases
IMPACTLE: General Functioning

INTEGRATION MODULES FOR PROGRAMMING ASSIGNMENTS CHECKING TOOLS AND LEARNING ENVIRONMENTS

Instructors and Students

Middleware and Adapter Administers

Legend: → = Data Transfer

Assessment Tool
IMPACTLE: Modules

Adapters
- API
- Stubs
- Simulator
- ProgTest
- ...

Middleware
- Core
- Installation
  - Service
  - Stubs
  - GUI
- Administration
  - Service
  - Stubs
  - GUI
- Assessment
  - Service
  - Stubs

Plugins
- Simulator
- Moodle
- ...

Draylson Micael de Souza
ICMC/USP
February 6
Difficulties in Teaching and Learning Programming

Getting Motivated (P5) 22%
Applying Programming Concepts (P2) 24%
Learning Programming Concepts (P1) 38%
Understanding Programs (P3) 11%
Other 5%
Factoring/Refactoring Programs (P4) 3%
Instructors' Difficulties (P6) 2%
Solutions for the Teaching and Learning of Programming

- Visualization (S4): 21%
- Alternative Learning Methods (S5): 21%
- Serious Games (S6): 15%
- Pedagogical Environments (S7): 13%
- Collaboration (S1): 11%
- Scaffolding (S2): 6%
- Other: 13%

- Reflection (S3): 5%
- Alternative Notations (S10): 5%
- Feedback (S9): 2%
- E-learning (S8): 1%
Publications (Accepted)


- Souza, D. M; Batista, M. H. S.; Barbosa, E. F. *Avaliação de Qualidade de um Ambiente de Apoio ao Ensino de Programação RENOTE – Revista Novas Tecnologias na Educação*.
Publications (Submitted)


- Souza, D. M; Batista, M. H. S.; Barbosa, E. F. Problemas e dificuldades no ensino de programação: Um mapeamento sistemático. 12th *Experimental Software Engineering Latin American Workshop*.
Conclusions

- Integration of **assessment tools for programming assignments** and **learning management systems**
- Promoting the **use** of assessment tools in computing disciplines
  - LMSs **commonly used** by students and teachers
  - Avoiding the need to **adopt, learn and use** other environments
- Facilitate **access** to assessment tools for programming assignments
  - Making the tools **available** in commonly used LMSs
  - Avoiding need for **localization, configuration and installation**
Planned Activities

- Complete the **IMPACTLE** development
- Complete the **ProgTEST** adapter development
- Develop **adapters for other assessment tools** for programming assignments
- Develop **plugins for Moodle** and other LMSs
- Plan and conduct **experiments**
- Identify and propose other **features** for LMSs to support the difficulties in teaching and learning programming
- Produce **reports and research papers**
Contact Information

- Draylson Micael de Souza
draylson@icmc.usp.br

- Ellen Francine Barbosa
francine@icmc.usp.br

University of São Paulo (ICMC/USP)
Avenida Trabalhador São-carlense, 400
São Carlos, São Paulo, Brazil
THANK YOU