



Programming Exercises in LON-CAPA

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Salzgitter

Suderburg

Wolfenbüttel

Wolfsburg



Overview

- Project
- Motivation
- Current Situation
- Results so far
- Plans





Project Background

- Ostfalia University of Applied Sciences, Wolfenbüttel, Germany
- „Center of Successful Teaching and Learning“
Zentrum für erfolgreiches Lehren und Lernen (ZeLL)
- Aim: Improve teaching and learning in higher education
- 5 years grant by
„Federal Ministry of Education and Research“
Bundesministerium für Bildung und Forschung („BMBF“)

Dieses Vorhaben wird im Rahmen des Qualitätspakt Lehre aus Mitteln des Bundesministeriums für Bildung und Forschung unter den Förderkenn-zeichen 01PL11059 und 01PL11066H gefördert. Die Verantwortung für den Inhalt dieser Veröffentlichung liegt beim Autor.





Project eCULT

One part of ZeLL:



eCompetence and Utilities
for Learners and Teachers

- Various German universities involved
- At Ostfalia University:
 - Formative assessment of programming exercises
 - Connect course management systems (CMS) and grading engines



Motivation for Programming Exercises

- Computer science topics can be hard to teach:
 - Difficult concepts
 - Students have misconceptions
- Improve lectures by offering programming exercises
- Formative Assessment:
Providing individual and prompt feedback



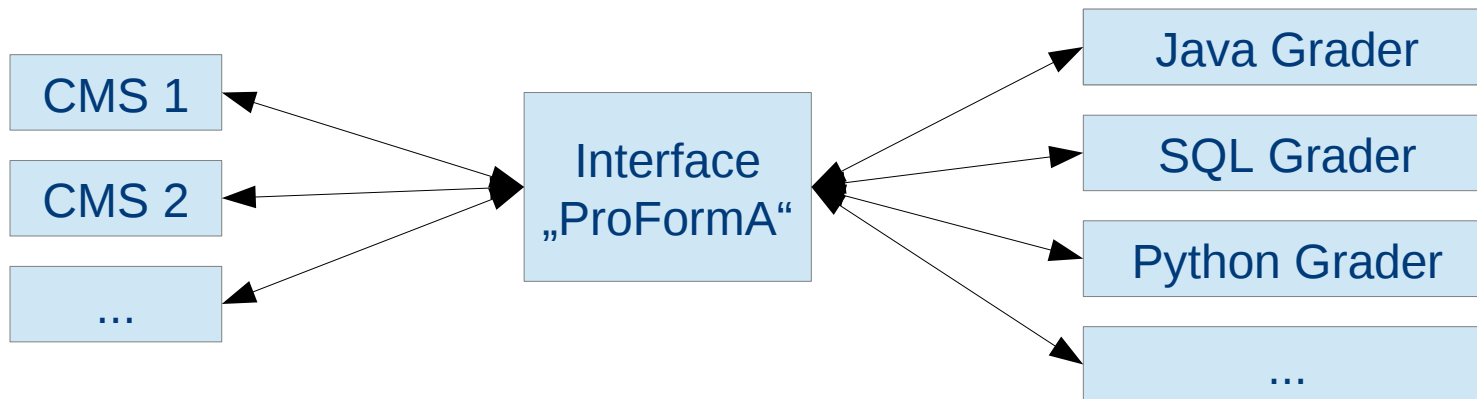
What we have

- LON-CAPA and other Systems as CMS
- LON-CAPA: homework problems (*internally* graded)
 - Multiple choice
 - Formulas
 - Options
 - Click-on-image
 - ...
- *Separate* systems offering programming exercises



General Idea

Extend possibilities of CMS with external grading engines



Combine advantages:

- Use management power of CMS
- Use grading power of external grading engine



Example: LON-CAPA and Praktomat

- **LON-CAPA** as CMS
 - Classlist
 - Provide documents to students
 - Access to programming exercises
- **Praktomat** as external grading engine
 - Java and SQL
 - Test cases (JUnit, Checkstyle, etc.)



Prototype

- Uses IFRAME

The screenshot shows a web browser window with the following content:

- Top navigation bar: Oliver Rod (Student/in) | E - Informatik für Ingenieure mit JAVA SS2012 | Nachrichten | Kurse | Hilfe | Logout
- Secondary navigation bar: Hauptmenü | Inhaltsverzeichnis
- Breadcrumb: Inhaltsverzeichnis » ... » Programmieraufgaben 2 (für die 4) | Notizen | Lesezeichen | Evaluieren | Kommunikation | Drucken | Info
- Task Title: **A03025: Umformungen** | Submission date: Mai 9, 2012
- Section: [My Solutions](#)
- Text: Gegeben sei folgendes Java-Programm
- Code Block:

```
public class A03025 {
    public static void main() {
        int i = 7;
        if (i == 2)
            System.out.println("zwei");
        if (i == 2 || i == 3)
            System.out.println("zwei oder drei");
        else if (i == 4)
            System.out.println("vier");
        else if (i >= 4 && i <= 10)
            System.out.println("zwischen vier und zehn");
        else
            System.out.println("anders");
    }
}
```
- Text: Wandeln Sie das Programm um in ein (syntaktisch korrektes!) äquivalentes Java Programm, in dem keine if-Anweisungen und maximal eine switch-Anweisung verwendet werden.
- Text: Äquivalent bedeutet: Dieselben Vorgaben für i erzeugen dieselben Ausgaben.
- Text: **computer-based assessment system (CBA)**
- Buttons: Antwort einreichen | Versuche 0/99
- Footer: [Diskussionsbeitrag abschicken](#) | **learning network and assessment system (LNAS)** | [Feedback geben](#)



Prototype (+/-)

- ✓ Simple connection
- ✓ Exercises embedded in CMS
- ✗ Evaluation data not stored by LON-CAPA



Improved Version

- Uses
 - Text field to submit answer
 - REST Interface
 - externalresponse

Write a program which contains a method that prints out "Hello World!" (without quotation marks). The class should be named "HelloWorld" and the method should be named "greet".

[Hinweise zur Benutzung](#)

Geben Sie im folgenden Feld Ihre Lösungsdatei ein:

```
public class HelloWorld {  
    public String greet() {  
        return "Hello World!";  
    }  
    public static void main(String[] args) {  
    }  
}
```

Antwort einreichen Versuche 0



Improved Version (+/-)

- ✓ Simple interface for students
- ✓ Exercises easy to maintain by instructors
- ✓ Evaluation data stored by LON-CAPA

- ✗ Only practical with small files
- ✗ Only single file
- ✗ Copy/Paste needed



LON-CAPA Library

- Centralized modul
- Connecting LON-CAPA and external grading engine
- Exclude logics from problem
 - Slim problem source code
 - Most changes possible without touching each problem

The screenshot displays the configuration interface for a script in the LON-CAPA Library. It consists of several sections:

- Import a File:** A header bar with a "Delete?" button and a text input field containing the path `/res/fhwfkadev/eCULT/Praktomat_2013-02/ProForm` and a "Select" button.
- Parameters for a part:** Three identical sections, each with a "Delete?" button and an "Insert:" dropdown. Each section contains:
 - "Use template:" dropdown
 - "Name:" text input (e.g., `proformaserver`)
 - "Type:" text input (e.g., `string`)
 - "Description:" text input (e.g., `ProFormA-Server`)
 - "Default:" text input
- Script:** A section with a "Delete?" button and a "Script Functions" icon. It contains a code editor with the following script:

```
$externalurl = &proforma_url(0, 'http://ourgradingserver/path', '14', 'external_grade_textfield', 'submit.txt');  
$output = &proforma_output(0,1); # Part ID, Response ID
```



Results and Discoveries so far

(Anonymized) data from exercises provides insights into learning strategies used by students.

Feedback from...

- **Students**

They like having a single interface for class materials and exercises.

- **Instructors**

Still labor-intensive to create programming exercises

- **Developers**

Collaboration with developers of similar tools is important

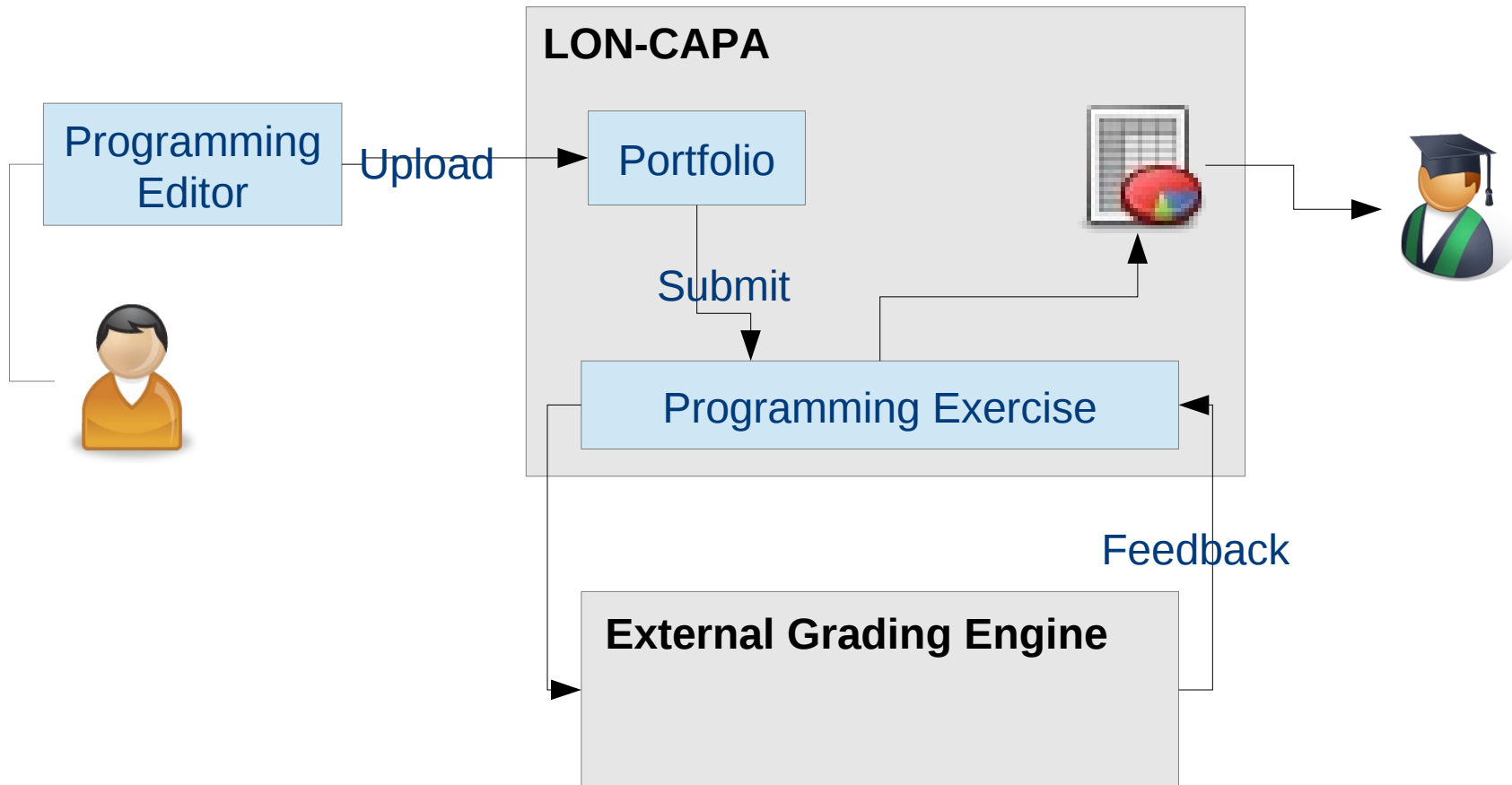


Plan: File Upload using Portfolio

- Will use
 - REST interface
 - User's portfolio
 - File upload to submit answer
- ✓ Large files possible
- ✓ Evaluation data stored by LON-CAPA
- ✗ Portfolio needed, many clicks
- ✗ External grading engine needs permission to retrieve file from student's portfolio



How it should work





Further Project Plans

- Proper connection with LON-CAPA
- Connect more CMS and more grading engines
- Exchange programming exercises
- Resource pool for programming exercises



Get in Touch

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