Examuntu: A Secure and Portable Linux-Distribution for Summative E-Assessments at Universities

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Introduction

Current e-assessment environments often . . .

- . . . are bound to specific computer labs
- . . . possess complex software architectures
- . . . require extensive work when deploying in other computer labs
- . . . involve manual configuration overhead for every examination

Our Solution 🔧

Examuntu: A secure and portable Linux-distribution
for summative e-assessments at universities

The Examuntu E-Assessment Environment

Key aspects of the Examuntu e-assessment environment are:

🔒 **Security**, to prevent PC-based cheating and simplify exam supervision

⚖ **Portability**, so that the system can effortlessly be deployed in varying computer labs

⚙ **Customizability**, allowing adaption to multiple types of e-assessments, each coming with different types of exercises and a distinct set of software applications

🎲 **Fairness**, by providing equal conditions for all examinees

- Ubuntu Linux with LXQT Desktop used as the base system
- Solid security measures implemented in the *core system*
- Applications and exam configurations extend the Examuntu core
- Self-contained OS images are centrally rolled out via network boot
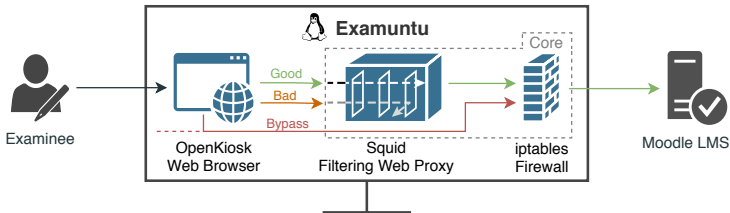- Identical environment reproducibly provided to every examinee

Figure 1: Interaction of the examinee with a Moodle LMS through Examuntu

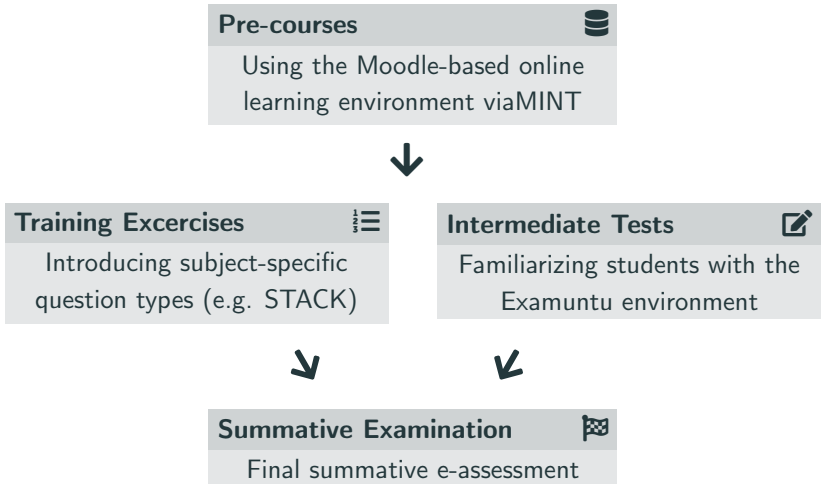*System behavior, available applications, and user interface are fully customizable for every assessment type.*

With our Moodle LMS scenario:

- Integration of the lockdown web browser *OpenKiosk*
- Enforcing full screen mode and preventing application switching to keep examinees focused on the assessment
- Removal of toolbars, developer tools, and browser settings
- Uniform and streamlined interface among all examinees

Teaching-learning Scenario

Students are incrementally introduced to all aspects of our e-assessment ecosystem, hereby establishing a well-founded constructive alignment.

Pre-courses 🗄

Using the Moodle-based online learning environment viaMINT

↓

Training Excercises ☷

Introducing subject-specific question types (e.g. STACK)

Intermediate Tests ✎

Familiarizing students with the Examuntu environment

↓   ↙

Summative Examination 🏁

Final summative e-assessment

Evaluation

We evaluated Examuntu with three types of assessments:

1. **Intermediate Test**: ungraded, fully digital, 60-75 minutes
2. **Hybrid Exam**: graded, digital and pen-and-paper part, 120 minutes
3. **Digital Exam**: graded, fully digital, 75-90 minutes

Qualitative Student Survey   👥

- Examuntu felt easy to use

- Security measures caused neither problems nor irritation

- Digital workflow was simple, supporting, and well streamlined

Feedback from Exam Supervisors   👤

- Digital cheating prevention simplified
    - E.g.: Monitoring of browser tabs and running applications
- Large computer labs easily supervised by a single staff member

Examuntu, despite all applied security measures and restrictions, did not systematically reduce student performance.
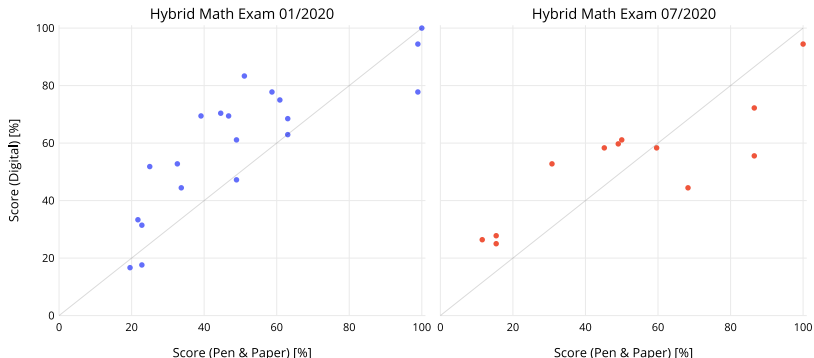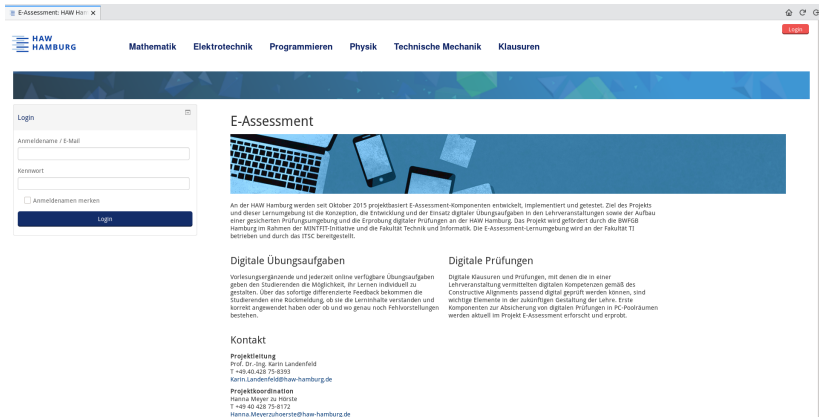
Figure 2: Student performance in digital vs. pen-and-paper parts of two hybrid exams

Any Questions **?**

- Technical Requirements

- Customization Options and Software Selection

- Scalability and Portability

- Exam Procedure / Moodle Configuration

- Automated Grading / Result Insight / Archiving

- Screenshots / User Interface

Examuntu – Screenshots

Figure 3: Full screen Examuntu GUI in our Moodle LMS scenario: Examinee login page

Figure 4: Full screen Examuntu GUI in our Moodle LMS scenario: Assessment selection page
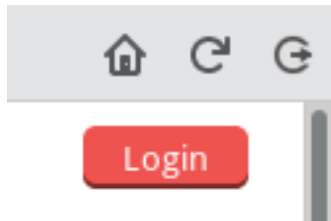
Figure 5: Available buttons (left to right): Navigate to homepage, Refresh page, Restart session (full reset)