

Empowering Non-Specialist Teachers and Students in Coding: A Case Study of a Python MOOC in an Austrian High School

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30.06.2022 | **Lehrermangel** | Doris Ohlenschläger

Lehrermangel - Ungleichgewicht nach Fächern

Schon seit Jahren gibt es an den Schulen in Fächern wie Mathematik, Physik, Informatik oder Sport zu wenig voll ausgebildetes Personal, während in anderen Fächern wie Geschichte oder Geografie ein Überschuss an Lehramtsabsolventinnen und Absolventen verzeichnet wird. Dieses Ungleichgewicht setzt sich an den Hochschulen auch aktuell fort, wie die Beantwortung einer parlamentarischen Anfrage der SPÖ durch Bildungsminister Martin Polaschek (ÖVP) zeigt. Der "Nachschub" an Lehrkräften ist je nach Fach unterschiedlich.

Many secondary schools in Austria lack adequately trained computer science teachers

Consequence: Non-specialist educators are assigned to teach the subject

Instruction is often limited to:

- Microsoft Word
- Excel
- PowerPoint
- ...

Missing:

- Foundational programming concepts
- Digital skills critical for the 21st century



Dieser Kurs ist offen für alle, richtet sich aber in erster Linie an Schüler:innen. Alle, die schon immer in die Welt des Programmierens hineinschnuppern wollten oder schon erste Erfahrungen in der Programmierung gesammelt haben, sind herzlich willkommen. In 4 Modulen (10 Wochen) beschäftigen wir uns auf spielerische Art und Weise mit der Programmiersprache Python und vertiefen das neue Wissen mit vielen praktischen Beispielen. Der Kurs ist für Schüler:innen der Mittelstufe (ab der 7. Klasse) gedacht und lässt sich wunderbar in den Unterricht integrieren.

📅 Seit 16. Juni 2024 im Selbststudium

🌐 Kurssprache: Deutsch

📄 Deutsch, English

Beginner, Junior, Programming

Zum Kurs

Kursteilnahme beenden

Kurs reaktivieren

Proposed Solution: Massive Open Online Courses (MOOCs)

Diesen Kurs reaktivieren

Diesen Kurs können Sie **reaktivieren** und so die Möglichkeit erhalten, sich noch für einen Leistungsnachweis zu qualifizieren. Weitere Informationen finden Sie **hier** — oder



Schulversion

Um den Gegebenheiten an Schulen besser gerecht zu werden, wurde dieser Kurs zeitlich gestreckt und an die Schulferienzeiten angepasst. Um erfolgreich am Kurs teilzunehmen, sollte man ca. 2 bis 3 Stunden Zeit pro Woche einplanen.

Benefits for Students:

- Exposure to real programming and computational thinking
- Personalized and flexible learning opportunities

Benefits for Teachers:

- Support for non-specialist educators
- Ready-made, pedagogically structured materials
- Role shifts from content expert to facilitator

How can MOOCs be implemented to enhance students' coding skills in secondary education, particularly when non-specialist teachers, with limited formal training in computer science, are responsible for teaching the subject?

Implemented MOOC:

- MOOC: *"Programmieren lernen mit Python – Schulversion"*
provided by HPI Open School
- **Target group:** fifth-grade classes at an Austrian high school
(so called "Gymnasium")
- **Goal:**
 - a. Close the gap in CS education in German-speaking schools
 - b. Support for non-specialist educators

Key reasons for selecting this MOOC:

- Tailored for school context, not adult learners
- Available in German - rare in the MOOC landscape
- Synchronous format, aligned with school calendar
- Strong didactic design: Video tutorials, Interactive exercises, continuous support by providers
- Programming directly in the browser - no software installation needed
- Automated grading system (Instant feedback, Verifies task completion, Supports differentiated learning)

How the MOOC was implemented in class:

Lesson 1: Introduction

- Teacher walkthrough of platform
- Class watches "Hello World" video
- **Exercise 1:** Done together with teacher
- **Exercises 2 & 3:** Completed independently

Each topic (variables, strings, data types...) followed this scaffolded model

Every class began with a **Kahoot quiz** to review prior content (Quizzes created by the CS teacher)

Ensured: Reinforcement of key concepts, Readiness for new topics

Gradual shift to independent learning

Study Design = Mixed-Methods Evaluation Approach:

Approach: Combination of quantitative surveys & qualitative interviews

Participants:

- 42 students (aged 14–15)
- 2 non-specialist teachers

Study period:

- Summer semester 2023: 3 classes (incl. one all-girls class)
- Winter semester 2023/24: 2 classes

Facilitation:

- Teachers used solution guides
- Supported by a qualified CS teacher

Student Survey Design:

Total questions: 24

- 18 closed-ended (single response)
- 4 multiple choice
- 2 open-ended

Focus areas:

- Engagement
- Motivation
- Perceived skill development

Example scale:

- *"Very useful"* to *"Less useful"* (regarding programming skill improvement)

Purpose: Capture both measurable and reflective student feedback

Teacher Interviews:

Initial phase:

- Oral interviews
- Unstructured, open format
- Encouraged free reflection on experience

Follow-up:

- Development of structured questionnaire (22 questions)
- Format: 15 single response, 4 multiple response, 3 open-ended (challenges & improvement suggestions)

Outcome:

- Teachers completed the survey post-interview
- Data included in overall result analysis

Prior Experience with MOOCs:

- **86 %** had **never heard of or used** a MOOC before
- **12 %** had heard of MOOCs, but had no experience
- Only **2 %** had used a MOOC occasionally

Prior Programming & Python Experience:

- **64 %** had **no programming experience**
- **24 %** had programmed in school before
- **12 %** had programmed in their free time
- **47 %** of students (out of 15 responses) had **no experience with Python**
- Only **13 %** had **advanced Python skills**

MOOC Usability & Navigation (n=15):

- **53 %** found the MOOC **intuitive and user-friendly**
- **33 %** needed a short adjustment period
- **14 %** had **navigation difficulties**

Difficulty & Engagement (n=15):

- **40 %** perceived the difficulty as **well-balanced**
- **33 %** found it **appropriate**
- **27 %** found the course **too difficult**
- **60 %** liked the MOOC overall, **40 %** did not

Most Valued Aspects:

Self-paced learning

Flexibility (time/place)

Students valued:

- **Improved programming skills**
- **Freedom to choose learning location**
- **Structured content and clear objectives**

Reported Challenges:

Limited peer interaction

Motivation issues, lack of customization/feedback

Technical issues (e.g., server overload, login problems)

Criticism of videos: too boring, not engaging

Desire for:

- **Clearer instructions, better support, more varied solutions**
- **Possibility to ask instructors directly**

Usefulness & Recommendation:

- **57 %** found the MOOC **useful or very useful** for learning programming
- **38 %** rated it as moderately useful
- **5 %** found it less useful
- **40 %** would recommend the MOOC (16 % definitely, 24 % probably)
- **50 %** said “maybe”

Broader Interest & Motivation:

- **64 %** would consider using MOOCs in other subjects
- **26 %** felt **motivated** for further self-learning
- **48 %** felt **moderately motivated**
- **26 %** reported **low motivation**

Teacher Reflections:

- No prior MOOC experience, but **quick adaptation** to platform
- Found materials **well-structured and engaging**
- Valued **advance access to solution sets**
- Saw the MOOC as “**very useful**” for teaching programming
- Would **recommend it** to other educators, especially non-specialists
- Inspired to use MOOCs for **own professional development**

Outcomes:

The MOOC facilitated structured, engaging programming instruction

Helped bridge the CS teacher gap

Enabled scalable, accessible integration of programming in schools

Supports long-term improvement of digital education in secondary schools

Thank You! Questions?

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